HIV Prevalence and Associated Risk Factors among Female Sex Workers in Dar es Salaam, Tanzania: Tracking the Epidemic

Mizinduko MM[1], Moen K[3], Likindikoki S[1], Mwijage A[1], Leyna GH[1], Makyao N[2], Leshabari MT[1], Ramadhan A[2], Kambi MB[2], Meyrowitsch D[4], Tersbøl B[4], Mmbaga EJ[1, 3]

Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania[1], Ministry of Health, Community Development, Gender, Elderly and Children, Dodoma, Tanzania[2], University of Oslo, Oslo Norway[3], University of Copenhagen, Copenhagen, Denmark[4]

Corresponding author:

Dr. Mucho MIZINDUKO, M.D., M.P.H.,
Muhimbili University of Health and Allied Sciences,
9 United Nations Road – Upanga,
P.O. Box 65001, Dar es Salaam, Tanzania
Telephone: +255 752 30 79 88
Email: mmizinduko@gmail.com

ABSTRACT

Since 2014, HIV care and treatment services among key populations including female sex workers (FSW) have intensified in Tanzania. We sought to track the epidemic among FSW in Dar es Salaam, Tanzania. We conducted a cross-sectional integrated bio-behavioral survey (IBBS) using respondent-driven sampling (RDS) using a structured questionnaire. Blood was drawn for HIV testing. Modified Poisson regression was used to determine factors associated with HIV infection. We recruited 958 FSW (median age 26 years) of whom 952 consented to HIV testing. The HIV prevalence was 15.3% (95%CI: 12.5 – 18.6). Factors associated with higher HIV prevalence included old age (25 to 34: aPR 2.38; 95CI: 1.23, 4.60 and above 35: aPR = 6.08; 95CI: 3.19, 11.58) and having experienced sexual violence in the past year (aPR = 1.94; 95CI: 1.34, 2.82). Attaining higher education level was associated with lower HIV prevalence (aPR = 0.51; 95%CI: 0.36, 0.73 for primary school level and aPR = 0.20; 95CI: 0.08, 0.46 for secondary school level and/or above). The HIV prevalence among FSW in Dar es Salaam has decreased by half since 2013. Prevention strategies should target older FSW, aim to educate young girls and institute approaches to mitigate violence among FSW.

INTRODUCTION

By the end of 2016, UNAIDS estimated that of the 36.7 million people living with HIV/AIDS globally, 25.5% resided in sub-Saharan Africa (1), and that 58.2% in the latter group were women and girls (1). Sub-Saharan Africa observed an eleven percentage increase in HIV prevalence from 1998 to 2003 (2). In Tanzania, the peak of the HIV epidemic was in 2003 when the prevalence reached 8% (3). Recent estimates from UNAIDS indicate that there has been a decrease in infection rates in many parts of the world, and in Tanzania the overall prevalence had dropped to 4.7% in 2016 (3,4). The decreasing HIV prevalence may be indicative of positive impact from ongoing efforts to prevent new HIV infections.

Despite the overall decrease in infection rates, HIV prevalence rates remain unacceptably high in key populations, including among female sex workers (FSW). While sex work is widely practiced especially in economic centers such Dar es Salaam city, it is criminalized and punishable by law. An integrated bio-behavioral survey (IBBS) conducted by the Tanzania National AIDS Control Program (NACP) in 2013 reported the prevalence of HIV among FSW to be 26.6% across seven large cities (5). This was lower than in an earlier survey, carried out by NACP in 2010, which found the HIV prevalence among FSW to be 31.4% (6).

