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Female sex workers in Kigali, Rwanda: a key population at risk of HIV, sexually transmitted infections, and unplanned pregnancy

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Abstract
Female sex workers (FSWs) were recruited from known hotspots in Kigali, Rwanda, and offered free, anonymous human immunodeficiency virus (HIV) counseling and testing, diagnosis and treatment of sexually transmitted infections (STIs) and long-acting reversible contraception (LARC). From September 2012 to March 2015, 1168 FSWs sought services, including 587 (50%) who were HIV-positive. More than 90% had previously tested for HIV, and 26% who reported previously testing negative had seroconverted. Of the 349 who already knew their HIV-positive status, 74% were on antiretroviral treatment. The prevalence of serologic syphilis was 43% in HIV-positive and 19% in HIV-negative FSWs (p < 0.0001), and Trichomonas vaginalis was found in vaginal wet mounts in 21% of HIV-positive and 13% of HIV-negative FSWs (p < 0.0001). Signs and symptoms of STIs were found in 35% of HIV-positive compared with 21% of HIV-negative FSWs (p < 0.0001). Only one-third reported consistent condom use in the last month. Modern contraceptive use was reported by 43% of HIV-positive and 56% of HIV-negative FSWs (p < 0.0001). Current pregnancy was reported by 4% of HIV-positive and 6% of HIV-negative FSWs (p = 0.0409). Despite Rwanda’s successes with preventing 70% of new infections in the general population through nationwide couples’ testing in antenatal clinics, prevention and timely treatment in key populations including FSWs are lacking. The prevalence of HIV – including many new cases – and STIs among FSWs in Kigali is high and condom and contraceptive use are low. Tailored and integrated HIV/STIs and family planning programs are urgently needed for FSWs.

Keywords
HIV, female sex workers, sexually transmitted infections, key populations, family planning

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Introduction
Worldwide, women who exchange sex for money are at high risk of human immunodeficiency virus (HIV), sexually transmitted infections (STIs), and unplanned pregnancy, but are often less likely to seek HIV testing due to transportation costs, time constraints, and the stigma and discrimination associated with sex work and being HIV-positive.¹ This is particularly true in Africa, where the prevalence of HIV and STIs is high and access to modern contraception is suboptimal.² In Africa, female sex workers (FSWs) are among the most vulnerable: young, homeless, poor, undereducated, alcohol or drug dependent, victims of physical or sexual violence,
and resident in areas of economic or political upheaval.\textsuperscript{3–11} Studies in East Africa confirm high prevalence of HIV and STIs in Uganda\textsuperscript{12} and Kenya.\textsuperscript{13}

As in other countries in sub-Saharan Africa, the majority of new HIV infections in Rwanda are the result of heterosexual transmission in the adult population.\textsuperscript{14,15} The Rwandan national HIV/AIDS control program is known globally for its HIV prevention success. In the last 25 years, the general population prevalence of HIV in urban Kigali was reduced from 25–30\% to less than 10\%.\textsuperscript{16,17} Rwanda is the only country in Africa that has successfully implemented couples’ voluntary HIV counseling and testing (CVCT) nationwide to reduce the transmission of HIV among cohabiting couples;\textsuperscript{18} and as of the 2014–2015 Rwanda Demographic Health Survey (DHS), 80\% of 15–49 year olds know their HIV status, 92\% of pregnant women have access to antenatal care and prevention of mother-to-child transmission of HIV (PMTCT) services, 84\% of pregnant women are tested with their partners, and 63\% of HIV-positive people are on antiretroviral therapy (ART).\textsuperscript{19–21}

Despite these ongoing efforts to reduce the HIV burden on the health care system, more must be done to fight the HIV/AIDS epidemic among FSWs, the most at-risk population. According to a study conducted by the Rwanda Biomedical Center in 2010, the prevalence of HIV in this group is estimated at 51\%, which is 17 times greater than the general population.\textsuperscript{22} The majority of FSWs in Rwanda are found in Kigali,\textsuperscript{23} and per the 2014–2015 Rwanda DHS, 13\% of adult men living in the city reported to have ever paid for sex in the year prior to the survey.\textsuperscript{20}

\textit{Projet San Francisco} (PSF), one of the sites the Rwanda Zambia HIV Research Group established in 1986, initiated a program to provide reproductive health services to FSWs recruited from Kigali urban areas. We describe the status, condom use, and contraceptive use of HIV and STIs among FSWs to better understand HIV prevention and family planning needs in this population and to inform future interventions.

