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HIV prevalence, risk behaviour, and treatment and prevention cascade outcomes among cisgender men, transgender women, and transgender men who sell sex in Zimbabwe: a cross-sectional analysis of programmatic data

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Corresponding Author:	Jan A.C. Hontelez Rotterdam, NETHERLANDS
First Author:	Mariëlle Kloek
Order of Authors:	Mariëlle Kloek
	Sungai T. Chabata
	Laura van Noord
	Fortunate Machingura
	Rumbidzo Makandwa
	Jeffrey Dirawo
	Albert Takaruza
	Primrose Matambanadzo
	Sake J. de Vlas
	Jan A.C. Hontelez
	Frances M. Cowan
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Abstract:	Background: There is limited evidence about the HIV vulnerabilities and service engagements among people who sell sex in sub-Saharan Africa identifying as cisgender men, transgender women or transgender men. We present unique data describing the sexual risk behaviour, HIV prevalence, and access to HIV services among cisgender men (MWSS), transgender women (TGWWSS), and transgender men (TGMWSS) who sell sex in Zimbabwe. Methods: From July 2018, CeSHHAR expanded its community and clinical services to include SW in their diversity more broadly. All SW reached by the programme have routine data collected, including routine HIV testing, and were referred using a network of peer educators. Sexual risk behaviour, HIV prevalence, and HIV services uptake over the period July 2018 to June 2020 were analysed through descriptive statistics by gender group. Findings: In total, 423 MWSS, 343 TGWWSS, and 237 TGMWSS were included. Age standardized HIV prevalence estimates were 26·2% [95% CI: 22·0; 30·7] for MWSS, 39·4% [95% CI: 34·1; 44·9] for TGWWSS, and 38·4% [95% CI: 32·1; 45·0] for TGMWSS. Among those living with HIV, respectively 66·0% [95% CI: 55·7; 75·3], 74·8% [95% CI: 65·8; 82·4], and 70·2% [95% CI: 59·3; 79·7] knew their status, and respectively 15·5% [95% CI: 8·9; 24·2], 15·7% [95% CI: 9·5; 23·6] and 11·9% [95% CI: 5·9; 20·8] were on ART. Self-reported condom use was consistently low across gender groups, ranging from 28% to 55%. Interpretation: These unique data demonstrate that people who sell sex identifying as cisgender men, transgender women or transgender men in sub-Saharan Africa face high HIV prevalence and risk, coinciding with alarmingly low access to HIV prevention, testing and treatment services. There is an urgent need for people-centred HIV interventions for these high-risk groups and for more inclusive HIV policies and

	research to ensure we truly attain universal access for all. Funding: Aidsfonds Netherlands.

Editorial points to be addressed:

- *Suggest title change to "HIV prevalence, risk behaviour, and treatment and prevention cascade outcomes among cisgender male, transgender women, and transgender men who sell sex in Zimbabwe: a cross-sectional analysis of programmatic data"*

We have changed the title accordingly

- *When you list the authors' institutions/affiliations, after each department or body* ***list the authors in brackets who are affiliated, provide just one preferred degree designation or professional membership for each author, and indicate any full professors here.***

I have now added the requested information to the affiliations listed.

- *If you have added to or changed the order of existing authors, we require signed statements from ALL authors that they are happy with these changes.*

We have not made any changes to this

- *Provide author statement forms and ICMJE competing interests forms for ALL authors. Please see the end of this email for a list of signed statements from authors and people named in your paper that we will need before we can consider your paper further. Please scan and upload signed author statements and ICMJE conflict of interest forms for all authors with your revised submission.*

We have now added all documents

- *We require a statement on data access and decision to submit for publication: the standard wording is "All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication"; amend as necessary to reflect the reality for this study.*

We added the unamend phrase as suggested

- *Research papers of this type should have a maximum of 3500 words and 30 references; bear this in mind when revising your Article (eg, the current reference count is 57).*

We have reduced the wordcount to below 3500, and the number of references to 30

- *Please structure your paper in* The Lancet *format: structured Summary (Background, Methods, Findings, Interpretation, Funding); Introduction (no subheadings); Methods (limit subheadings to the Study design and participants; Procedures; Statistical analysis; Role of the funding source); Results (no subheadings); Discussion (no subheadings). After the main text include Contributors and Declaration of interests statements.*

We have now revised the structure accordingly. Specifically, we changed the subheadings in the methods to the suggested titles. All other aspects were already formatted correctly.

- *In the Summary and text, "voluntary testing" is mentioned and later in the methods it says testing was "routine". Please change "voluntary" to "routine" throughout the paper if indeed testing was routinely offered to all.*

We changed “voluntary” to “routine” as suggested.

- *In the Methods, state whether informed consent was obtained or necessary.*

Informed consent was not required, as these concern routinely collected programme data. We added this to the methods.

- *Please spell out abbreviations for groups of people in the paper (eg, MSW, TGWSW, and TGMSW). Consider if "people who sell sex" or "sex workers" is the more appropriate term.*

We have revised the acronyms. “people who sell sex” is a more neutral term than “sex workers”, and therefore we opted for the former, even though it is currently less commonly used in scientific literature. Instead of “SW” we now use WSS, i.e. “who sell sex” (MWSS, TGWWSS, TGMSWW). We are happy to further discuss or revise if needed.

- *In the Contributors, state who verified and had access to data.* The Lancet’s *journals require that more than one author has directly accessed and verified the underlying data in all research articles. For research articles that are the result of an academic and commercial partnership, at least one of the authors named as having accessed and verified data must be from the academic team. Please state which author(s) have accessed and verified the data, and which author(s) were responsible for the decision to submit the manuscript.*

We added the phrase to the section as requested

- *Is a translated abstract needed?* The Lancet HIV *encourages the submission of translated summaries (abstracts) in languages that are relevant to the country where the research was done. Translated summaries are published unedited and unformatted, as a separate supplementary file. If you are interested in submitting a translation of your summary, please let me know. We will expect to receive the text once your manuscript is accepted and edited, at proof stage.*

We do not require a translated abstract, English is an official language in Zimbabwe

- *Remove the tables from the revised Word file and supply the tables as a separate file.*

Done

- *Provide exact dates for the literature search described in Research in Context, Evidence before this study.*

We now added the date

- *Report the ethnicity data for the participants.*

Our data does not contain ethnicity variables.

- *Provide the Appendix in paginated PDF format.*

Done

- *Add the Appendix page numbers when mentioned in the text.*

Done

- The Lancet HIV *endorses the SAGER guidelines for reporting of sex and gender information in study design, data analyses, results and interpretation of findings: https://www.equator-network.org/reporting-guidelines/sager-guidelines/. For all study types, we encourage correct use of the terms sex (when reporting biological factors) and gender (when reporting identity, psychosocial, or cultural factors). Where possible, please report the sex and/or gender of study participants, and describe the methods used to determine sex and gender. Separate reporting of data by demographic variables, such as age and sex, facilitates pooling of data for subgroups across studies and should be routine, unless inappropriate. Please also discuss the influence or association of variables, such as sex and/or gender, on your findings, where appropriate, and the limitations of the data.*

We have revised our terminology slightly to ensure that we are consistent. Since gender identity is a main subject of our study, we now correctly applied the right terminology which meant to change “cisgender males who sell sex” into “cisgender men who sell sex”, and “cisgender females who sell sex” into “cisgender women who sell sex”. No other changes were needed.

HIV prevalence, risk behaviour, and treatment and prevention cascade outcomes among cisgender men, transgender women, and transgender men who sell sex in Zimbabwe: a cross-sectional analysis of programmatic data

Mariëlle Kloek[1], Sungai T. Chabata[1,2], Laura van Noord[1], Fortunate Machingura[2], Rumbidzo Makandwa[2], Jeffrey Dirawo[2], Albert Takaruza[2], Primrose Matambanadzo[2], Sake J. de Vlas[1], Jan A.C. Hontelez[1,3*], Frances M. Cowan[2,4*]

*Senior authors contributed equally

1. Department of Public Health, Erasmus MC, University Medical Center Rotterdam, Rotterdam, The Netherlands (Mariëlle Kloek, MSc; Sungai T. Chabata, MSc; Laura van Noord; Prof. Sake J. de Vlas, PhD; Dr. Jan A.C. Hontelez, PhD)

2. Centre for Sexual Health and HIV/AIDS Research (CeSHHAR) Zimbabwe, Harare, Zimbabwe (Sungai T. Chabata; Fortunate Machingura, MSc; Rumbidzo Makandwa, MSc; Jeffrey Dirawo, MSc; Albert Takaruza, MSc; Primrose Matambanadzo, MSc; Prof. Frances M. Cowan, PhD)

3. Heidelberg Institute of Global Health, Heidelberg University Medical Center, Heidelberg, Germany (Dr. Jan A.C. Hontelez, PhD)

4. Department of International Public Health, Liverpool School of Tropical Medicine (Prof. Frances M. Cowan, PhD)

Corresponding author

Dr. Jan A.C. Hontelez, Assistant Professor

Department of Public Health, Erasmus MC, University Medical Center Rotterdam,

Wytemaweg 80, 3015 CN, Rotterdam, The Netherlands

Email address: j.hontelez@erasmusmc.nl; Phone number: +31 6 44730408

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Word counts: summary 300 words (max=300), research in context 360 words, main text 3498 words (max=3500).

Summary

Background: There is limited evidence about the HIV vulnerabilities and service engagements among people who sell sex in sub-Saharan Africa identifying as cisgender men, transgender women or transgender men. We present unique data describing the sexual risk behaviour, HIV prevalence, and access to HIV services among cisgender men (MWSS), transgender women (TGWWSS), and transgender men (TGMWSS) who sell sex in Zimbabwe.

Methods: From July 2018, CeSHHAR expanded its community and clinical services to include SW in their diversity more broadly. All SW reached by the programme have routine data collected, including routine HIV testing, and were referred using a network of peer educators. Sexual risk behaviour, HIV prevalence, and HIV services uptake over the period July 2018 to June 2020 were analysed through descriptive statistics by gender group.