Previous studies have established that various factors, including inconsistent condom use, experience of violence, and poor access to health services, could be contributing to the high prevalence of HIV among FSW(7–10). However, these risk factors are extremely heterogenic and dynamic calling for studies to track the epidemic. In 2014, Tanzania developed and started using a guideline that aimed at guiding provision of comprehensive HIV care and treatment services to key and vulnerable populations, including FSW. Since the implementation of these guidelines started, there has been no survey to estimate the HIV prevalence and associated risk

factors among FSW. We therefore sought to track the HIV epidemic by estimating the current

prevalence of HIV and associated risk factors among FSW to inform ongoing efforts to control

the HIV epidemic in Tanzania

MATERIALS AND METHODS

Design and Setting

We conducted a cross-sectional integrated bio-behavioral survey among FSW in Dar es Salaam,

Tanzania using respondent driven sampling (RDS). Study participants were recruited between

September and December 2017 from all the five municipalities of Dar es Salaam, which is

Tanzania's largest city with a population of about 5 million. It is reported to have an overall HIV

prevalence of 6.3% (4) and as high as 26% among FSW(5).

Study Population

The study population consisted of women aged 18 and above who exchanged sex for

money/goods during the past three months and had been living in Dar es Salaam the past six

months before recruitment.

Power and Sample Size estimation

Power and sample size estimates were based on the 26.6% HIV infection estimate among FSW

from the survey conducted in 2013 (5). With a precision of 5% and design effect (DEFF) of 3,

based on the median DEFF found for key variables in similar previous surveys in the country,

the minimum sample size was estimated to be 892.

Sampling and Recruitment

Respondent-driven sampling (RDS), a method designed for sampling from populations for which

sampling frames are not available, was used in this study. This sampling technique takes into

consideration the network sizes of study participants for statistical adjustments to make the samples generalizable. The RDS methodology has been well described in the past (11,12). With RDS, initially selected members of the target population (referred to as "seeds") refer other members of the same population to the study team for possible participation in a succession of waves until the desired sample size is reached.

Data Collection Tool

We adapted tools from previous surveys of FSW in Tanzania to allow comparability of results across surveys. The initial questionnaire was developed in English and translated into Swahili; the language spoken by all Tanzanians. To ensure face validity, back translation into English was thereafter carried out. The translated questionnaire was pre-tested among FSW in order to receive feedback on its language, formatting and length, and the acceptability of using an electronic data collection method.

Data Collection Procedures

Recruitment started with five (5) seeds representing different groups of FSW with respect to age, residence, and type of sex work (street, brothel, clubs and bar-based). Contact with the initial seeds was made through peer health educators. All study participants gave informed consent to participate, and face-to-face interviews were conducted using a structured questionnaire on an Android tablet equipped with an Open Data Kit (ODK). The consent process and interviews were both done using Swahili language. Following the interviews, blood was drawn for HIV testing among consenting study participants. Participants who were HIV tested received pre-test counseling following the national guidelines for HIV testing. Blood was drawn by a qualified phlebotomist who collected 10 ml of venous blood from the left hand as per standard blood collection procedures. Samples were labeled with the participants' identification numbers in a

barcode. The barcode was used to link the samples with the information obtained through interviews. As part of the RDS protocol, upon completion of data collection, each participant was given three invitation coupons and asked to pass them on to some of their peers for the sake of inviting them to participate in the study. Upon successful completion of study procedures, participants were each compensated eight thousand Tanzanian Shillings (equivalent to about four US dollars) for their time and transport.

Laboratory Testing

HIV testing was done with SD Bioline HIV-1/2 3.0 rapid test (Standard Diagnostics, Inc., Korea). Non-reactive results were considered negative for HIV whereas reactive results were subsequently tested with Uni-Gold[TM] HIV-1/2 (Trinity Biotech Plc, Ireland). Discrepant results were resolved by Enzygnost HIV Integral II Antibody/Antigen ELISA (Siemens, Germany).

Data Analysis

Data analysis was carried out using STATA version 15 and the RDSAT statistical package. The use of RDS results in different selection probability for each participant. Participants with larger networks get more representation than those with smaller network sizes. Data were therefore weighted to control for network size and clustering. Categorical variables were summarized by calculating proportions and differences in proportions were examined using χ^2 test. Median and inter-quartile range (IQR) were used to summarize continuous variables.