\section*{Methods}

\subsection*{Study design and study population}

This is a descriptive cross-sectional study of clinical services offered to a sample of FSWs invited from known hotspots of sex work activity in neighborhoods surrounding the PSF research center in Kigali, the capital city of Rwanda, from September 2012 to March 2015. In this program, an FSW was defined as any woman exchanging sexual favors for money. We used one community health worker (CHW), herself a former FSW, to recruit FSWs. During the recruitment process, the CHW introduced herself to the administrative leader in the area, and the local leader introduced the CHW to FSWs known to be influential among their peers. The CHW explained the purpose of her visit and then asked to be introduced to other FSWs in the neighborhood. Up to 20 FSWs were contacted during a single visit. FSWs were given a voucher for free HIV and reproductive health services at the PSF clinic and were advised that the cost for transportation to and from PSF would be reimbursed. All women presenting for services and meeting the criteria described above were included in this study.

\begin{flushright}
\textbf{HIV counseling and testing, assessment of sexually transmitted infections, family planning counseling, and provision of long-acting reversible contraception (copper intra-uterine device and hormonal implant)}
\end{flushright}

Services began with a group education session about HIV, STIs, and family planning. Topics included basic facts on the transmission of HIV and STIs, the role of condoms, and the importance of modern contraceptive methods and dual method use in women’s reproductive health.\textsuperscript{24} Because previous work confirmed that knowledge about these methods was poor,\textsuperscript{25} and because they were not easily accessible at government clinics, the group discussion focused on long-acting reversible contraception (LARC) instead of oral and injectable hormonal contraception, which conversely had high knowledge levels and were readily available in government clinics.\textsuperscript{25} After the group education session, each FSW attended an individual pre-test counseling session where she had an opportunity to discuss the group education topics in greater detail. During this individual session, basic demographic and health information was recorded including signs and symptoms suggestive of an STI. A physical genital exam was performed if clinically indicated or requested, and methods were offered.

After verbal consent, 5 ml of venous blood were collected in an ethylenediaminetetraacetic acid (EDTA) tube for rapid HIV testing using the national HIV testing algorithm\textsuperscript{26} and for rapid plasma reagin (RPR) syphilis serology.\textsuperscript{27} FSWs also provided a self-administered vaginal swab for microscopic detection of \textit{Trichomonas vaginalis} and sperm (an indicator of recent condomless sex). Women requesting LARC provided a urine sample for pregnancy testing. HIV, syphilis, and \textit{T. vaginalis} results were provided the same day in an individual post-test counseling session. FSWs received free STI treatment as indicated by laboratory results, signs, and/or symptoms as recommended by WHO and Centers for Disease Control (CDC) guidelines.\textsuperscript{28} Copper intra-uterine devices (IUDs) and hormonal implant insertions were performed.
at PSF following a negative pregnancy test. Free condoms were provided and FSWs could return any time to request more. HIV-positive FSWs were referred to their local health center for appropriate care and treatment and PMTCT, if indicated.

Data collection and analysis
No personal identifiers were collected. Each participant was assigned a unique identification number to link laboratory, demographic, and clinic data. Data included age, marital status, previous history of HIV testing, ART for FSWs who reported being HIV-positive, condom use, contraceptive method use, signs and symptoms of STIs, and laboratory test results (HIV, RPR, and vaginal swab results). This information was entered into a Microsoft Access database. Analyses were performed using SAS version 9.4, with Chi square and Fisher’s exact tests for comparison of proportions and two-tailed t-tests for comparison of means between HIV-positive and HIV-negative FSWs. Following a collinearity assessment, we ran bivariate and multivariable logistic regression models. Condomless sex was added into the initial multivariable logistic regression model a priori based on biological plausibility for its association with HIV. All other predictors included in the initial multivariable logistic regression model were significant in bivariate models at an alpha of 0.05. The reduced multivariable model was generated by removing via backward elimination predictors that were not significant at an alpha of 0.05 in initial adjusted analyses.

Additional data collection in a subset of FSWs
A subset of 97 HIV-positive women (between September 2012 to September 2013) and 458 HIV-negative women (between September 2012 to March 2015) signed a written informed consent to participate in an interviewer-administered questionnaire assessing literacy and sexual practices, including recruitment of clients, number and type of clients, and types and frequency of sexual contact. These data were used to inform best practices for prevention messaging, and to assess whether HIV-positive and HIV-negative FSWs reported different sexual practices. The study and informed consent were approved by Office for Human Research Protections-registered Institutional Review Boards in Rwanda and at Emory University. Signed consents did not include the unique study identifier and were stored in locked cabinets.

Results
Unless specified, all comparisons presented in text are statistically significant with p-values provided in tables.

Demographic information, previous HIV testing and ART, pregnancy, and contraceptive use (Table 1)
Of 1168 FSWs seeking HIV and reproductive health services at PSF from 2012 to 2015, 587 (50%) were HIV-positive. HIV-positive women were older (mean age 30.4, SD = 6.3 vs. 27.6, SD = 5.9 for HIV-negative women) and more likely to be widowed (12% vs. 4%), while HIV-negative women were more likely to be single (never married) (43% vs. 36% of HIV-positive).

The majority of FSWs reported that they were previously tested for HIV (1088; 93%); of these 1088 FSWs, 349 (32%) had previously tested HIV-positive, while the remaining 739 (68%) reported that they had last tested HIV-negative. Of note, about one-fourth of the FSWs who reported that they previously tested HIV-negative (189/739; 26%) were found to be HIV-positive when tested at the PSF clinic. Of the 349 FSWs who previously tested HIV-positive, 260 (74%) reported taking ART. While more HIV-positive FSWs reported condomless sex in the last month (72% vs. 67% of HIV-negative FSWs), this difference was not statistically significant.