Findings: In total, 423 MWSS, 343 TGWWSS, and 237 TGMWSS were included. Age standardized HIV prevalence estimates were 26·2% [95% CI: 22·0; 30·7] for MWSS, 39·4% [95% CI: 34·1; 44·9] for TGWWSS, and 38·4% [95% CI: 32·1; 45·0] for TGMWSS. Among those living with HIV, respectively 66·0% [95% CI: 55·7; 75·3], 74·8% [95% CI: 65·8; 82·4], and 70·2% [95% CI: 59·3; 79·7] knew their status, and respectively 15·5% [95% CI: 8·9; 24·2], 15·7% [95% CI: 9·5; 23·6] and 11·9% [95% CI: 5·9; 20·8] were on ART. Self-reported condom use was consistently low across gender groups, ranging from 28% to 55%.

Interpretation: These unique data demonstrate that people who sell sex identifying as cisgender men, transgender women or transgender men in sub-Saharan Africa face high HIV prevalence and risk, coinciding with alarmingly low access to HIV prevention, testing and treatment services. There is an urgent need for people-centred HIV interventions for these high-risk groups and for more inclusive HIV policies and research to ensure we truly attain universal access for all.

Funding: Aidsfonds Netherlands.

Research in context

Evidence before this study: Cisgender women who sell sex (WWSS) are well established as people at higher risk for HIV in sub-Saharan Africa (SSA), but cisgender men (MWSS), transgender women (TGWWSS), and transgender men (TGMWSS) who sell sex are poorly described. We searched PubMed for scientific literature published between January 2010 and May 2022 that assessed HIV risk, sexual behaviour or access to HIV services among these groups in sub-Saharan Africa, using the terms "sub-Saharan Africa" and "sex worker" or "sex workers", and "HIV" or "behaviour" or "behavior", and "male" or "transgender" (search performed at June 10th, 2022). Twelve studies discussed HIV risk, sexual behaviour or access to HIV services largely among MWSS in Kenya. In a systematic literature review on the HIV prevalence among these groups in SSA, we could find no literature on the HIV burden among TGWWSS and TGMWSS in sub-Saharan Africa (SSA). Only five studies are available on MWSS in SSA, all from Nigeria and Kenya. In addition, the Joint United Nations Programme on HIV/AIDS (UNAIDS) reports HIV prevalences in MWSS and transgender people who sell sex for only a small number of SSA countries, Nigeria and Côte d'Ivoire.

Added value of this study: To our knowledge, this study is one of the first to provide a quantitative data analysis of sexual behaviour, HIV prevalence and access to HIV services among MWSS, TGWWSS and TGMWSS in SSA. In line with global literature, the data identify high HIV risks and clear gaps in HIV treatment and prevention and provide a valuable addition to the current limited availability of scientific literature about these groups in SSA.

Implications of all the available evidence: We found a high HIV prevalence, risky sexual behaviour, and low access to HIV treatment and prevention services among the most hidden and vulnerable members who sell sex in Zimbabwe. Our results highlight the need for people-centred HIV interventions for these groups and the importance of the inclusion of these high-risk groups in HIV policy, research, and interventions in the whole of Sub-Saharan Africa. The insights of our study should encourage policymakers to improve the availability of – and access to – HIV services for these high-risk populations.

Introduction

People who sell sex (WSS) are a recognised key population in the HIV response. However, the HIV epidemiology is primarily characterised among cisgender women who sell sex (WWSS),[1,2] while the pattern and distribution of HIV among cisgender men (MWSS), transgender women (TGWWSS), and transgender men (TGMWSS) who sell sex in sub-Saharan Africa is poorly described. These gender groups remain hidden and poorly engaged with HIV services.[3-5] Studies from other regions confirm that MWSS and TGWWSS are at increased HIV risk.[4,6] A few studies suggest a relatively lower HIV risk for transgender men but do not describe risk among those selling sex.[7]

Zimbabwe is one of the worst HIV-affected countries worldwide, with an estimated prevalence of 13% among the general population,[8] representing around 1·3 million people living with HIV.[8] Nevertheless, significant progress has been made towards epidemic control.[9] The annual number of AIDS-related deaths in Zimbabwe has fallen from about 120,000 in 2000 to 22,000 in 2020, and HIV incidence has declined by an estimated 79% over the same period,[9] largely due to progress in HIV prevention, testing, and care. The country was amongst the first to reach the 90-90-90 targets, i.e. over 90% of the general population are aware of their HIV status, over 90% of those living with HIV are on antiretroviral therapy (ART), and over 90% of those are virally supressed.[10]

The Joint United Nations Programme on HIV/AIDS (UNAIDS) highlights the importance of engaging key populations in prevention and care as central to the HIV response.[11] Estimates for the HIV prevalence in Zimbabwe are 50% to 70% for WWSS,[12] 21% for men who have sex with men (MSM)[13] and 28% for transgender women.[13] UNAIDS estimates that the global relative risk of HIV infection for cisgender women WSS is 26 times higher than for the general adult female population, for MSM 25 times higher than heterosexual men, and for transgender women 43 times higher than for other adult females.[8] Estimates for HIV prevalence and risk among cisgender men and transgender people WSS are not well characterised, but they are expected to be very high as well. Men and transgenders WSS face high levels of stigma and discrimination and are doubly criminalised, imposing significant barriers to service engagement, increasing their risk of HIV and STI infection, violence, substance abuse and poor mental health.[4,14,15]

The Centre for Sexual Health and HIV/AIDS Research (CeSHHAR) implements Zimbabwe's national programme, for people WSS, "Sisters with a Voice", on behalf of the National AIDS Council and Ministry of Health and Child Care.[12]Since 2009, this programme provides comprehensive sexual and reproductive health and HIV services supported by a network of peer educators, and by September 2018 had reached over 67,000 WWSS nationwide, with an HIV prevalence of about 54% over the period 2015 to 2017.[12] In

2018, this comprehensive programme was expanded to include MWSS, TGWWSS, and TGMWSS – supported by outreach services provided through community-based organisations supported by CeSHHAR. Here we present an analysis of programme data collected between 2018-2020 to describe the sex work behaviour, HIV prevalence, and access to HIV services among MWSS, TGWWSS and TGMWSS engaged with services in Zimbabwe.

Methods

Study design and participants

We used routine programmatic data that was collected from MWSS, TGWWSS, and TGMWSS between July 2018 to June 2020 as part of accessing sexual and reproductive health, and HIV services provided through the Sisters with a Voice programme ('Sisters') programme at 31 sites across Zimbabwe, including major urban cities, towns, and highway truck stops.[12] Data for this analysis represent the initiation period of the programme for these gender groups; prior to July 2018, the programme was only able to focus on WWSS. The age of consent for treatment or HIV counselling and testing in Zimbabwe is 16 years. The Sisters with a Voice programme offer free treatment and HCT services among other services to all individuals who report selling sex, and those who are ≥16 years are eligible to access such services and their data are routinely collected. This is programme data as data collection is part of the CeSHHAR services. We obtained ethical approval from the Medical Research Council of Zimbabwe in the form of a waiver to analyse the data. The data concern routinely collected clinical programme data, and informed consent for using these data was not required.

Procedures

People who sell sex were mobilised for services by a team of trained peer educators/empowerment workers working in the community surrounding 'Sisters' sites. The peer educators/empowerment workers would approach individuals engaged in selling sex via personal networks and at venues where people WSS meet with clients and sexual partners. Upon first programme attendance, each person was assigned a unique programme identifier linked to a demographic data collection form and clinical record. The ID would be used to link repeat visits of an individual over time. Non-clinical data was collected on tablets by outreach workers and clinical data was collected on tablets by nursing staff undertaking clinical consultation. All data was subsequently synchronised to a local server. Each person identified was asked to provide sociodemographic information, including age, highest level of education attained, sex and gender identity, and sexual behaviour in the past month, including the number of different clients, type of sex partners, type of sex, and condom use. Furthermore, for those who reported living with HIV,HIV treatment history was asked, and those who knew they were living without HIV were asked about pre-exposure prophylaxis

(PrEP) use. The data collection tool was adapted from the one used for WWSS in close collaboration with MWSS, TGWWSS, and TGMWSS to suit the target population. The data collection tool was developed in English and translated into Shona and Ndebele, the two predominant Zimbabwean languages.

Rapid HIV testing, conducted according to national testing algorithms, was routinely offered to each person at first programme attendance unless they reported having already tested positive, or negative within the last three months. HIV tests were performed with Determine HIV-1/2 or First response HIV-1-2 kit antibody testing. Testing was repeated when the results were positive, and when the two test results were discordant, repeated testing was advised within two weeks. Persons who tested HIV positive were referred for ART initiation. Persons were also asked about STI symptoms and examined for signs, and treated for STIs syndromically according to national guidelines.[16] HIV results, reported STI symptoms and diagnosed STI results were entered into the tablets by nursing staff undertaking clinical consultation and subsequently synchronised to a local server.

Two questions regarding sex and gender identity were routinely collected, similar to the approach suggested by Tate and colleagues.[17] The first is "What was your sex assigned at birth?", with response options: "male", "female", and "intersex"; the second question is "What is your gender identity?", with response options: "male", "female", "gender non-conforming", "genderqueer", "transgender woman", "transgender man", or "other". Consistent with global standards, those responding transgender woman and the participants who identified themselves as female but were assigned as male at birth were considered transgender women for our analyses. Likewise, those identifying as transgender man or as male but female at birth were qualified as transgender men.[17] Some participants reported identifying as "gender non-conforming", "genderqueer", or "other".For this analysis, they were assigned according to their sex given at birth. When data on gender identity and sex assigned at birth were unavailable, or participants reported intersex, we excluded the participant from the analysis. See Appendix panel 1 (p2) for the terminology of the different gender groups.

Statistical analysis

Data from the most recent clinic visit were used in the analysis. Percentages and 95% exact binomial confidence intervals (CI) were calculated to examine sociodemographic characteristics, sexual risk behaviour, HIV and STI syndrome prevalence, and reported HIV prevention and treatment uptake. Descriptive statistics were calculated separately for MWSS, TGWWSS, and TGMWSS. The HIV and STI prevalence was categorised into three age groups (17-24 years, 25-34 years, ≥35 years). Age standardized prevalences were calculated through direct standardization, using the age distribution of the entire data sample as the reference population, and prevalence estimates were compared to those reported by the

ZIMPHIA 2020 population-based HIV impact assessment in Zimbabwe on the general population HIV prevalence.[8] We performed univariate and multivariate binary logistic regression analyses to determine associations between HIV status and age, gender, education, numbers of clients, type of sex partner, vaginal sex, anal sex, and oral-penile sex, and consistent condom use in the past; and between HIV prevention and treatment uptake and age, gender, education, numbers of clients, and type of sex partner. Multivariate models were constructed for each outcome with at least one significant associated variable (p-value of <0.05) in the univariate analysis. Multivariate models were constructed using forward selection with a -2 log likelihood test to determine whether each added variable significantly improved the fit of the model (p-value of <0.05). All multivariate models controlled for age and gender. Data were analysed using R (version 4.0.0).