The outcome variable (HIV infection) was common, hence conventional logistic regression would have overestimated the odds ratio (OR). To address this, we used weighted modified Poisson regression with robust standard error to estimate prevalence ratio (PR). Using a selection cut-off point of $p \leq 0.2$ in bivariate analysis, weighted modified multivariable Poisson regression model with robust standard errors was built to identify independent risk factors for HIV infection

among FSW. Significance level was set at 0.05 and a two-tailed p-value was used for all the analyses.

Ethical Considerations

We obtained ethical approval to conduct this study from the Research and Publication Committee of the Muhimbili University of Health and Allied Sciences. Permission to conduct the study was then sought from local authorities. Health education on safer sex was given to all participants. Participants who tested positive for HIV were referred to care and treatment for further management. Written informed consent was obtained from each participant before commencing an interview or collecting blood specimens.

RESULTS

A total of 958 eligible FSW were recruited through 6 to 16 recruitment waves over a three-month period. Their median age was 26 years (IQR: 22 – 32), and two thirds (67.3%) reported to be single. Two thirds (69.8%) had completed primary school (seven years of schooling), and the median monthly income was Tanzanian shillings 250,000 (IQR: 150,000 – 400,000). About 80.0% of the participants were either born and raised in the study area or had lived in the area for 6 or more years (Table 1).

Sex-work related characteristics and other HIV-related risk behaviors

Age at first experience of selling sex ranged from 12 to 48 years with the median being 20 years (IQR: 18 – 25). The amount earned per sex act varied among participants with a median of TZS 5,000 (IQR: 3,000 – 10,000). Similarly, participants presented with varying amount paid when they last worked with a median pay of TZS 15,000 (IQR: 10,000 – 30,000). Regarding their number of clients, a large proportion (65.3%: 626/958) reported to have had 2 to 4 clients on the

last day they worked whereas 14.0% reported more than 5 clients (Table 2). HIV related risks were common among participants. Alcohol use while working in the past one week was reported by three quarters (76.7%, 544/709) of the participants. A quarter (25.9%: 246/949) reported to not have used a condom with the last one-time client they had had, and a similar proportion (27.6%, 264/957) had not used a condom the last day they worked. A third of the participants (32.8%) had experienced sexual violence during the previous one year. 59.2% of the 314 participants who had experienced forced sex reported one-time clients as the perpetrators, whereas 26.1% (82/314) reported that they had been forced by a regular client. A majority of the study participants (53.2%: 510/958) said they primarily met their clients in pubs, bars, and night clubs. The other common meeting places that were mentioned were brothels and private rooms (17.5%; 168/958) (Table 2). Prior to survey, 65.3% of study participants reported to have had an HIV test in the past 12 months and received results. There was no difference in proportions of having had an HIV test in the past year and age.

Prevalence and Risk factors of HIV Infection

The weighted prevalence of HIV infection among study participants was 15.3% (95%CI: 12.5 – 18.6). Modified Poisson regression analysis indicated the risk of HIV infection to be linearly associated with age. Compared with FSW aged 15 to 24, those aged 25 to 34 had near three times higher risk of HIV infection (PR = 2.85; 95%CI: 1.51, 5.35) whereas FSW aged 35 and above had a 9-fold higher risk (PR = 8.99; 95%CI: 5.00 ,16.18). Women who had completed primary school (PR = 0.4; 95%CI: 0.26, 0.61) and those with secondary school education or above (PR = 0.09; 95%CI: 0.04, 0.21) had a lower risk of HIV infection than those without formal education. Women who had not been married had lower risk of HIV than those who were

married at the time of interview (PR = 2.35; 95%CI: 1.01, 5.47) and those who were either

separated, divorced or widowed (PR = 2.73; 95%CI: 1.85, 4.03).

Regarding sex-work related characteristics, FSW who had started sex work at the age of 18 or

later had significantly higher HIV prevalence than those who had started at a younger age (PR =

1.81; 95%CI: 1.04, 3.11). Moreover, FSW who received lower pay when they last worked were

at an increased risk of being HIV infected (Table 3) than those who received a higher pay.