At the clinic, 59 women (5%) self-reported being pregnant. Although HIV-negative women were more likely to be pregnant (6% vs. 4% of HIV-positive), they were also more likely to be using a modern non-barrier contraceptive method (56% vs. 43% of HIV-positive). The most common contraceptives were injectable hormonal (medroxyprogesterone aka Depo-Provera) reported by 19% of HIV-positive and 23% of HIV-negative FSWs, and implant (Jadelle or Norplant), reported by 19% of HIV-positive and 20% of HIV-negative FSWs. Among women not pregnant or infertile (bilateral tubal ligation, hysterectomy) and not already using a LARC method, 11% of 444 HIV-positive and 12% of 414 HIV-negative women requested and received a LARC method (p = 0.6696), with 96 requesting the Jadelle implant and five requesting the IUD (not shown). An additional 11 women requested LARC, but had a positive pregnancy test and could not be accommodated as pregnancy termination is not legal in Rwanda.

Urogenital symptoms
Urogenital complaints were explored and assessed via an initial open-ended question and a list of potential symptoms, which were coded as spontaneously reported, prompted with symptom present today, or prompted with symptom present previously (Table 2). Among the 1168 FSWs, 446 (38%) spontaneously...
reported urogenital symptoms when asked, ‘Do you have any gynecologic problems you would like us to evaluate? If so, what are they?’ All spontaneously reported symptoms were more common among HIV-positive women, including dysuria (18% HIV-positive vs. 10% HIV-negative), vaginal itching (16% vs. 10%), vaginal discharge (13% vs. 7%), dyspareunia (6% vs. 2%), lower abdominal pain (16% vs. 6%), and acute (5% vs. 1%) or chronic ulcers (4% vs. 0.2%). Thirty-five percent of HIV-positive women spontaneously reported at least one symptom, compared with 21% of HIV-negative women. An additional 1% to 9% of women responded yes when prompted about symptoms that were not spontaneously reported, with similar proportions in HIV-positive and HIV-negative women.

**Prevalence of positive laboratory tests for sexually transmitted infections**

The prevalence of positive RPR serology for syphilis was markedly higher among HIV-positive women (43%) compared with HIV-negative women (19%) (Table 3). Similarly, 21% of HIV-positive and 13% of HIV-negative women had *T. vaginalis* noted on vaginal wet mount. Sperm on wet mount, a biological marker of unprotected sex in the last few days, was not significantly more frequent in HIV-positive women (8%) compared.
with HIV-negative women (6%) (p = 0.2332, not shown).

In both HIV-positive and HIV-negative women, the proportion with sperm on wet mount was not different among those reporting condomless sex in the last month and those not reporting condomless sex.

### Gynecologic exam findings

Table 3 shows results of external and speculum exam in the subset of women who reported symptoms and/or requested a gynecologic exam. In keeping with the higher prevalence of urogenital symptoms, 59% of

| Reproductive health disturbances                      | HIV+ (n=587) (50%) | HIV– (n=581) | p²  |
|-------------------------------------------------------|---------------------|--------------|-----|
| **Cystitis/dysuria**                                  |                     |              | 0.0008 |
| Yes, spontaneous and present today                    | 100                 | 50           | 0   |
| Yes, prompted and present today                       | 38                  | 27           | 0   |
| Yes, prompted but not present today                   | 7                   | 9            | 0   |
| No                                                    | 420                 | 431          | 0   |
| **Vaginal itching**                                   |                     |              | 0.0441 |
| Yes, spontaneous and present today                    | 88                  | 51           | 0   |
| Yes, prompted and present today                       | 42                  | 37           | 0   |
| Yes, prompted but not present today                   | 16                  | 16           | 0   |
| No                                                    | 419                 | 413          | 0   |
| **Vaginal discharge**                                 |                     |              | 0.0099 |
| Yes, spontaneous and present today                    | 74                  | 36           | 0   |
| Yes, prompted and present today                       | 45                  | 41           | 0   |
| Yes, prompted but not present today                   | 9                   | 8            | 0   |
| No                                                    | 436                 | 432          | 0   |
| **Dyspareunia**                                       |                     |              | 0.0008 |
| Yes, spontaneous and present today                    | 33                  | 10           | 0   |
| Yes, prompted and present today                       | 29                  | 18           | 0   |
| Yes, prompted but not present today                   | 5                   | 1            | 0.2 |
| No                                                    | 497                 | 488          | 0   |
| **Lower abdominal pain**                              |                     |              | <0.0001|
| Yes, spontaneous and present today                    | 93                  | 31           | 0   |
| Yes, prompted and present today                       | 51                  | 41           | 0   |
| Yes, prompted but not present today                   | 7                   | 8            | 0   |
| No                                                    | 414                 | 437          | 0   |
| **Acute genital ulcer**                               |                     |              | 0.0027 |
| Yes, spontaneous and present today                    | 26                  | 7            | 0   |
| Yes, prompted and present today                       | 11                  | 9            | 0   |
| Yes, prompted but not present today                   | 13                  | 4            | 0   |
| No                                                    | 515                 | 497          | 0   |
| **Chronic/recurrent genital ulcer**                   |                     |              | <0.0001|
| Yes, spontaneous and present today                    | 21                  | 1            | 0.2 |
| Yes, prompted and present today                       | 15                  | 4            | 0   |
| Yes, prompted but not present today                   | 2                   | 3            | 1   |
| No                                                    | 527                 | 509          | 0   |
| **Reproductive Health Disturbance Score**             |                     |              | <0.0001|
| 0                                                     | 365                 | 411          | 0   |
| 1                                                     | 81                  | 58           | 0   |
| 2                                                     | 55                  | 26           | 0   |
| 3                                                     | 35                  | 14           | 0   |
| 4+                                                    | 29                  | 8            | 0   |