Role of the funding source

The Dutch AIDS foundation had no role in the any part of the process of the development of this paper.

Results

A total of 1003 people WSS were recruited to the programme: 423 (42·2%) MWSS, 343 (34·2%) TGWWSS, and 237 (23·6%) TGMWSS (Table 1). Manywere young (17-24 years), ranging from 38·8% of TGMWSS to 46·1% of TGWWSS. In total, 66·7% had one, 28·1% had two to four, and 5·2% had more than four clinic visits since the initiation of the programme (Appendix table S1, p3).

<Table 1>

Most reported having fewer than ten clients in the past month (Table 2). The sex partners of TGWWSS were usually male (86·7%), while TGMWSS mainly reported female partners (89·6%). Finally, 42·9% of MWSS reported only men partners, while 28·6% reported only women partners, and 27·9% reported both men and women partners.

<Table 2>

In total, 20 out of 1003 individuals (2·0%) declined HIV testing (Appendix table S2, p4). Age standardized HIV prevalence was 26·2% [95% CI: 22·0; 30·7] for MWSS, 39·4% [95% CI: 34·1; 44·9] for TGWWSS, and 38·4% [95% CI: 32·1; 45·0] for TGMWSS, roughly twice as high compared to the estimated HIV prevalence in the general population (Figure 1). For each gender group, HIV prevalence increased by age, but this increase appeared much greater for TGWWSS and TGMWSS than for MWSS. Multivariate logistic regression analysis confirmed that increasing age, transgender women and men gender types, and lower attained educational levels were significantly associated with increased HIV prevalence (Appendix table S3, p5).

<Figure 1>

STI syndromes were diagnosed among 16·5% [95% CI: 12·5; 21·2] of MWSS, 32·9% [95% CI: 27·2; 39·1] of TGWWSS and 33·1% [95% CI: 25·9; 41·0] of TGMWSS (Figure 2). TGWWSS and TGMWSS had a higher occurrence of STIs than MWSS, especially among the young age group (17-24 years) (Appendix table S2, p4)).

<Figure 2>

Figure 3 shows the HIV treatment and prevention uptake for the three gender groups. Results from univariate and multivariate logistic regression analyses are given in appendix tables S7 to S9 and S10 respectively (Appendix p8-11). Among people living with HIV, 66·0% [95% CI: 55·7; 75·3] of MWSS, 74·8% [95% CI: 65·8; 82·4] of TGWWSS, and 70·2% [95% CI: 59·3; 79·7] of TGMWSS knew their status. Moreover, 15·5% [95% CI: 8·9; 24·2] of MWSS, 15·7% [95% CI: 9·5; 23·6] of TGWWSS and 11·9% [95% CI: 5·9; 20·8] of TGMWSS reported being on ART. Among those who were aware of their status (living with HIV), only 23·4% [95% CI: 13·8; 35·7] of MWSS, 20·9% [95% CI: 12·9; 31·0] of TGWWSS, and 16·9% [95% CI: 8·4; 29·0] of TGMWSS reported being on ART. Treatment uptake did not significantly vary by age (Appendix table S9, p10), but older individuals (87·2% [95% CI: 77·7; 93·7]) appeared more aware of their positive status compared to young individuals . In addition, those reporting only female sex partners were significantly less likely to know their HIV status (aOR = 0.25; $p<0.001$)) (Appendix table S10, p11). Among people living without HIV, PrEP use was low among all gender groups: 16·9% [95% CI: 12·8; 21·6], 15·6% [95% CI: 11·0; 21·3] and 10·3% [95% CI: 5·7; 16·7] ever used PrEP, and 6·0% [95% CI: 3·6; 9·3], 9·0% [95% CI: 5·5; 13·7] and 6·6% [95% CI: 3·1; 12·2] reported using PrEP consistently in the past month. Reported consistent condom use did not vary between people living with HIV and those without HIV. Those reporting more than 10 partners in the past month were less likely to

report consistent condom use (aOR = 0.44; p<0.001) and TGMWSS were more likely to report consistent condom use with vaginal sex compared to MWSS (aOR = 2.86; p<0.001) (Appendix table S10, p11).

<Figure 3>

Discussion

This is one of the very few studies describing HIV prevalence, engagement with prevention and treatment services, and sexual behaviour among cisgender men who sell sex (MWSS) in sub-Saharan Africa (SSA), and to our knowledge, the first describing these indicators for transgender people who sell sex in SSA. In total, 423 MWSS, 343 transgender women who sell sex (TGWWSS), and 237 transgender men who sell sex (TGMWSS) were recruited to the programme. Age-adjusted HIV prevalence was 26% in MWSS, and 39% among TGWWSS, and 38% among TGMWSS; more than double the HIV prevalence of the general population. Furthermore, in a country with very high HIV status awareness and treatment coverage among the general population, only 60% to 70% in our sample knew their status, and 10% to 15% were on ART. Those reporting primarily female clients and living with HIV were about 4 times less likely to be aware of their HIV status compared to those primarily reporting male clients. The reported PrEP use among those living without HIV was low, between 5% and 10%.

We could find no other literature on the HIV burden among TGWWSS and TGMWSS in SSA.[5] Only five studies reported about MWSS in SSA, all from Nigeria and Kenya.[18-22] They found an HIV prevalence among MWSS of 26%,[18] 26%,[20] and 40%[19] in Kenya, and 17%[22] and 51%[21] in Nigeria. This is comparable to or higher than our finding of 26·2% [95% CI: 22·0-30·4] among MWSS. However, four of these studies included only one or two major cities, and only the study by Bamgboye and collegues[22] was nationwide. The HIV prevalence in TGWWSS (39·4% [95% CI: 34·2-44·6]) in our study was somewhat higher than an estimated HIV prevalence of 30% for transgender women in Eastern and Southern Africa[5] and 28% for a representative sample among transgender women in Zimbabwe.[13,23] The additional risk of selling sex likely explains this difference. Lastly, our finding of an HIV prevalence of 38·4% [95% CI: 31·1-44·6] in TGMWSS was much higher than the global HIV burden estimate of 3% for transgender men who do not report selling sex.[7] However, none of the twenty studies included in this review were conducted in sub-Saharan Africa.[7]

Of those living with HIV in our study, 30 to 40% did not know their status, while this was estimated to be 7%[9] for the Zimbabwean general population, 22% for WWSS,[12] 52% for MSM[23] and 63% for transgender women.[23] However, such comparisons between programme and population survey data should always be

taken with caution as programme data are usually not a representative sample of their respective populations. The observation that HIV status awareness was substantially lower among those reporting to primarily have female clients may reflect a lower perceived HIV risk while having only female clients, yet more research is needed to better understand these differences. HIV prevalence itself was not significantly associated with reported partner types. The low self-reported ART coverage among people who knew their status (15-25%) is in sharp contrast to the estimated 91%[9] coverage among the Zimbabwean general population, 67% among WWSS,[12] 45% among MSM[23] and 34% among transgender women.[23] While the accuracy of self-reported ART status can vary greatly,[24] misreporting ART use within the context of a programme is likely much lower as it results in immediate and supported linkage to ART.

Only 5% to 10% in our sample consistently reported using PrEP in the past month. However, the contrast between these groups and WWSS (<15%),[12] MSM and transgender women (10%),[25] or the general population (<1%)[26] is much less stark than for ART, as PrEP roll-out only commenced in Zimbabwe in 2019.[27] The high occurrence of STI syndromes confirms high-risk behaviour, particularly among young people WSS, and is consistent with the reported low rates of consistent condom use (<50%). Numerous studies have shown that condom-less receptive anal intercourse is associated with the highest HIV transmission risk.[27] While we could not distinguish between insertive and receptive intercourse, anal sex was reported more frequently by MWSS and TGWWSS, indicating that they are potentially at a very high risk for HIV acquisition. HIV prevalence was highest among TGWWSS and TGMWSS, suggesting that factors associated with being transgender increase vulnerability to HIV infection.[7]

In general, our findings point to large gaps for MWSS, TGWWSS and TGMWSS regarding their access to and uptake of HIV prevention, testing and treatment and are in great contrast to other populations in the same context.[9] Programmes have since been scaled up so coverage is likely improved but more research is needed to adequately assess barriers in access to care, with a specific focus on stigma, through in-depth surveys and qualitative research amongst both key-populations and care providers.[29,30] Such research can help inform more inclusive HIV policies and services to overcome these barriers, e.g. through people-centred services similar to those for WWSS, and de-criminalization and de-stigmatization of LGBT people and selling sex in SSA.[9,30] Cowan and colleagues showed that such services for Zimbabwean WWSS led to an increased services uptake, status awareness and ART use.[12]

Our study also provides new insights into the complex sexual networks and behaviours of MWSS, TGWWSS and TGMWSS in SSA. MWSS and TGMWSS in our sample reported high rates of having sex with female clients, which contradicts the widely held notion that heterosexual sex only encompasses a

negligible proportion of all commercial sex offered by men.[8] Also, the type of sex varied widely and varied by gender. Almost all TGMWSS reported having vaginal sex in the past month compared to just half of MWSS. On the other hand, anal sex was reported nine times more often by MWSS compared to TGMWSS. However, to assess this more profoundly, additional data on a broader range of types of sex, roles per type of sex (e.g. a receptive or insertive role) and the characteristics of the clients are needed.