Independent risk factors for HIV infection

Modified multivariable Poisson regression model of risk factors for HIV infection among FSW

showed age, education level, and sexual violence to be independently associated with HIV

infection in this population. Participants aged 25 to 34 (APR = 2.38; 95CI: 1.23, 4.60) and those

aged 35 and above (APR = 6.08; 95CI: 3.19, 11.58) had 2- and 6-times higher risk of HIV

infection than those aged 15 to 24. Experience of sexual violence during the past year (APR =

1.94; 95CI: 1.34, 2.82) was significantly associated with twice the risk of HIV infection.

Compared to those who did not have any formal education, having completed primary school

(APR = 0.51; 95%CI: 0.36, 0.73) or secondary school and above (APR = 0.20; 95CI: 0.08, 0.46)

were independently associated with lower risk of HIV infection (Table 3).

DISCUSSION

We present results from the largest survey ever among FSW in Dar es Salaam, Tanzania's largest

city. The estimated HIV prevalence of 15.3% is more than twice as high as among women of the

same age in general (6.3%) (4). While this difference is large, the current HIV prevalence among

FSW is considerably lower than the 26.6% reported by a survey conducted in Dar es Salaam four

years before the fieldwork for the present study took place (5). These two studies used similar

research methods; hence the observed difference in prevalence could not be explained by the differences in methodology. Various reasons, however, could have contributed to the observed decline in HIV prevalence. First, over the past decade, Tanzania has experienced advances in the control of HIV infection through extensive interventions in prevention and provision of treatment to the already infected individuals. These efforts have coincided with a significant decrease in HIV prevalence in the general population and potentially among FSW as well. Secondly, compared to the previous survey in 2013, we recruited a relatively younger population. Nearly half (43.3%) of our study participants were 24 years or younger whereas the previous survey had only 27.2% in that age bracket (5). It is therefore possible that the demographics of FSW in the city has evolved over the years with large number of young girls joining the profession whose risk exposure is low due to exposure time and access to preventive information. The lower prevalence observed in the current study could also be due to the fact that the current survey had better educated study participants and education appeared to be a preventive factor. Mortality related to HIV is unlikely to explain the observed decrease in prevalence. Data from Tanzania HIV Impact Survey indicate that 91% of people aged 15-64 who knows their HIV status are linked to care and 88 % of those linked to care have suppressed viral load and decreased HIV related mortality suggesting that mortality could not have claimed lives to an extent of decreasing the prevalence (4). In light of the above, it is therefore possible that the observed decrease is an indication of positive impact of ongoing intervention measures with decrease in infection rates.

Not surprisingly, HIV infections were substantially more prevalent among older FSW (those aged above 25 years) than among younger ones (18-24 years). Similar findings were observed in

the previous survey and various other surveys in sub Saharan African region (5,8,13,14). This could be related to cumulative risk emanating from long period of exposure given the estimated median age at start of sex work of 20 years. Due to the fact that only 52% of people aged 15-64 know their HIV status (4), there is a possibility that substantial number of older FSW have not accessed HIV testing services as well. Therefore, it is imperative that among other groups, interventions that focus on treatment should be scaled up to reach older FSW.

A third (32.7%) of the participants in this study reported to have experienced sexual violence in the one year preceding the survey. This proportion is lower than those found in Uganda, where 36% of FSW experience sexual violence(14) and in Abidjan, Ivory Coast, where they found a prevalence of 43.2%(15). On the other hand, it is higher than that observed in a study in Benin, where the prevalence of sexual violence was 13.5% (16). The reported prevalence is also lower than the reported sexual violence prevalence of 44.3% in the previous survey four years earlier (5). Further analysis determined that sexual violence was associated with HIV seropositivity. Similar association corroborates findings from three other studies that have reported presence of sexual violence among FSW(15–17). The lower rate of sexual violence in this study compared to the previous survey and the fact that sexual violence is significantly associated with HIV risk could partly explain the differences in HIV prevalence between the two studies. It is imperative that ongoing implementation of the Comprehensive guideline for HIV care and treatment among key population in the country, of which addressing violence is a component, should continue and be intensified. The number of years spent at school was observed to be protective with regard to HIV acquisition. FSW who attained primary school education (7 years of schooling) and secondary school education or above (11+ years of schooling), were found to have lower HIV

prevalence as compared to those without formal education (less than 7 years of schooling). Studies in similar settings in the region reported similar associations (13,17). Studies have indicated that education increases the probability of exposure to preventive interventions and also ability for one to internalize and act on preventive messages (18). Increased access to education among young people could also partly explain the lower risk of HIV among young FSW in this population as explained previously. Improving access to education among girls not only increases their chance to earn better income in the future, but also their ability to protect themselves from HIV infection.