| a | Chi square test for categorical variables with cell counts greater than or equal to 5, Fisher’s exact test for categorical variables with 20% of expected cell counts less than 5. |
| b | Score from 0 to 7, where one point is given for a spontaneous complaint of any of the following reproductive health disturbances: cystitis/dysuria, vaginal itching, vaginal discharge, dyspareunia, lower abdominal pain, acute genital ulcer, chronic/recurrent ulcer. |
HIV-positive women received a gynecologic exam compared with 46% of HIV-negative. On external exam, HIV-positive women were more likely to have bilateral inguinal adenopathy (14% vs. 4% of HIV-negative), ulcers (7% vs. 2%), and condyloma (7% vs. 1%), while no difference was noted in prevalence of inflammation (2% in both groups, not shown). Internal examination revealed HIV-positive women were also more likely to have vaginal ulcer (3% vs. 0% in HIV-negative), visible erosion or friability (ease of bleeding when touched) of the vagina (2% vs. 0.4%) or cervix (5% vs. 2%), non-menstrual bleeding of the cervix (2% vs. 0%), and condyloma (4% vs. 0.4%). Bi-manual exam showed more adnexal tenderness among HIV-positive women (12% vs. 4% in HIV-negative). Although the point estimates were consistently higher among HIV-positive, no significant differences were noted in prevalence of cervicitis (5% vs. 4%, p=0.5681), cervical pus (2% vs.1%, p=0.3110), or cervical ulcer (1% vs. 0.4%, p=1.000); vaginal

| Table 3. Laboratory testing and gynecologic exam results at screening for female sex workers by HIV status in Kigali, Rwanda (n=1168). |
|---|---|---|---|
| HIV+ (n=587) (50%) | HIV- (n=581) | p* |
| **Laboratory testing** | | | |
| Rapid plasma reagin (RPR) | | | |
| Positive (+) | 250 | 43 | 107 | 19 | <0.0001 |
| Negative (−) | 337 | 57 | 470 | 81 |  |
| Trichomonas vaginalis | | | | | <0.0001 |
| Positive (+) | 121 | 21 | 72 | 13 |  |
| Negative (−) | 446 | 79 | 499 | 87 |  |
| **Gynecologic exam results** | | | | | |
| Gynecologic exam completed | | | | | <0.0001 |
| Yes | 346 | 59 | 267 | 46 |  |
| No | 241 | 41 | 314 | 54 |  |
| Inguinal adenopathy > 1 cm bilateral | | | | | <0.0001 |
| Yes | 48 | 14 | 10 | 4 |  |
| No | 289 | 86 | 256 | 96 |  |
| Ulceration | | | | | 0.0034 |
| Yes | 24 | 7 | 5 | 2 |  |
| No | 313 | 93 | 260 | 98 |  |
| Condyloma/warts | | | | | 0.0034 |
| Yes | 25 | 7 | 2 | 1 |  |
| No | 311 | 93 | 263 | 99 |  |
| Ulcer vagina | | | | | 0.0054 |
| Yes | 9 | 3 | 0 | 0 |  |
| No | 320 | 97 | 264 | 100 |  |
| Erosion or friability cervix | | | | | 0.0254 |
| Yes | 18 | 5 | 5 | 2 |  |
| No | 312 | 95 | 259 | 98 |  |
| Erosion or friability vagina | | | | | 0.0481 |
| Yes | 8 | 2 | 1 | 0 | 4 |
| No | 322 | 98 | 263 | 100 |  |
| Non-menstrual bleeding cervix | | | | | 0.0363 |
| Yes | 6 | 2 | 0 | 0 | 0 |
| No | 324 | 98 | 264 | 100 |  |
| Condyloma/warts vagina | | | | | 0.0085 |
| Yes | 12 | 4 | 1 | 0 | 4 |
| No | 318 | 96 | 263 | 100 |  |
| Adnexal tenderness | | | | | 0.0003 |
| Yes | 40 | 12 | 10 | 4 |  |
| No | 290 | 88 | 252 | 96 |  |

*Chi square test for categorical variables with cell counts greater than or equal to 5, Fisher’s exact test for categorical variables with 20% of expected cell counts less than 5.
inflammation (5% vs. 2%, \(p = 0.0696\)) or discharge (22% vs. 19%, \(p = 0.3728\)); or adnexal mass (1% vs. 0.4%, \(p = 0.6336\)) (not shown).