The findings we reported should be viewed in light of some limitations. First, all behavioural data were self-reported and thus subject to social desirability bias, which may have led to underestimating risk behaviour and overestimating treatment and prevention uptake. However, this may have been ameliorated as all the programme staff involved in data collection were explicitly trained to maintain the best relationship with the participants. Some were part of the target population themselves. Second, misclassification by gender group may have occurred even though we used a scientific approach combining sex assigned at birth and gender identity.[17] These answer options can be influenced by a lack of understanding of the differences between gender and sex and the meaning of answer options. Nevertheless, our study population was predominantly young, and both the peer educators and participants are likely more aware of the difference between sex and gender than people in the general population given that they are part of the LGBT community, and well trained. We do not expect this to be a significant issue. Third, the type of sex should be interpreted with caution. For example, in contrast to receptive penile-vaginal sex for WWSS, vaginal sex might have been interpreted more broadly as sex including a vagina (e.g. receptive, insertive, fingering, oral, and with sex toys). Fourth, we sampled people WSS through peer-educator referral at physical sex work locations and peer networks at major sex work locations throughout Zimbabwe. We, therefore, might have missed those working from home, at less known locations, or who are less connected to peers. In general, people WSS who are more hidden and who are less connected to other peers are potentially even at greater HIV risk. The high HIV prevalences presented in our study are likely minimum estimates, and access to HIV services might, in reality, be even poorer. Fifth, The data collection methods and time-frames from our study and the ZIMPHIA study are slightly different, slightly complicating direct quantitative comparisons. However, these are not likely to be so influential that they would change the qualitative inference from our study. Sixth, the cross-sectional nature of our data prevented us from performing more in-depth analyses on impact of access to interventions on HIV risk within each population.

In conclusion, our study showed that MWSS, TGWWSS, and TGMWSS in Zimbabwe are subject to high HIV prevalence and vulnerabilities, coinciding with alarmingly low access to HIV prevention, testing and treatment services. Attaining true universal access to HIV services in Zimbabwe and SSA as a whole urgently requires the implementation of evidence-based, inclusive, and appropriately scaled combinations

of HIV prevention, testing and treatment services that address the needs of MWSS, TGWWSS and TGMWSS.

Table 1. Sociodemographic characteristics of the study population. The distribution of gender, age and level of education among the study population of cisgender men (MWSS), transgender women (TGWWSS) and transgender men (TGMWSS) who sell sex in Zimbabwe.

Table 2. Self-reported sexual risk behaviour of the study population. Description of programme data at first attendance at clinical services among cisgender men (MWSS), transgender women (TGWWSS) and transgender men (TGMWSS) who sell sex in Zimbabwe. * Defined as consistent condom use during vaginal, anal and oral-penile sex.

Figure 1. HIV prevalence overall and by age group amongst the general population and cisgender men (MWSS), transgender women (TGWWSS) and transgender men (TGMWSS) who sell sex in Zimbabwe. HIV prevalence estimates for the general population are derived from a 2020 population-based HIV impact assessment (ZimPHIA 2020) amongst the Zimbabwean general population (Appendix table S4, p6).[8] Data from MWSS, TGWWSS and TGMWSS were derived from CeSHHAR programme data collected between 2018 and 2020 (Appendix table S2, p4). Colour representation: Red represents sex workers in general and is used for MWSS in our study. Light pink (used for TGWWSS) and light blue (used for TGMWSS) represent the colours of the transgender flag.

Figure 2. Diagnosed STI syndromes at CeSHHAR services by age group cisgender men (MWSS), transgender women (TGWWSS) and transgender men (TGMWSS) who sell sex in Zimbabwe. Data from MWSS, TGWWSS and TGMWSS were derived from CeSHHAR programme data collected between 2018 and 2020. A detailed overview of the underlying data is given in Appendix table S2 (p4).

Figure 3. HIV treatment and prevention uptake among cisgender men (MWSS), transgender women (TGWWSS) and transgender men (TGMWSS) who sell sex in Zimbabwe. Data from MWSS, TGWWSS and TGMWSS were derived from CeSHHAR programme data collected between 2018 and 2020. A detailed overview of the underlying data is given in Appendix tables S5 and S5 (p7). Arrows and percentages in HIV treatment cascade show the percentage of those who knew their status reported being on ART.

Additional information

Authors' contribution

MK, JACH, SJdV and FMC conceptualized and designed the study, MK, SC, FM, RM, JD and PM performed data collection and interpretation, MK, SC and LvN performed all analyses, JACH and SC verified the data, MK, FMC and SJdV wrote the first draft of the manuscript, all authors contributed to writing and editing the final version of the manuscript. SJdV, JACH and FMC provided overall supervision. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Conflicts of interest

None to declare.

Role of funding source

Aidsfonds Netherlands had no role in the any part of the process of the development of this paper.

Data sharing statement

Anonymized dataset available upon request to CeSHHAR.

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Table 1

Table 1. Sociodemographic characteristics of the study population. The distribution of gender, age and level of education among the study population of cisgender men (MWSS), transgender women (TGWWSS) and transgender men (TGMWSS) who sell sex in Zimbabwe.

	Cisgender men who sell sex (MWSS)		**Transgender women** who sell sex (TGWWSS)		**Transgender men** who sell sex (TGMWSS)	
Variable	**N**	**% [95% CI]**	**N**	**% [95% CI]**	**N**	**% [95% CI]**
Age	**423**		**343**		**237**	
17-24 years	189	44·7 [39·9; 49·6]	158	46·1 [40·7; 51·5]	92	38·8 [32·6; 45·3]
25-34 years	166	39·2 [34·6; 44·1]	131	38·2 [33; 43·6]	83	35·0 [29·0; 41·5]
≥35 years	68	16·1 [12·7; 19·9]	54	15·7 [12·1; 20·0]	62	26·2 [20·7; 32·2]
Highest level of education attained	**419**		**330**		**225**	
None or primary school	18	4·3 [2·6; 6·7]	30	9·1 [6·2; 12·7]	41	18·2 [13·4; 23·9]
Secondary school	333	79·5 [75·3; 83·2]	282	85·5 [81·2; 89·1]	169	75·1 [68·9; 80·6]
Tertiary education	68	16·2 [12·8; 20·1]	18	5·5 [3·3; 8·5]	15	6·7 [3·8; 10·8]

Table 2

Table 2. Self-reported sexual risk behaviour of the study population. Description of programme data at first attendance at clinical services among cisgender men (MWSS), transgender women (TGWWSS) and transgender men (TGMWSS) who sell sex in Zimbabwe. * Defined as consistent condom use during vaginal, anal and oral-penile sex.

	Cisgender mals who sell sex (MWSS)		**Transgender women** who sell sex (TGWWSS)		**Transgender men** who sell sex (TGMWSS)	
Variable	**N**	**% [95% CI]**	**N**	**% [95% CI]**	**N**	**% [95% CI]**
Number of clients in past month	**423**		**343**		**237**	
<10 clients	355	83·9 [80·1; 87·3]	285	83·1 [78·7; 86·9]	218	92·0 [87·8; 95·1]
≥10 clients	68	16·1 [12·7; 19·9]	58	16·9 [13·1; 21·3]	19	8·0 [4·9; 12·2]
Type of sex partner in past month	**420**		**338**		**230**	
Male	180	42·9 [38·1; 47·7]	293	86·7 [82·6; 90·1]	11	4·8 [2·4; 8·4]
Female	120	28·6 [24·3; 33·2]	1	0·3 [0; 1·6]	206	89·6 [84·9; 93·2]
Both	117	27·9 [23·6; 32·4]	40	11·8 [8·6; 15·8]	11	4·8 [2·4; 8·4]
Other / Not sure	3	0·7 [0·1; 2·1]	4	1·2 [0·3; 3]	2	0·9 [0·1; 3·1]
Type of sex in past month						
Had vaginal sex	206/409	50·4 [45·4; 55·3]	219/338	64·8 [59·4; 69·9]	202/229	88·2 [83·3; 92·1]
Had anal sex	187/409	45·7 [40·8; 50·7]	97/337	28·8 [24; 33·9]	14/229	6·1 [3·4; 10]
Had oral-penile sex	70/408	17·2 [13·6; 21·2]	57/336	17·0 [13·1; 21·4]	21/229	9·2 [5·8; 13·7]
Reported condom use in past month						
*Consistent during all type of sex**	115/363	31·7 [26·9; 36·7]	83/315	26·3 [21·6; 31·6]	64/210	30·5 [24·3; 37·2]
Consistent during vaginal sex	108/213	50·7 [43·8; 57·6]	86/225	38·2 [31·8; 44·9]	91/199	45·7 [38·7; 52·9]
Consistent during anal sex	93/189	49·2 [41·9; 56·6]	43/99	43·4 [33·5; 53·8]	9/15	60·0 [32·3; 83·7]
Consistent during oral-penile sex	14/70	20·0 [11·4; 31·3]	19/60	31·7 [20·3; 45·0]	3/21	14·3 [3·0; 36·3]

Figure 1

Figure 2

Figure 3

HIV prevalence, risk behaviour, and treatment and prevention cascade outcomes among cisgender ~~male~~men, transgender women, and transgender men who sell sex in Zimbabwe: ~~an~~a cross-sectional analysis of programmatic data

Mariëlle Kloek[1], Sungai T. Chabata[1,2], Laura van Noord[1], Fortunate Machingura[2], Rumbidzo Makandwa[2], Jeffrey Dirawo[2], Albert Takaruza[2], Primrose Matambanadzo[2], Sake J. de Vlas[1], Jan A.C. Hontelez[1,3*], Frances M. Cowan[2,4*]

*Senior authors contributed equally

1. Department of Public Health, Erasmus MC, University Medical Center Rotterdam, Rotterdam, The Netherlands (Mariëlle Kloek, MSc; Sungai T. Chabata, MSc; Laura van Noord; Prof. Sake J. de Vlas, PhD; Dr. Jan A.C. Hontelez, PhD)

2. Centre for Sexual Health and HIV/AIDS Research (CeSHHAR) Zimbabwe, Harare, Zimbabwe (Sungai T. Chabata; Fortunate Machingura, MSc; Rumbidzo Makandwa, MSc; Jeffrey Dirawo, MSc; Albert Takaruza, MSc; Primrose Matambanadzo, MSc; Prof. Frances M. Cowan, PhD)

3. Heidelberg Institute of Global Health, Heidelberg University Medical Center, Heidelberg, Germany (Dr. Jan A.C. Hontelez, PhD)

4. Department of International Public Health, Liverpool School of Tropical Medicine (Prof. Frances M. Cowan, PhD)

Corresponding author

Dr. Jan A.C. Hontelez, Assistant Professor

Department of Public Health, Erasmus MC, University Medical Center Rotterdam,

Wytemaweg 80, 3015 CN, Rotterdam, The Netherlands

Email address: j.hontelez@erasmusmc.nl; Phone number: +31 6 44730408

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Summary

Background: There is limited evidence about the HIV vulnerabilities and service engagements among people who sell sex ~~(SW)~~ in sub-Saharan Africa identifying as cisgender ~~male~~men, transgender women or transgender men. We present unique data describing the sexual risk behaviour, HIV prevalence, and access to HIV services among cisgender ~~male (MSW~~men (MWSS), transgender women~~(TGWSW~~ (TGWWSS), and transgender men (~~TGMSW~~TGMWSS) who sell sex in Zimbabwe.