Findings from our study should be interpreted in light of the following limitations. The cross-sectional design of the study presents the limited capability to elicit temporal relationship between HIV infection and the observed potential risk factors. We are confident however in that, our findings are in line with other studies in similar population and settings. Also, desirability bias might have affected our estimates especially with factors that are considered sensitive sexual behaviors such as condom usage. Although HIV infection and sexually transmitted infections (STIs) have been reported to show associations in previous studies, our study did not test or inquire information on STIs status of our participants. The large sample size of our study and the fact that we used seeds of various socio-demographics present one of the strengths of our study to support our findings.

CONCLUSIONS AND RECOMMENDATIONS

HIV prevalence among FSW in Dar es Salaam has decreased by half over the past 4 years. Despite the observed decrease, FSW still bear a disproportionate burden of HIV infections.

Younger and educated FSW have lower prevalence of HIV infection whereas experience of sexual violence is associated with increased risk of HIV infection. Improving access to education among girls could have an impact in preventing HIV infection in the future. Care and treatment interventions should be scaled out to reach FSW particularly of older age groups.

SUPPLEMENTARY MATERIALS

Data will be available, upon reasonable request, from the corresponding author

REFERENCES

1.   UNAIDS. Prevention Gap Report 2016. Unaids [Internet]. 2016;286. Available from: http://www.unaids.org/sites/default/files/media_asset/2016-prevention-gap-report_en.pdf

2.   Coovadia HM, Hadingham J. HIV/AIDS: Global trends, global funds and delivery bottlenecks. Global Health. 2005;1:1–10.

3.   Tanzania Commission for AIDS National Bureau of Statistics Tanzania [Internet]. 2003. Available from: www.measuredhs.com

4.   NBS. Tanzania Hiv Impact Survey (This) 2016-2017. Tanzania HIV Impact Surv 2016-2017 [Internet]. 2018;(December 2017):2016–7. Available from: http://www.nbs.go.tz/nbs/takwimu/this2016-17/Tanzania_SummarySheet_English.pdf

5.   NACP. Hiv and sti bilogical and behavioral survey, 2013 A study of Female Sex workers in seven Regions: Dar es Salaam, Iringa, Mbeya, Mwanza, Shinyanga, Tabora and Mara. 2013.

6.   THE UNITED REPUBLIC OF TANZANIA [Internet]. 2011 [cited 2019 Jun 4]. Available from: www.nacp.go.tz

7.   Shannon K, Goldenberg SM, Deering KN, Strathdee SA. HIV infection among female sex workers in concentrated and high prevalence epidemics. Curr Opin HIV AIDS [Internet]. 2014 Mar [cited 2017 Mar 24];9(2):174–82. Available from: http://content.wkhealth.com/linkback/openurl?sid=WKPTLP:landingpage&an=01222929-201403000-00011

8.   Coetzee J, Jewkes R, Gray GE. Cross-sectional study of female sex workers in Soweto, South Africa: Factors associated with HIV infection. PLoS One [Internet]. 2017 [cited 2018 May 11];12(10):e0184775. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28981511

9.   Longo JDD, Simaleko MM, Diemer HS-C, Grésenguet G, Brücker G, Belec L. Risk factors for HIV infection among female sex workers in Bangui, Central African Republic. PLoS One [Internet]. 2017 [cited 2018 May 11];12(11):e0187654. Available from: http://www.ncbi.nlm.nih.gov/pubmed/29108022