**Multivariable analysis**

Table 4 presents the bivariate analyses and reduced multivariable model of predictors of positive HIV serostatus. Age 32–45 vs. age 18–26, widowhood vs. single (never married) status, positive RPR serology for syphilis vs. negative RPR serology, *T. vaginalis* present on vaginal wet mount vs. negative for *T. vaginalis*, not using a non-barrier modern contraceptive method vs. using any modern method, and increasing number of urogenital symptoms were independently predictive of HIV. Variables significant in bivariate analyses that were not significant in multivariable analysis and were removed via backwards elimination included previous-

### Table 4. Bivariate and multivariable logistic regression models of predictors of HIV-positive status among female sex workers in Kigali, Rwanda (n = 1168).

|                                | Bivariate models | Reduced multivariable model |
|--------------------------------|------------------|----------------------------|
|                                | 95% CI           |                             |
|                                | cPOR  LL \(^a\)  UL \(^b\)  p | aPOR  LL \(^a\)  UL \(^b\)  p |
| Age (per one-year increase)    | 1.08  1.05  1.10  <0.0001 |                             |
| Age tertiles (years)           |                  |                             |
| 18–26                          | ref  –  –  –  | ref  –  –  –  |
| 27–31                          | 1.63  1.23  2.17  0.0007 | 1.35  0.94  1.94  0.1007 |
| 32–45                          | 2.58  1.94  3.42  <0.0001 | 2.06  1.42  3.00  0.0002 |
| Marital status                 |                  |                             |
| Single (never married)         | ref  –  –  –  | ref  –  –  –  |
| Divorced/separated             | 1.16  0.88  1.54  0.2822 | 1.03  0.75  1.41  0.8797 |
| Widowed                        | 3.65  2.10  6.35  <0.0001 | 2.31  1.24  4.29  0.0080 |
| Previously tested for HIV      |                  |                             |
| No                             | ref  –  –  –  |                             |
| Yes                            | 0.62  0.39  0.99  0.0432 |                             |
| Any condomless sex in the past month |                  |                             |
| No                             | ref  –  –  –  |                             |
| Yes                            | 1.29  0.99  1.67  0.0575 |                             |
| Self-reported pregnancy        |                  |                             |
| Not pregnant                   | ref  –  –  –  |                             |
| Pregnant                       | 0.57  0.33  0.98  0.0432 |                             |
| RPR for syphilis               |                  |                             |
| Positive                       | ref  –  –  –  | ref  –  –  –  |
| Negative                       | 0.36  0.24  0.40  <0.0001 | 0.29  0.21  0.40  <0.0001 |
| *T. vaginalis* on wet mount    |                  |                             |
| Positive                       | ref  –  –  –  | ref  –  –  –  |
| Negative                       | 0.53  0.39  0.73  0.0001 | 0.56  0.38  0.84  0.0045 |
| Current contraceptive method   |                  |                             |
| None/condoms only              | ref  –  –  –  | ref  –  –  –  |
| Any method                     | 0.67  0.53  0.84  0.0007 | 0.72  0.54  0.97  0.0298 |
| Reproductive Health Disturbance Score \(^c\) |                  |                             |
| 0                              | ref  –  –  –  |                             |
| 1                              | 1.57  1.09  2.27  0.0152 |                             |
| 2                              | 2.38  1.46  3.88  0.0005 |                             |
| 3                              | 2.82  1.49  5.32  0.0014 |                             |
| 4+                             | 4.08  1.84  9.04  0.0005 |                             |
| Reproductive Health Disturbance Score (per one unit increase in score) | 1.44  1.27  1.63  <0.0001 | 1.24  1.07  1.44  0.0049 |

RPR: rapid plasma reagin; cPOR: crude prevalence odds ratio; aPOR: adjusted prevalence odds ratio; ref: reference group.

\(^{a}\)Lower limit for 95% confidence interval (CI).

\(^{b}\)Upper limit for 95% confidence interval (CI).

\(^{c}\)Score from 0 to 7, where one point is given for a spontaneous complaint of any of the following reproductive health disturbances: cystitis/dysuria, vaginal itching, vaginal discharge, dyspareunia, lower abdominal pain, acute genital ulcer, chronic/recurrent ulcer.
ly being tested for HIV, any condomless sex in the last month, and self-reported current pregnancy. The reduced multivariable model excluding these variables is shown in Table 4.