Methods: From July 2018, CeSHHAR expanded its community and clinical services to include SW in their diversity more broadly. All SW reached by the programme have routine data collected, including routine HIV ~~voluntary~~ testing, and were referred using a network of peer educators. Sexual risk behaviour, HIV prevalence, and HIV services uptake over the period July 2018 to June 2020 were analysed through descriptive statistics by gender group.

Findings: In total, 423 ~~MSW~~MWSS, 343 ~~TGWSW~~TGWWSS, and 237 ~~TGMSW~~TGMWSS were included. Age standardized HIV prevalence estimates were 26·2% [95% CI: 22·0; 30·7] for ~~MSW~~MWSS, 39·4% [95% CI: 34·1; 44·9] for ~~TGWSW~~TGWWSS, and 38·4% [95% CI: 32·1; 45·0] for ~~TGMSW~~TGMWSS. Among those living with HIV, respectively 66·0% [95% CI: 55·7; 75·3], 74·8% [95% CI: 65·8; 82·4], and 70·2% [95% CI: 59·3; 79·7] knew their status, and respectively 15·5% [95% CI: 8·9; 24·2], 15·7% [95% CI: 9·5; 23·6] and 11·9% [95% CI: 5·9; 20·8] were on ART. Self-reported condom use was consistently low across gender groups, ranging from 28% to 55%.

Interpretation: These unique data demonstrate that people who sell sex identifying as cisgender ~~male~~men, transgender women or transgender men in sub-Saharan Africa face high HIV prevalence and risk, coinciding with alarmingly low access to HIV prevention, testing and treatment services. There is an urgent need for people-centred HIV interventions for these high-risk groups and for more inclusive HIV policies and research to ensure we truly attain universal access for all.

Funding: Aidsfonds Netherlands.

Research in context

Evidence before this study: Cisgender ~~females~~women who sell sex (~~FSW~~WWSS) are well established as people at higher risk for HIV in sub-Saharan Africa (SSA), but cisgender ~~male (MSW~~men (MWSS), transgender women (~~TGWSW~~TGWWSS), and transgender men (~~TGMSW~~TGMWSS) who sell sex are poorly described. We searched PubMed for scientific literature published between January 2010 and May 2022 that assessed HIV risk, sexual behaviour or access to HIV services among these groups in sub-Saharan Africa, using the terms "sub-Saharan Africa" and "sex worker" or "sex workers", and "HIV" or "behaviour" or "behavior", and "male" or "transgender~~".~~" (search performed at June 10th, 2022). Twelve studies discussed HIV risk, sexual behaviour or access to HIV services largely among ~~MSW~~MWSS in Kenya. In a systematic literature review on the HIV prevalence among these groups in SSA, we could find no literature on the HIV burden among ~~TGWSW~~TGWWSS and ~~TGMSW~~TGMWSS in sub-Saharan Africa (SSA). Only five studies are available on ~~MSW~~MWSS in SSA, all from Nigeria and Kenya. In addition, the Joint United Nations Programme on HIV/AIDS (UNAIDS) reports HIV prevalences in ~~MSW~~MWSS and transgender people who sell sex for only a small number of SSA countries, Nigeria and Côte d'Ivoire.

Added value of this study: To our knowledge, this study is one of the first to provide a quantitative data analysis of sexual behaviour, HIV prevalence and access to HIV services among ~~MSW, TGWSW~~MWSS, TGWWSS and ~~TGMSW~~TGMWSS in SSA. In line with global literature, the data identify high HIV risks and clear gaps in HIV treatment and prevention and provide a valuable addition to the current limited availability of scientific literature about these groups in SSA.

Implications of all the available evidence: We found a high HIV prevalence, risky sexual behaviour, and low access to HIV treatment and prevention services among the most hidden and vulnerable members who sell sex in Zimbabwe. Our results highlight the need for people-centred HIV interventions for these groups and the importance of the inclusion of these high-risk groups in HIV policy, research, and interventions in the whole of Sub-Saharan Africa. The insights of our study should encourage policymakers to improve the availability of – and access to – HIV services for these high-risk populations.

Introduction

People who sell sex (~~SW~~WSS) are a recognised key population in the HIV response. However, the HIV epidemiology is primarily characterised among cisgender ~~females~~women who sell sex (~~FSW~~WWSS),[1-4,2] while the pattern and distribution of HIV among cisgender ~~males (MSW~~men (MWSS), transgender women (~~TGWSW~~TGWWSS), and transgender men (~~TGMSW~~TGMWSS) who sell sex in sub-Saharan Africa is poorly described. These gender groups remain hidden and poorly engaged with HIV services.[3-5-9] Studies from other regions confirm that ~~MSW~~MWSS and ~~TGWSW~~TGWWSS are at increased HIV risk.[8,104,6] A few studies suggest a relatively lower HIV risk for transgender men but do not describe risk among those selling sex.[7,11,12]

~~Eastern and Southern Africa remain at the epicentre of the global HIV epidemic, with about 54% of all people living with HIV residing in this area.[13]~~ Zimbabwe is one of the worst HIV-affected countries worldwide, with an estimated prevalence of 13% among the general population,[148] representing around 1·3 million people living with HIV.[15,168] Nevertheless, significant progress has been made towards epidemic control.[179] The annual number of ~~deaths from~~ AIDS-related ~~illness~~deaths in Zimbabwe has fallen from ~~an estimated~~about 120,000 in 2000 to 22,000 in 2020, and HIV incidence has declined by an estimated 79% over the same period,[169] largely due to progress in HIV prevention, testing, and care.[13] The country was amongst the first to reach the 90-90-90 targets, i.e. over 90% of the general population are aware of their HIV status, over 90% of those living with HIV are on antiretroviral therapy (ART), and over 90% of those are virally supressed.[1810]

~~As Zimbabwe approaches epidemic control, infection is likely to become increasingly concentrated among key populations.[19-21] Globally and in Zimbabwe, key populations have high HIV incidence, and face numerous barriers to engagement with HIV prevention and care services.[22] An estimated 25% of the new HIV infections in Eastern and Southern Africa are thought to occur among key populations and their sexual partners.[23]~~ The Joint United Nations Programme on HIV/AIDS (UNAIDS) highlights the importance of engaging key populations in prevention and care as central to the HIV response.[21,24] ~~SW, men who have sex with men (MSM) and transgender people are among those defined as key populations.[25]~~

[11]Estimates for the HIV prevalence in Zimbabwe are 50% to 70% for ~~FSW,[26]~~WWSS,[12] 21% for ~~MSM[27]~~men who have sex with men (MSM)[13] and 28% for transgender women.[2713] UNAIDS estimates that the global relative risk of HIV infection for cisgender women ~~SW~~WSS is 26 times higher than for the general adult female population, for MSM 25 times higher than heterosexual men, and for transgender women 43 times higher than for other adult females.[248] Estimates for HIV prevalence and risk among cisgender ~~male~~men

and transgender ~~SW~~people WSS are not well characterised, but they are expected to be very high as well. ~~Males~~Men and transgenders ~~who sell sex~~WSS face high levels of stigma and discrimination and are doubly criminalised, imposing significant barriers to service engagement, increasing their risk of HIV and STI infection, violence, substance abuse and poor mental health.[8,28–33] ~~This study aims to describe the HIV prevalence, risks, and access to services among these key populations in Zimbabwe to better shape an integrated and inclusive HIV response in Zimbabwe and sub-Saharan Africa.~~[4,14,15]

The Centre for Sexual Health and HIV/AIDS Research (CeSHHAR) implements Zimbabwe's national ~~SW~~ programme, for people WSS, "Sisters with a Voice", on behalf of the National AIDS Council and Ministry of Health and Child Care.[26,34–36] ~~Since~~[12]Since 2009, this programme provides comprehensive sexual and reproductive health and HIV services supported by a network of peer educators, and by September 2018 had reached over 67,000 ~~FSW~~WWSS nationwide, with an HIV prevalence of about 54% over the period 2015 to 2017.[36]12 In 2018, this comprehensive programme was expanded to include ~~MSW, TGWSW~~MWSS, TGWWSS, and ~~TGMSW~~TGMWSS – supported by outreach services provided through community-based organisations supported by CeSHHAR. Here we present an analysis of programme data collected between 2018-2020 to describe the sex work behaviour, HIV prevalence, and access to HIV services among ~~MSW, TGWSW~~MWSS, TGWWSS and ~~TGMSW~~TGMWSS engaged with services in Zimbabwe.

Methods

Study ~~setting~~design and ~~population~~ participants

We used routine programmatic data that was collected from ~~MSW, TGWSW~~MWSS, TGWWSS, and ~~TGMSW~~TGMWSS between July 2018 to June 2020 as part of accessing sexual and reproductive health, and HIV services provided through the Sisters with a Voice programme ('Sisters') programme at 31 sites across Zimbabwe~~. Sites included~~, including major urban cities ~~and~~, towns, and highway truck stops ~~where sex work is prevalent.~~[36].[12] Data for this analysis represent the initiation period of the programme for these gender groups; prior to July 2018, the programme was only able to focus on ~~FSW~~WWSS. The age of consent for treatment or HIV counselling and testing in Zimbabwe is 16 years. The Sisters with a Voice programme offer free treatment and HCT services among other services to all individuals who report selling sex, and those who are ≥16 years are eligible to access such services and their data are routinely collected. This is programme data as data collection is part of the CeSHHAR services. We obtained ethical approval from the Medical Research Council of Zimbabwe in the form of a waiver to analyse the data. The data concern routinely collected clinical programme data, and informed consent for using these data was not required.