10.   Mutagoma M, Samuel MS, Kayitesi C, Gasasira AR, Chitou B, Boer K, et al. High HIV prevalence and associated risk factors among female sex workers in Rwanda. Int J STD AIDS [Internet]. 2017 Oct 12 [cited 2017 Feb 17];28(11):1–8. Available from: http://journals.sagepub.com/doi/10.1177/0956462416688137

11.   Malekinejad M, Grazina L, Ae J, Kendall C, Ligia A, Franco R, et al. Using Respondent-Driven Sampling Methodology for HIV Biological and Behavioral Surveillance in International Settings: A Systematic Review. 2008;

12.   Goel S, Salganik MJ. Respondent-driven sampling as Markov chain Monte Carlo. Stat Med

[Internet]. 2009 Jul 30 [cited 2017 Jan 27];28(17):2202–29. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19572381

13.   Do Â, Augusto R, Young PW, Horth RZ, Inguane C, Sathane I, et al. High burden of HIV infection and risk behaviors among female sex workers in three main urban areas of Mozambique HHS Public Access. AIDS Behav. 2016;20(4):799–810.

14.   Hladik W, Baughman AL, Serwadda D, Tappero JW, Kwezi R, Nakato ND, et al. Burden and characteristics of HIV infection among female sex workers in Kampala, Uganda – a respondent-driven sampling survey. BMC Public Health [Internet]. 2017;17(1):565. Available from: http://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-017-4428-z

15.   Lyons CE, Grosso A, Drame FM, Ketende S, Diouf D, Ba I, et al. Physical and sexual violence affecting female sex workers in Abidjan, Côte d'Ivoire: Prevalence, and the relationship with the work environment, HIV and access to health services.

16.   Tounkara FK, Diabaté S, Guédou FA, Ahoussinou C, Kintin F, Zannou DM, et al. Violence, condom breakage and HIV infection among female sex workers in Benin, West Africa. Sex Transm Dis. 2014;41(5):312–8.

17.   Hladik W, Baughman AL, Serwadda D, Tappero JW, Kwezi R, Nakato ND, et al. Burden and characteristics of HIV infection among female sex workers in Kampala, Uganda - a respondent-driven sampling survey. BMC Public Health [Internet]. 2017 Jun 10 [cited 2018 Sep 4];17(1):565. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28601086

18.   Mmbaga E et al. Education attainment and the risk of HIV-1 infections in rural Kilimanjaro Region of Tanzania, 1991-2005: a reversed association. Sex Transm Dis. 2007;34(12):947–53.

Table 1: Comparison of Socio-demographic characteristics by HIV status among FSW in Dar es Salaam, Tanzania (N = 958)

Variable	n (%)	HIV status		p-value
		Positive n (%*)	Negative n (%*)	
Age groups (years)				
15-24	415 (43.32)	18 (5.04)	395 (94.96)	<0.001
25-34	343 (35.70)	60 (14.35)	278 (85.65)	
35 and above	201 (20.98)	91 (45.32)	110 (54.68)	
Education level				
No formal	135 (14.09)	43 (34.45)	92 (65.55)	<0.001
Primary	669 (69.83)	115 (13.81)	549 (86.19)	
Secondary and above	154 (16.08)	11 (3.22)	142 (96.78)	
Marital Status				
Never married	645 (67.33)	74 (10.16)	569 (89.84)	<0.001
Married/cohabiting	22 (2.30)	8 (23.97)	14 (76.03)	
Divorced/separated	290 (30.27)	87 (27.75)	199 (72.25)	
Income past month (TZS)**				
<75,000	88 (9.19)	14 (10.70)	74 (89.30)	0.195
75,000 - 150,000	237 (24.74)	45 (19.41)	188 (80.59)	
150,001- 300,000	337 (35.18)	52 (12.52)	284 (87.48)	
>300,000	296 (30.90)	58 (15.99)	237 (84.01)	
Time lived in Dar es Salaam				
Lived for </= 5 years	194 (20.29)	29 (15.07)	164 (84.93)	0.489
Lived for >/= 6 years	284 (29.71)	69 (18.16)	213 (81.84)	
Born and raised	478 (50.00)	71 (13.65)	404 (86.35)	
Currently living with				
Alone	369 (38.52)	81 (20.16)	285 (79.84)	0.022
Boyfriend/Husband/Family	386 (40.29)	69 (14.16)	315 (85.84)	
Friends/Fellow FSW	203 (21.19)	19 (9.07)	183 (90.93)	
Tested for HIV prior to survey				
No HIV test	336 (34.66)	91 (21.07)	240 (78.93)	0.006
Tested and received results	622 (65.34)	78 (12.25)	543 (87.75)	