**Interviewer-administered questionnaire for a subset of FSWs**

Among 97 HIV-positive and 458 HIV-negative women who completed interviewer-administered questionnaires, 60% were literate in the national language Kinyarwanda, and 8% of HIV-positive vs. 13% of HIV-negative could understand or read French (p = 0.1854). HIV-negative women were significantly more likely to report understanding English (13% vs. 2% of HIV-positive, p = 0.0015) or reading English (12% vs. 1%, p = 0.0008). HIV-positive and HIV-negative women reported a similar number of clients in the last month (median 30 vs. 24, p = 0.1828). All respondents provided vaginal sex to clients. Non-vaginal sex was uncommon, with oral sex reported by 9% of HIV-positive and 13% of HIV-negative women (p = 0.4285), and anal sex reported by 3% of HIV-positive and 7% of HIV-negative women (p = 0.2850). Venues for meeting clients were similar in the two groups of women: bars and hotels (41% HIV-negative vs. 38% HIV-positive, p = 0.5543), in the street (49% vs. 42%, p = 0.2600), and at their own home (17% vs. 22%, p = 0.2421). HIV-positive women were less likely to report using the telephone to link with clients (35% of HIV-positive vs. 64% of HIV-negative, p < 0.0001).

**Discussion**

This paper describes the characteristics of FSWs seeking free and anonymous HIV, STIs, and family planning services in Kigali, to better understand their needs and to guide future interventions. Rwanda has had remarkable success with HIV prevention and care services in the general population, but our findings confirm significant gaps among FSWs. We found 50% of FSWs are living with HIV, which is comparable to previous studies. More than 90% of FSWs reporting condomless sex in the last month and the many women not using modern contraception confirms the ongoing risk of acquisition and transmission of HIV and STIs as well as unplanned pregnancy in this vulnerable group.

Although HIV testing has been successful in reaching the majority of Rwandans, the high proportion of FSWs who seroconverted since their last HIV-negative test is of concern and indicates that regular follow-up testing is needed to prevent onward transmission, particularly given that acute infection is typically asymptomatic in Rwanda. Although our program did not assess the timing of the most recent negative HIV test results, another study conducted among 800 FSWs in Kigali documented an incidence rate of 11%/year.

Studies conducted elsewhere in eastern Africa have shown the rate of HIV incidence to be as high as 13.5%/year.

In 2014, the UNAIDS set the goal of having 90% of people diagnosed with HIV on ART by 2020. In our program, only 74% of FSWs who knew their HIV-positive status before coming to PSF were on ART. When our program was initiated in 2012, the national HIV treatment guidelines recommended the initiation of ART when CD4-positive T cell counts were below 350 cells per µl, or for patients at clinical stages 3 and 4. In 2013, these guidelines were changed and all HIV-positive FSWs, as well as other ‘higher risk’ population categories such as HIV discordant couples and men who have sex with men, could initiate ART irrespective of their CD4-positive T cell counts or clinical stage.

While ART has been readily available and provided free of charge at government health centers in Kigali, anecdotal reports indicated that FSWs are reluctant to disclose their profession in order to access ART because of stigma, a problem that has hampered HIV testing and access to health care for FSWs in Zambia. Zimbabwe, Kenya, Ethiopia, and Uganda. A systematic review of ten African countries found that in addition to stigma and discrimination, poor nutrition, food insecurity, and substance abuse were also associated with inadequate linkage, retention, and adherence in care and treatment programs.

In 2016, Rwanda adopted test-and-treat, which has facilitated access to ART among FSWs and other key populations who no longer must disclose their risk behaviors to receive ART.

Only one-third of FSWs reported consistent condom use during the one month prior to seeking services at the PSF clinic. This is in keeping with the high prevalence of syphilis and T. vaginalis detected by routine screening, much of which was asymptomatic. Women who have genital ulceration or inflammation are at high risk of acquiring or transmitting HIV and more
likely to acquire or transmit multiple viruses. Self-reported condom use is frequently inaccurate, as shown in our group in whom sperm was detected with the same frequency in FSWs who reported and those who did not report condomless sex. Where possible, simple laboratory tests such as sperm on vaginal wet mount can help identify those who might be under-reporting and who require supplemental counseling and condom skills training.48,49

We also observed that nearly 60% of HIV-positive FSWs were not using a non-barrier modern contraceptive method. Encouragingly, 21% were already using a LARC method and an additional 11% of non-users requested LARC insertions. Not using an effective contraceptive method exposes FSWs to the risks of unplanned pregnancy and subsequent transmission of HIV to their children. A study in Kenya reported 24% of unplanned pregnancies in FSWs who viewed these as an ‘added burden’.50 Integration of family planning services with HIV is a cornerstone for HIV prevention program in high-risk women as it reduces mother-to-child transmission as well as the economic and social consequences of unplanned pregnancy.51

As reported in other African countries, anal sex was infrequently reported by Kigali FSWs. Anal sex is generally not common but a survey in Tanzania showed anal sex was associated with less condom use, forced sex, multiple partners, less HIV testing and low awareness of the risks of acquiring HIV through anal sex.52 In Ivory Coast, anal intercourse was again associated with less condom use and more frequent condom breakage.53 Information about strategies for safer oral and anal sex should be included in counseling for FSWs, along with lubricant for those who provide anal sex services.