~~Data collection~~

Procedures

People who sell sex were mobilised for services by a team of trained ~~SW~~ peer educators/empowerment workers working in the community surrounding 'Sisters' sites. The peer educators/empowerment workers would approach individuals engaged in selling sex via personal networks and at venues where ~~SW~~people WSS meet with clients and sexual partners. Upon first programme attendance, each ~~SW~~person was assigned a unique programme identifier ~~(CeSHHAR ID)~~ linked to a demographic data collection form and clinical record. The ID would be used to link repeat visits of an individual ~~SW~~ over time. Non-clinical data was collected on tablets by outreach workers and clinical data was collected on tablets by nursing staff undertaking clinical consultation. All data was subsequently synchronised to a local server. ~~SW were~~Each person identified was asked to provide sociodemographic information, including age, highest level of education attained, sex and gender identity, and sexual behaviour in the past month, including the number of different clients, type of sex partners, type of sex, and condom use. Furthermore, for those who reported living with HIV, ~~their~~ HIV treatment history was asked, and those who knew they were living without HIV were asked about pre-exposure prophylaxis (PrEP) use. The data collection tool was adapted from the one used for ~~FSW~~WWSS in close collaboration with ~~MSW, TGWSW~~MWSS, TGWWSS, and ~~TGMSW~~TGMWSS to suit the target population. The data collection tool was developed in English and translated into Shona and Ndebele, the two predominant Zimbabwean languages.

~~HIV and STI testing~~

Rapid HIV testing, conducted according to national testing algorithms, was routinely offered to each ~~SW~~person at first programme attendance unless they reported having already tested positive, or negative within the last three months. HIV tests were performed with Determine HIV-1/2 or First response HIV-1-2 kit antibody testing. Testing was repeated when the results were positive, and when the two test results were discordant, repeated testing was advised within two weeks. ~~SW~~Persons who tested HIV positive were referred for ART initiation. ~~SW~~Persons were also asked about STI symptoms and examined for signs, and treated for STIs syndromically according to national guidelines.[~~37~~16] HIV results, reported STI symptoms and diagnosed STI results were entered into the tablets by nursing staff undertaking clinical consultation and subsequently synchronised to a local server.

~~Measures~~

Two questions regarding sex and gender identity were routinely collected, similar to the approach suggested by Tate and colleagues.[~~38~~17] The first is "What was your sex assigned at birth?", with response options:

"male", "female", and "intersex"; the second question is "What is your gender identity?", with response options: "male", "female", "gender non-conforming", "genderqueer", "transgender woman", "transgender man", or "other". Consistent with global standards, those responding transgender woman and the participants who identified themselves as female but were assigned as male at birth were considered transgender women for our analyses. Likewise, those identifying as transgender man or as male but female at birth were qualified as transgender men.[38][17] Some participants reported identifying as "gender non-conforming", "genderqueer", or "other".[39] For this analysis, they were assigned according to their sex given at birth. When data on gender identity and sex assigned at birth were unavailable, or participants reported intersex, we excluded the participant from the analysis. See Appendix panel 1 (p2) for the terminology of the different gender groups.

Statistical analysis

Data from the most recent clinic visit were used in the analysis. ~~Descriptive statistics, number (N), percentage (%)~~Percentages and 95% exact binomial confidence intervals (CI) were calculated to examine sociodemographic characteristics, sexual risk behaviour, HIV and STI syndrome prevalence, and reported HIV prevention and treatment uptake. Descriptive statistics were ~~stratified~~calculated separately for ~~MSW, TGWSW~~MWSS, TGWWSS, and ~~TGMSW~~TGMWSS. The HIV and STI prevalence was categorised into three age groups (17-24 years, 25-34 years, ≥35 years). Age standardized prevalences were calculated through direct standardization, using the age distribution of the entire data sample ~~of our study~~ as the reference population, and prevalence estimates were compared to those reported by the ZIMPHIA 2020 population-based HIV impact assessment in Zimbabwe on the general population HIV prevalence.[14][8] We performed univariate and multivariate binary logistic regression analyses to determine associations between HIV status and age, gender, education, numbers of clients, type of sex partner, vaginal sex, anal sex, and oral-penile sex, and consistent condom use in the past; and between HIV prevention and treatment uptake and age, gender, education, numbers of clients, and type of sex partner. Multivariate models were constructed for each outcome with at least one significant associated variable (p-value of <0.05) in the univariate analysis. Multivariate models were constructed using forward selection with a -2 log likelihood test to determine whether each added variable significantly improved the fit of the model (p-value of <0.05). All multivariate models controlled for age and gender. Data were analysed using R (version 4.0.0).

~~**Ethical approval**~~

Role of the funding source

The Dutch AIDS foundation had no role in the any part of the process of the development of this paper.

~~This is programme data as data collection is part of the CeSHHAR services. We obtained ethical approval from the Medical Research Council of Zimbabwe in the form of a waiver to analyse the data.~~

Results

A total of 1003 ~~SW~~people WSS were recruited to the programme~~, namely~~: 423 (42·2%) ~~MSW~~MWSS, 343 (34·2%) ~~TGWSW~~TGWWSS, and 237 (23·6%) ~~TGMSW~~TGMWSS (Table 1). ~~Across gender groups, many SW were~~Manywere young (17-24 years), ranging from 38·8% of ~~TGMSW~~TGMWSS to 46·1% of ~~TGWSW. Secondary school was the highest level of education attained for 75·1% to 85·5% of all three gender groups.~~TGWWSS. In total, 66·7% had one ~~clinic visit~~, 28·1% had two to four ~~clinic visits~~, and 5·2% had more than four clinic visits since the initiation of the programme (~~see~~ Appendix table S1, p3).

~~Table 1. Sociodemographic characteristics of the study population.~~ ~~The distribution of gender, age and level of education among the study population of cisgender males (MSW), transgender women (TGWSW) and transgender men (TGMSW) who sell sex in Zimbabwe.~~

	~~Cisgender males~~ ~~who sell sex (MSW)~~		**~~Transgender women~~** ~~who sell sex (TGWSW)~~		**~~Transgender men~~** ~~who sell sex (TGMSW)~~	
~~Variable~~	**~~N~~**	**~~% [95% CI]~~**	**~~N~~**	**~~% [95% CI]~~**	**~~N~~**	**~~% [95% CI]~~**
~~Age~~	**~~423~~**		**~~343~~**		**~~237~~**	
~~17-24 years~~	~~189~~	~~44·7 [39·9; 49·6]~~	~~158~~	~~46·1 [40·7; 51·5]~~	~~92~~	~~38·8 [32·6; 45·3]~~
~~25-34 years~~	~~166~~	~~39·2 [34·6; 44·1]~~	~~131~~	~~38·2 [33; 43·6]~~	~~83~~	~~35·0 [29·0; 41·5]~~
~~≥35 years~~	~~68~~	~~16·1 [12·7; 19·9]~~	~~54~~	~~15·7 [12·1; 20·0]~~	~~62~~	~~26·2 [20·7; 32·2]~~
~~Highest level of education attained~~	**~~419~~**		**~~330~~**		**~~225~~**	
~~None or primary school~~	~~18~~	~~4·3 [2·6; 6·7]~~	~~30~~	~~9·1 [6·2; 12·7]~~	~~41~~	~~18·2 [13·4; 23·9]~~
~~Secondary school~~	~~333~~	~~79·5 [75·3; 83·2]~~	~~282~~	~~85·5 [81·2; 89·1]~~	~~169~~	~~75·1 [68·9; 80·6]~~
~~Tertiary education~~	~~68~~	~~16·2 [12·8; 20·1]~~	~~18~~	~~5·5 [3·3; 8·5]~~	~~15~~	~~6·7 [3·8; 10·8]~~

<Table 1>

Most ~~SW~~ reported having fewer than ten clients in the past month (Table 2). The sex partners of ~~TGWSW~~TGWWSS were usually ~~men~~male (86·7%), while ~~TGMSW~~TGMWSS mainly reported female partners (89·6%). ~~MSW~~Finally, 42·9% of MWSS reported ~~both male and female sex~~only men partners~~; 42·9% had only men,~~, while 28·6% ~~had~~reported only women partners, and 27·9% ~~both men and women. Most SW reported having had vaginal sex in the past month (88·2% of TGMSW, 64·8% of TGWSW and 50·4% of MSW). Anal sex in the past month was reported among 45·7% of MSW and 28·8% of TGWSW, and only among 6·1% of TGMSW. Self-reported consistent condom use in the past month for vaginal and~~

~~anal sex in each group was; respectively 50·7% and 49·2% for MSW, 38·2% and 43·4% for TGWSW, and 45·7% and 60·0% for TGMSW.~~ reported both men and women partners.

Table 2. Self-reported sexual risk behaviour of the study population. Description of programme data at first attendance at clinical services among cisgender males (MSW), transgender women (TGWSW) and transgender men (TGMSW) who sell sex in Zimbabwe. * Defined as consistent condom use during vaginal, anal and oral-penile sex.