*: percentages are weighted network size.

**: TZS = Tanzanian Shillings

Table 2: Sex-work and other HIV related risk behaviors by HIV Status among FSW in Dar es Salaam, Tanzania (N = 952)

Variable	N (%)	HIV Infection		p-value
		Positive: n (%*), Mean (SE)	Negative: n (%*), Mean (SE)	
Least amount paid for Sex Sold	952	5,821 (566.0)	10,602 (1,292.6)	0.01
Last Amount Paid for Sex Sold	952	15,721 (1,593.6)	23,751 (1,511.0)	0.002
Age (years) at First Sold Sex				
<18	213 (22.4)	21 (9.5)	192 (90.5)	0.03
>= 18	739 (77.6)	148 (17.1)	591 (82.9)	
Payment Last Time You Had Sex with Client (TZS)**				
>25,000	279 (29.3)	44 (10.3)	235 (89.7)	<0.001
16,000 – 25,000	185 (19.4)	19 (7.4)	166 (92.6)	
11,000 – 15,000	125 (13.1)	19 (14.1)	106 (85.1)	
</= 10,000	363 (38.1)	87 (23.0)	276 (77.0)	
Number of Clients (Last Day You Worked)				
>= 5	134 (14.1)	26 (15.7)	108 (84.3)	0.89
2 – 4	622 (65.3)	100 (14.8)	522 (85.2)	
1	196 (20.6)	43 (16.5)	153 (83.5)	
Forced Sex in Past One Year				
Yes	312 (32.8)	66 (19.5)	246 (80.5)	0.06
No	640 (67.2)	103 (13.4)	537 (86.6)	
Using Alcohol While Working (Past One Week)				
Yes	541 (77.1)	82 (13.2)	459 (86.8)	0.59
No	161 (22.9)	43 (17.6)	118 (82.4)	
Condom use (One-time client)				
Yes	700 (74.2)	133 (16.3)	567 (83.7)	0.30
No	243 (25.8)	34 (12.5)	209 (87.5)	
Refuse One-time sex if no condom				
Yes	530 (60.7)	104 (17.1)	426 (82.9)	0.46
No	343 (39.3)	51 (13.4)	292 (86.6)	
Condom use last day you worked				
Yes	689 (72.4)	133 (15.8)	556 (84.2)	0.76
No	262 (27.6)	36 (14.1)	226 (85.9)	
Primary Meeting Point with Clients				
Others	16 (1.68)	5 (26.4)	11 (73.6)	0.002
Pub/Bar/Night Club	507 (53.3)	69 (11.5)	438 (88.5)	
Guest house/Hotel	91 (9.5)	19 (17.6)	72 (82.4)	
Street	96 (10.1)	16 (13.5)	80 (86.5)	
Telephone/internet/agent	75 (7.9)	13 (11.2)	62 (88.8)	
Brothels/private room	167 (17.5)	47 (27.6)	120 (72.4)	
Reason for First Sex Sold				
Other	13 (1.4)	2 (3.9)	11 (96.1)	0.181
Help Family/Pay Debt	317 (33.3)	63 (18.1)	254 (81.8)	

Extra income	184 (19.3)	22 (11.2)	162 (88.8)	
Abandoned by Husband/Family	160 (16.8)	38 (20.6)	122 (79.4)	
Pleasure	77 (8.1)	9 (8.8)	68 (91.2)	
Peer pressure (Friends, Family)	194 (20.4)	33 (14.5)	161 (85.5)	
Refuse Sex with Steady Partner (If no condom)				
Yes	61 (15.8)	11 (14.8)	50 (85.2)	0.871
No	326 (84.2)	53 (12.1)	273 (87.9)	

*: percentages are weighted network size.