Of note was the high rate of illiteracy in the local language among the FSWs in our survey, and very few could understand English or French. This confirms the need for verbal messaging in the local language when providing HIV prevention information. While we did not collect data on income, we did note that HIV-negative FSWs were twice as likely (two-thirds compared with one-third of HIV-positive FSWs) to link with clients by mobile phone. This may mean that HIV-negative FSWs are wealthier and can afford phones, and/or that they are more discriminating and rely more on referrals.

There are several limitations to this study. We collected only minimal information needed to provide clinical services to FSWs in our program, with more detailed information collected on a subset. Our recruitment strategy may have led to some bias as systematic methods such as respondent-driven sampling were not used. However, the prevalence of HIV among FSWs in our program is comparable to the prevalence found in the national survey conducted by the Rwanda Biomedical Center in 2010,23 and we believe that our findings are broadly generalizable. Another limitation of our study is the reliance on syndromic approach for STIs other than syphilis and T. vaginalis. STIs are often asymptomatic, particularly among women.34,55 Conversely, signs and symptoms are often not specific, and the diagnosis of STIs and other genital abnormalities based only on these may be inaccurate.56 In this program, we did not have the required resources for a laboratory-confirmed etiological diagnosis of gonorrhea and Chlamydia.22 Our findings thus underestimate the prevalence of STIs in these FSWs.

Despite the above-mentioned limitations, our program has several important implications. Attendance at free services confirms that these high-risk women are willing to take up HIV prevention interventions. The high proportion of seroconvertors and the low rate of condom use is an urgent call to action for a vigorous campaign to promote regular HIV testing and condom use and to make these easily accessible to FSWs. Routine screening for STIs, including new rapid technology such as GeneXpert tests for gonorrhea and Chlamydia,57,58 is indicated where affordable. Effective interventions are also urgently needed to increase access to the full range of contraceptives and effective counseling to prevent unplanned pregnancy among FSWs, particularly those who are HIV-positive. Stigma mitigation and staff supervision are needed to facilitate testing and access to ART and other services, as has been done in Uganda and Senegal.59,60

Our findings call for strengthened and promoted HIV interventions targeting FSWs in Rwanda. Access to family planning including the most effective reversible contraceptive methods – hormonal implants and IUDs – should be a goal in HIV prevention programs targeting women, especially FSWs. To achieve the UNAIDS goal of zero new HIV infections and zero AIDS-related deaths by 2030, innovative strategies to strengthen and implement successful HIV prevention and treatment among Rwanda FSWs are needed. Our results highlight this need.