	Cisgender mals who sell sex (MSW)		**Transgender women** who sell sex (TGWSW)		**Transgender men** who sell sex (TGMSW)	
Variable	**N**	**% [95% CI]**	**N**	**% [95% CI]**	**N**	**% [95% CI]**
Number of clients in past month	**423**		**343**		**237**	
<10 clients	355	83·9 [80·1; 87·3]	285	83·1 [78·7; 86·9]	218	92·0 [87·8; 95·1]
≥10 clients	68	16·1 [12·7; 19·9]	58	16·9 [13·1; 21·3]	19	8·0 [4·9; 12·2]
Type of sex partner in past month	**420**		**338**		**230**	
Male	180	42·9 [38·1; 47·7]	293	86·7 [82·6; 90·1]	11	4·8 [2·4; 8·4]
Female	120	28·6 [24·3; 33·2]	1	0·3 [0; 1·6]	206	89·6 [84·9; 93·2]
Both	117	27·9 [23·6; 32·4]	40	11·8 [8·6; 15·8]	11	4·8 [2·4; 8·4]
Other / Not sure	3	0·7 [0·1; 2·1]	4	1·2 [0·3; 3]	2	0·9 [0·1; 3·1]
Type of sex in past month						
Had vaginal sex	206/409	50·4 [45·4; 55·3]	219/338	64·8 [59·4; 69·9]	202/229	88·2 [83·3; 92·1]
Had anal sex	187/409	45·7 [40·8; 50·7]	97/337	28·8 [24; 33·9]	14/229	6·1 [3·4; 10]
Had oral-penile sex	70/408	17·2 [13·6; 21·2]	57/336	17·0 [13·1; 21·4]	21/229	9·2 [5·8; 13·7]
Reported condom use in past month						
*Consistent during all type of sex**	115/363	31·7 [26·9; 36·7]	83/315	26·3 [21·6; 31·6]	64/210	30·5 [24·3; 37·2]
Consistent during vaginal sex	108/213	50·7 [43·8; 57·6]	86/225	38·2 [31·8; 44·9]	91/199	45·7 [38·7; 52·9]
Consistent during anal sex	93/189	49·2 [41·9; 56·6]	43/99	43·4 [33·5; 53·8]	9/15	60·0 [32·3; 83·7]
Consistent during oral-penile sex	14/70	20·0 [11·4; 31·3]	19/60	31·7 [20·3; 45·0]	3/21	14·3 [3·0; 36·3]

<Table 2>

In total, 20 out of 1003 ~~SW~~individuals (2·0%) declined HIV testing (~~see~~ Appendix ~~S1). The crude HIV prevalence was 25·2% [95% CI: 21·1; 29·7] for MSW, 36·1% [95% CI: 31·0; 41·5] for TGWSW and 38·8% [95% CI: 32·5; 45·4] for TGMSW.~~table S2, p4). Age standardized HIV prevalence was 26·2% [95% CI: 22·0; 30·7] for ~~MSW~~MWSS, 39·4% [95% CI: 34·1; 44·9] for ~~TGWSW~~TGWWSS, and 38·4% [95% CI: 32·1; 45·0] for ~~TGMSW~~ TGMWSS, roughly twice as high ~~as~~ compared to the estimated HIV prevalence ~~for men and women of the same age~~ in the general population (Figure 1). For each gender group, HIV prevalence increased by age, but this increase appeared much greater for ~~TGWSW~~TGWWSS and ~~TGMSW~~TGMWSS than for ~~MSW~~MWSS. Multivariate logistic regression analysis confirmed that increasing age, transgender women and men gender types, and lower attained educational levels were significantly associated with increased HIV prevalence (~~see~~ Appendix table ~~S2~~S3, p5).

<Figure 1>

STI syndromes ~~(Warts, Herpes, Genital Discharge Syndrome (GDS), Pelvic Inflammatory Disease (PID), Candida or Genital Ulcer)~~ were diagnosed among 16·5% [95% CI: 12·5; 21·2] of ~~MSW~~MWSS, 32·9% [95% CI: 27·2; 39·1] of ~~TGWSW~~TGWWSS and 33·1% [95% CI: 25·9; 41·0] of ~~TGMSW~~TGMWSS (Figure 2). ~~TGWSW~~TGWWSS and ~~TGMSW~~TGMWSS had a higher occurrence of STIs than ~~MSW~~MWSS, especially among the young age group (17-24 years~~). STI syndromes occurred more often amongst people living with HIV compared to people who were not living with HIV: respectively, 22·5% [95% CI: 13·9; 33·2] versus 14·5% [95% CI: 10·1; 19·8] for MSW, 41·7% [95% CI: 31·7; 52·2] versus 28·1% [95% CI: 21·1; 35·9] for TGWSW, and 39·4% [95% CI: 28·0; 51·7] versus 28·4% [95% CI: 19·3; 39·0] for TGMSW (see ~~) (Appendix table ~~S4).~~S2, p4)).

<Figure 2>

Figure 3 shows the HIV treatment and prevention uptake for the three gender groups~~, and results~~. Results from univariate and multivariate logistic regression analyses are given in appendix tables S7 to S9 and S10 respectively~~.~~ (Appendix p8-11). Among people living with HIV, 66·0% [95% CI: 55·7; 75·3] of ~~MSW~~MWSS, 74·8% [95% CI: 65·8; 82·4] of ~~TGWSW~~TGWWSS, and 70·2% [95% CI: 59·3; 79·7] of ~~TGMSW~~TGMWSS knew their status. Moreover, 15·5% [95% CI: 8·9; 24·2] of ~~MSW~~MWSS, 15·7% [95% CI: 9·5; 23·6] of ~~TGWSW~~TGWWSS and 11·9% [95% CI: 5·9; 20·8] of ~~TGMSW~~TGMWSS reported being on ART. Among those who were aware of their status (living with HIV), only 23·4% [95% CI: 13·8; 35·7] of ~~MSW~~MWSS, 20·9% [95% CI: 12·9; 31·0] of ~~TGWSW~~TGWWSS, and 16·9% [95% CI: 8·4; 29·0] of ~~TGMSW~~TGMWSS reported being on ART. Treatment uptake did not significantly vary by age (~~see~~

Appendix table S9, p10), but older ~~SW~~individuals (87·2% [95% CI: 77·7; 93·7]) appeared more aware of their positive status compared to young ~~SW (Appendix table S10).~~individuals . In addition, those reporting only female sex partners were significantly less likely to know their HIV status (aOR = 0.25; p<0.001~~—~~)) (Appendix table S10, p11). Among people living without HIV, PrEP use was low among all gender groups: 16·9% [95% CI: 12·8; 21·6], 15·6% [95% CI: 11·0; 21·3] and 10·3% [95% CI: 5·7; 16·7] ever used PrEP, and 6·0% [95% CI: 3·6; 9·3], 9·0% [95% CI: 5·5; 13·7] and 6·6% [95% CI: 3·1; 12·2] reported using PrEP consistently in the past month. Reported consistent condom use did not vary between people living with HIV and those without HIV~~, and multivariate logistic regression shows that those with~~. Those reporting more than 10 partners in the past month were less likely to report consistent condom use (aOR = 0.44; p<0.001) and ~~TGMSW~~TGMWSS were more likely to report consistent condom use with vaginal sex compared to ~~MSW~~MWSS (aOR = 2.86; p<0.001) (Appendix table S10, p11).

<Figure 3>

Discussion

This is one of the very few studies describing HIV prevalence, engagement with prevention and treatment services, and sexual behaviour among cisgender ~~males~~men who sell sex (~~MSW~~MWSS) in sub-Saharan Africa (SSA), and to our knowledge, the first ~~study~~ describing these indicators for transgender people who sell sex in SSA. In total, 423 ~~MSW~~MWSS, 343 transgender women who sell sex (~~TGWSW~~TGWWSS), and 237 transgender men who sell sex (~~TGMSW~~TGMWSS) were recruited to the programme. Age-adjusted HIV prevalence was ~~high~~26% in ~~MSW (26%)~~MWSS, and ~~even higher in TGWSW (~~39~~%)~~% among TGWWSS, and ~~TGMSW (~~38~~%), i.e.~~% among TGMWSS; more than double the HIV prevalence of the general population. Furthermore, in a country with very high HIV status awareness and treatment coverage among the general population, only 60% to 70% in our sample knew their status, and 10% to 15% were on ART. Those reporting primarily female clients and living with HIV were about 4 times less likely to be aware of their HIV status compared to those primarily reporting male clients. The reported PrEP use among those living without HIV was low, between 5% and 10%.

We could find no other literature on the HIV burden among ~~TGWSW~~TGWWSS and ~~TGMSW~~TGMWSS in SSA~~, preventing a direct comparison with our findings.~~[~~9~~,5] Only five studies reported about ~~MSW~~MWSS in SSA, all from Nigeria and Kenya.[~~40-44~~ ~~In these studies, they~~18-22] They found an HIV prevalence among ~~MSW~~MWSS of 26%,[~~40~~18] 26~~%~~[~~42~~%,[20] and 40%[~~41~~19] in Kenya, and 17%[~~44~~22] and 51%[~~43~~21] in Nigeria. This is comparable to or higher than our finding of 26·2% [95% CI: 22·0-30·4] among ~~MSW~~MWSS. However,

four of these studies included only one or two major cities~~: Nairobi, Mtwapa, Abuja,~~ and ~~Lagos. Only~~only the study by Bamgboye and ~~collegues[44]~~collegues[22] was nationwide~~, including eight major cities throughout the country. Our finding for the~~. The HIV prevalence in ~~TGWSW~~TGWWSS (39·4% [95% CI: 34·2-44·6]) in our study was somewhat higher than an estimated HIV prevalence of 30% for transgender women in Eastern and Southern ~~Africa[9]~~Africa[5] and 28% for a representative sample among transgender women in Zimbabwe.~~[27,45]~~[13,23] The additional risk of ~~working as SW~~selling sex likely explains this difference. ~~Similarly, Cowan and collegues[36] found a high estimated HIV prevalence (54%) in 2015-2017 for Zimbabwean FSW, compared to 17% in 2015 among adult women in the general population.[46]~~ Lastly, our finding of an HIV prevalence of 38·4% [95% CI: 31·1-44·6] in ~~TGMSW~~TGMWSS was much higher than the global HIV burden estimate of 3% for transgender men who do not report selling sex.~~[12]~~[7] However, none of the twenty studies included in this review were conducted in sub-Saharan Africa.~~[12]~~[7]

~~The low self-reported ART coverage among people who knew their status (15-25%) is in sharp contrast to the estimated 91%[18] coverage among the Zimbabwean general population, 67% among FSW,[36] 45% among MSM[45] and 34% among transgender women.[45] While the accuracy of self-reported ART status can vary greatly and is often subject to quite extreme under reporting in surveys, [47,48] misreporting ART use within the context of a programme is likely much less as it results in immediate and supported linkage to ART. Even under the extreme assumption that under reporting of ART use is 60%, ART coverage will still be suboptimal at around 50%.~~ Of those living with HIV in our study, 30 to 40% did not know their status, while this was estimated to be 7%~~[18]~~[9] for the Zimbabwean general population, 22% for ~~FSW[36]~~,WWSS,[12] 52% for ~~MSM[45]~~MSM[23] and 63% for transgender ~~women[45].~~women.[23] However, such comparisons between programme and population survey data should always be taken with caution as programme data are usually not a representative sample of their respective populations. The observation that HIV status awareness was substantially lower among those reporting to primarily have female clients may reflect a lower perceived HIV risk while having only female clients, yet more research is needed to better understand these differences. HIV prevalence itself was not significantly associated with reported partner types. The low self-reported ART coverage among people who knew their status (15-25%) is in sharp contrast to the estimated 91%[9] coverage among the Zimbabwean general population, 67% among WWSS,[12] 45% among MSM[23] and 34% among transgender women.[23] While the accuracy of self-reported ART status can vary greatly,[24] misreporting ART use within the context of a programme is likely much lower as it results in immediate and supported linkage to ART.