**: TZS = Tanzanian Shillings

Table 3: Modified Poisson Regression Modeling of risk factors for HIV infection among FSW in Dar es Salaam, Tanzania (N = 952)

Variable	PR (95%CI)	p-value	APR (95% CI)¥	p-value
Age categories (years)				
15-24	1	Ref.	1	Ref.
25-34	2.85 (1.51, 5.35)	0.001	2.38 (1.23, 4.60)	0.010
35 and above	9.0 (5.00, 16.18)	<0.001	6.08 (3.19, 11.58)	<0.001
Education level				
No formal	1	Ref	1	Ref
Primary	0.40 (0.26, 0.61)	<0.001	0.51 (0.36, 0.73)	<0.001
Secondary and above	0.09 (0.04, 0.21)	<0.001	0.20 (0.08, 0.46)	<0.001
Marital Status				
Never married	1	Ref	1	Ref
Married/cohabiting	2.35 (1.01, 5.47)	0.046	1.58 (0.72, 3.46)	0.25
Divorced/separated	2.73 (1.84, 4.03)	<0.001	1.26 (0.81, 1.95)	0.30
Currently living with				
Alone	1	Ref	1	Ref
Boyfriend/Husband/Family	0.70 (0.45, 1.08)	0.110	0.89 (0.63, 1.26)	0.53
Friends/Fellow FSW	0.45 (0.24, 0.82)	0.009	0.82 (0.47, 1.45)	0.50
Age (years) at First Sold Sex				
<18	1	Ref	1	Ref.
>= 18	1.81 (1.04, 3.11)	0.033	1.04 (0.61, 1.77)	0.88
Payment (TZS) Last Time You Had Sex with Client				
</= 10,000	1	Ref	1	Ref.
11,000 – 15,000	0.61 (0.34, 1.10)	0.10	0.94 (0.55, 1.60)	0.83
16,000 – 25,000	0.32 (0.17, 0.61)	<0.001	0.50 (0.26, 0.97)	0.04
> 25,000	0.45 (0.27, 0.72)	0.001	0.78 (0.48, 1,27)	0.33
Forced Sex in Past One Year				
No	1	Ref.	1	Ref.
Yes	1.45 (0.98, 2.15)	0.061	1.94 (1.34, 2.82)	<0.001
Primary Meeting Point with Clients				
Pub/Bar/Night Club	1	Ref	1	Ref.
Guest house/Hotel	1.52 (0.83, 2.75)	0.166	1.61 (0.90, 2.88)	0.11
Street	1.17 (0.61, 2.21)	0.638	0.80 (0.45, 1.41)	0.44
Telephone/internet/agent	0.97 (0.47, 1.98)	0.941	1.10 (0.59, 2.05)	0.75
Brothels/private room	2.39 (1.47, 3.87)	<0.001	1.30 (0.83, 2.02)	0.25
Others	2.28 (0.83, 6.28)	0.109	0.87 (0.35, 2.17)	0.78
Reason for First Sex Sold				
Extra income	1	Ref.	1	Ref.
Help Family/Pay Debt	1.62 (0.89, 2.93)	0.108	1.44 (0.88, 2.35)	0.15
Abandoned by Husband/Family	1.84 (0.99, 3.43)	0.052	1.44 (0.81, 2.56)	0.21
Peer pressure (Friends, Family)	1.29 (0.69, 2.41)	0.416	1.40 (0.83, 2.36)	0.21
Pleasure/Fun	0.78 (0.33, 1.83)	0.577	1.06 (0.53, 2.14)	0.86

PR, Prevalence Ratio; APR, Adjusted Prevalence Ratio

¥ Variables included in the model include age, education, marital status, current living status, age at first sold sex, payment received when last sold sex, forced sex status in the past one years, primary meeting point with clients, and reason for firs sold sex.