~~The access of our study groups to prevention methods was low, with only~~Only 5% to 10% in our sample consistently reported using PrEP in the past month. However, the contrast between these groups and

~~FSW~~WWSS (<15%),[~~36~~12] MSM and transgender women (10%),[~~50~~25] or the general population (<1~~%, 72,500~~[~~51~~ ~~out of 7·8 million adult population~~[~~52~~])~~%~~)[26] is much less stark than for ~~treatment~~ART, as PrEP roll~~-~~-out only commenced in Zimbabwe in 2019.[~~53~~] ~~Nevertheless~~[27] The high occurrence of STI syndromes confirms high-risk behaviour, particularly among young people WSS, and is consistent with the reported low rates of consistent condom use (<50%). Numerous studies have shown that condom-less receptive anal intercourse is associated with the highest HIV transmission risk.[27] While we could not distinguish between insertive and receptive intercourse, anal sex was reported more frequently by MWSS and TGWWSS, indicating that they are potentially at a very high risk for HIV acquisition. HIV prevalence was highest among TGWWSS and TGMWSS, suggesting that factors associated with being transgender increase vulnerability to HIV infection.[7]

In general, our findings point to large gaps for ~~MSW, TGWSW~~MWSS, TGWWSS and ~~TGMSW~~TGMWSS regarding their access to and uptake of HIV prevention, testing and treatment and are in great contrast to other populations in the same context.[~~18~~9] Programmes have since been scaled up so coverage is likely improved but more research is needed to adequately assess barriers in access to care, with a specific focus on stigma, through in-depth surveys and qualitative research amongst both key-populations and care providers.[~~54~~29,30] Such research can help inform more inclusive HIV policies and services to overcome these barriers, e.g. through people-centred services similar to those for ~~FSWs~~WWSS, and de-criminalization and de-stigmatization of LGBT people and ~~SW~~selling sex in SSA.[~~7,18,31~~9,30] Cowan and colleagues showed that such services for Zimbabwean ~~FSW~~WWSS led to an increased services uptake, status awareness and ART use.[~~36~~12]

Our study also provides new insights into the complex sexual networks and behaviours of ~~MSW, TGWSW~~MWSS, TGWWSS and ~~TGMSW~~TGMWSS in SSA. ~~MSW~~MWSS and ~~TGMSW~~TGMWSS in our sample reported high rates of having sex with female clients, which contradicts the widely held notion that heterosexual sex only encompasses a negligible proportion of all commercial sex offered by ~~males~~men.[8,~~55~~] Also, the type of sex varied widely and varied by gender. Almost all ~~TGMSW~~TGMWSS reported having vaginal sex in the past month compared to just half of ~~MSW~~MWSS. On the other hand, anal sex was reported nine times more often by ~~MSW~~MWSS compared to ~~TGMSW~~TGMWSS. However, to assess this more profoundly, additional data on a broader range of types of sex, roles per type of sex (e.g. a receptive or insertive role) and the characteristics of the clients are needed.

~~The high occurrence of STI syndromes confirms high-risk behaviour, particularly among young SW, and is consistent with the reported low rates of consistent condom use. Less than 50% reported using a condom~~

~~consistently. These findings were comparable to Zimbabwe's low self-reported condom use among FSW.[36] Numerous studies have shown that condom-less receptive anal intercourse is associated with the highest HIV transmission risk.[56] While we could not distinguish between insertive and receptive intercourse, anal sex was reported more frequently by MSW and TGWSW, indicating that they are potentially at a very high risk for HIV acquisition. HIV prevalence was highest among TGWSW and TGMSW, suggesting that factors associated with being transgender increase vulnerability to HIV infection.[12]~~

The findings we reported should be viewed in light of some limitations. First, all behavioural data were self-reported and thus subject to social desirability bias, which may have led to underestimating ~~sexual~~ risk behaviour and overestimating ~~HIV~~ treatment and prevention uptake. However, this may have been ameliorated as all the programme staff involved in data collection were explicitly trained to maintain the best relationship with the participants. Some were part of the target population themselves. Second, misclassification by gender group may have occurred even though we used a scientific approach combining sex assigned at birth and gender identity.[37][17] These answer options can be influenced by a lack of understanding of the differences between gender and sex and the meaning of answer options. Nevertheless, our study population was predominantly young, and both the peer educators and participants are likely more aware of the difference between sex and gender than people in the general population given that they are part of the LGBT community, and well trained. We do not expect this to be a significant issue. Third, the type of sex should be interpreted with caution. For example, in contrast to receptive penile-vaginal sex for ~~FSW~~WWSS, vaginal sex might have been interpreted more broadly as sex including a vagina (e.g. receptive, insertive, fingering, oral, and with sex toys~~) by our study population.~~). Fourth, we sampled ~~SW~~people WSS through peer-educator referral at physical sex work locations and peer networks at major sex work locations throughout Zimbabwe. We, therefore, might have missed ~~SW~~those working from home, at less known locations, or ~~SW~~ who are ~~possibly~~ less connected to peers. In general, ~~SW~~people WSS who are more hidden and who are less connected to other peers are ~~likely to be at~~ potentially even at greater HIV risk.[57] The high HIV prevalences presented in our study are likely minimum estimates, and access to HIV services might, in reality, be even poorer. Fifth, The data collection methods and time-frames from our study and the ZIMPHIA study are slightly different, slightly complicating direct quantitative comparisons. However, these are not likely to be so influential that they would change the qualitative inference from our study. Sixth, the cross-sectional nature of our data prevented us from performing more in-depth analyses on impact of access to interventions on HIV risk within each population.

In conclusion, our study showed that ~~MSW, TGWSW~~MWSS, TGWWSS, and ~~TGMSW~~TGMWSS in Zimbabwe are subject to high HIV prevalence and vulnerabilities, coinciding with alarmingly low access

to HIV prevention, testing and treatment services. Attaining true universal access to HIV services in Zimbabwe and SSA as a whole urgently requires the implementation of evidence-based, inclusive, and appropriately scaled combinations of HIV prevention, testing and treatment services that address the needs of ~~MSW, TGWSW~~MWSS, TGWWSS and TGMWSS.

Table 1. Sociodemographic characteristics of the study population. The distribution of gender, age and level of education among the study population of cisgender men (MWSS), transgender women (TGWWSS) and transgender men (TGMWSS) who sell sex in Zimbabwe.

Table 2. Self-reported sexual risk behaviour of the study population. Description of programme data at first attendance at clinical services among cisgender men (MWSS), transgender women (TGWWSS) and transgender men (TGMWSS) who sell sex in Zimbabwe. * Defined as consistent condom use during vaginal, anal and oral-penile sex.

~~TGMSW.~~

Figure 1. HIV prevalence overall and by age group amongst the general population and cisgender ~~males (MSW~~men (MWSS), transgender women (~~TGWSW~~TGWWSS) and transgender men (~~TGMSW~~TGMWSS) who sell sex in Zimbabwe. HIV prevalence estimates for the general population are derived from a 2020 population-based HIV impact assessment (ZimPHIA 2020) amongst the Zimbabwean general population (~~see~~ Appendix table ~~S1).~~[14]S4, p6).[8] Data from ~~MSW, TGWSW~~MWSS, TGWWSS and ~~TGMSW~~TGMWSS were derived from CeSHHAR programme data collected between 2018 and 2020 (~~see~~ Appendix table ~~S3~~S2, p4). Colour representation: Red represents sex workers in general and is used for ~~MSW~~MWSS in our study. Light pink (used for ~~TGWSW~~TGWWSS) and light blue (used for ~~TGMSW~~TGMWSS) represent the colours of the transgender flag.

Figure 2. Diagnosed STI syndromes at CeSHHAR services by age group cisgender ~~males (MSW~~men (MWSS), transgender women (~~TGWSW~~TGWWSS) and transgender men (~~TGMSW~~TGMWSS) who sell sex in Zimbabwe. Data from ~~MSW, TGWSW~~MWSS, TGWWSS and ~~TGMSW were derived from CeSHHAR programme data collected between 2018 and 2020. A detailed overview of the underlying data is given in Appendix table S3.~~

TGMWSS

~~**Figure 3. HIV treatment and prevention uptake among cisgender males (MSW), transgender women (TGWSW) and transgender men (TGMSW) who sell sex in Zimbabwe.** Data from MSW, TGWSW and TGMSW~~ were derived from CeSHHAR programme data collected between 2018 and 2020. A detailed overview of the underlying data is given in Appendix table S2 (p4).

Figure 3. HIV treatment and prevention uptake among cisgender men (MWSS), transgender women (TGWWSS) and transgender men (TGMWSS) who sell sex in Zimbabwe. Data from MWSS, TGWWSS and TGMWSS were derived from CeSHHAR programme data collected between 2018 and 2020. A detailed overview of the underlying data is given in Appendix ~~table S4.~~tables S5 and S5 (p7). Arrows and percentages in HIV treatment cascade show the percentage of those who knew their status reported being on ART.

Additional information

Authors' contribution

MK, JACH, SJdV and FMC conceptualized and designed the study, MK, SC, FM, RM, JD and PM performed data collection and interpretation, MK, SC and LvN performed all analyses, JACH and SC verified the data, MK, FMC and SJdV wrote the first draft of the manuscript, all authors contributed to writing and editing the final version of the manuscript. SJdV, JACH and FMC provided overall supervision. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Conflicts of interest

None to declare.

Role of funding source

Aidsfonds Netherlands had no role in the any part of the process of the development of this paper.

Data sharing statement

Anonymized dataset available upon request to CeSHHAR.

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