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References

1. Tokar A, Broerse JEW, Blanchard J, et al. HIV testing and counseling among female sex workers: a systematic literature review. AIDS Behav 2018; 22: 2435–2457.
2. Dhana A, Luchters S, Moore L, et al. Systematic review of facility-based sexual and reproductive health services for female sex workers in Africa. Global Health 2014; 10: 46.
3. Wechsberg WM, Peasant C, Kline T, et al. HIV prevention among women who use substances and report sex work: risk groups identified among South African women. AIDS Behav 2017; 21: 155–166.
4. Valles X, Lusala PL, Devaliere H, et al. Network analysis of knowledge and practices regarding sexual and reproductive health: a study among adolescent street girls in Kinshasa (DRC). Eur J Contracept Reprod Health Care 2017; 22: 62–69.
5. Ouedraogo SY, Sisawo EJ and Huang SL. Sexual abuse and risky sexual behaviors among young female hawkers in Burkina Faso: a mixed method study. BMC Int Health Hum Rights 2017; 17: 1.
6. Ouedraogo HG, Ky-Zerbo O, Baguia A, et al. HIV among female sex workers in five cities in Burkina Faso: a cross-sectional baseline survey to inform HIV/AIDS programs. AIDS Res Treat 2017; 2017: 1–11.
7. Muldoon KA, Akello M, Muzaya G, et al. Policing the epidemic: high burden of workplace violence among female sex workers in conflict-affected northern Uganda. Glob Public Health 2017; 12: 84–97.
8. Elmes J, Skovdal M, Nhongo K, et al. A reconfiguration of the sex trade: how social and structural changes in eastern Zimbabwe left women involved in sex work and transactional sex more vulnerable. PLoS One 2017; 12: e0171916.
9. Coetzee J, Jewkes R and Gray GE. Cross-sectional study of female sex workers in Soweto, South Africa: factors associated with HIV infection. PLoS One 2017; 12: e0184775.
10. Lancaster KE, Cernigliaro D, Zulliger R, et al. HIV care and treatment experiences among female sex workers living with HIV in sub-Saharan Africa: a systematic review. Afr J AIDS Res 2016; 15: 377–386.
11. Lancaster KE, MacLean SA, Lungu T, et al. Socioecological factors related to hazardous alcohol use among female sex workers in Lilongwe, Malawi: a mixed methods study. Subst Use Misuse 2018; 53: 782–791.
12. Vandepitte J, Hughes P, Matovu G, et al. High prevalence of ciprofloxacin-resistant gonorrhea among female sex workers in Kampala, Uganda (2008–2009). Sex Transm Dis 2014; 41: 233–237.
13. Odek WO, Githuka GN, Avery L, et al. Estimating the size of the female sex worker population in Kenya to inform HIV prevention programming. PLoS One 2014; 9: e89180.
14. Dunkle KL, Stephenson R, Karita E, et al. New heterosexual transmitted HIV infections in married or cohabiting couples in urban Zambia and Rwanda: an analysis of survey and clinical data. Lancet 2008; 371: 2183–2191.
15. Dunkle KL, Greenberg L, Lanterman A, et al. Source of new infections in generalised HIV epidemics – authors’ reply. Lancet 2008; 372: 1300–1301.
16. Bucyendore A, Van de Perre P, Karita E, et al. Estimating the seroincidence of HIV-1 in the general adult population in Kigali, Rwanda. AIDS 1993; 7: 275–277.
17. Kayirangwa E, Hanson J, Munyakazi L, et al. Current trends in Rwanda’s HIV/AIDS epidemic. Sex Transm Infect 2006; 82: 127–131.
18. Karita E, Nsanzimana S, Ndagijije F, et al. Implementation and operational research: evolution of couples’ voluntary counseling and testing for HIV in Rwanda: from research to public health practice. J Acquir Immune Defic Syndr (1999) 2016; 72: e208–e215.
19. National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda], and ICF International. Rwanda Demographic and Health Survey 2014–15. Rockville, Maryland, USA: NISR, MOH, and ICF International, 2015.
20. Rwanda Ministry of Health. National HIV/AIDS targets 2018–2020–2030. Rwanda: Rwanda Ministry of Health, 2017.
21. Mutagoma M, Samuel MS, Kayitesi C, et al. High HIV prevalence and associated risk factors among female sex workers in Rwanda. Int J STD AIDS 2017; 28: 1082–1089.
using three different methods. *Int J STD AIDS* 2015; 26: 810–814.
24. Khu NH, Vwalika B, Karita E, et al. Fertility goal-based counseling increases contraceptive implant and IUD use in HIV-discordant couples in Rwanda and Zambia. *Contraception* 2013; 87: 74–82.
25. Grabbe K, Stephenson R, Vwalika B, et al. Knowledge, use, and concerns about contraceptive methods among sero-discordant couples in Rwanda and Zambia. *J Womens Health (Larchmt)* 2009; 18: 1449–1456.
26. Boeras DI, Luisi N, Karita E, et al. Indeterminate and discrepant rapid HIV test results in couples’ HIV testing and counselling centres in Africa. *J Int AIDS Soc* 2011; 14: 18.
27. Dionne-Odom J, Karita E, Kilembe W, et al. Syphilis treatment response among HIV-discordant couples in Zambia and Rwanda. *Clin Infect Dis* 2013; 56: 1829–1837.
28. Ghebremichael M. The syndromic versus laboratory diagnosis of sexually transmitted infections in resource-limited settings. *ISBN AIDS* 2014; 2014: 5.
29. Sullivan PS, Fidelu I, Wall KM, et al. Prevalence of seroconversion symptoms and relationship to set-point viral load: findings from a subtype C epidemic, 1995–2009. *AIDS* 2012; 26: 175–184.
30. Braunstein SL, Ingabire CM, Geubbels E, et al. High burden of prevalent and recently acquired HIV among female sex workers and female HIV voluntary testing center clients in Kigali, Rwanda. *PLoS One* 2011; 6: e24321.
31. Graham SM, Raboud J, McClelland RS, et al. Loss to follow-up as a competing risk in an observational study of HIV-1 incidence. *PLoS One* 2013; 8: e59480.
32. Cowan FM, Davey CB, Fearon E, et al. The HIV care cascade among female sex workers in Zimbabwe: results of a population-based survey from the sisters antiretroviral therapy programme for prevention of HIV, an integrated response (SAPPH-IRe) trial. *J Acquir Immune Defic Syndr* (1999) 2017; 74: 375–382.
33. UNAIDS. Political declaration on HIV and AIDS: on the fast-track to accelerate the fight against HIV and to end the AIDS epidemic by 2030, United Nations, www.unaids.org/sites/default/files/media_asset/2016-political-declaration-HIV-AIDS_en.pdf (2016, accessed 19 November 2018).
34. World Health Organization. Implementing comprehensive HIV/STI programmes with sex workers, www.who.int/hiv/pub/sti/sex_worker_implementation/en/ (2013, accessed 19 November 2018).
35. Binagwaho A, Agbonyisor M, Mwananawe A, et al. Developing human rights-based strategies to improve health among female sex workers in Rwanda. *Health Hum Rights* 2010; 12: 89–100.
36. Chanda MM, Perez-Brumer AG, Ortblad KF, et al. Barriers and facilitators to HIV testing among Zambian female sex workers in three transit hubs. *AIDS Patient Care STDs* 2017; 31: 290–296.
37. Rao A, Stahman S, Hargreaves J, et al. Sampling key populations for HIV surveillance: results from eight cross-sectional studies using respondent-driven sampling and venue-based snowball sampling. *JMIR Public Health Surveill* 2017; 3: e72.
38. Musyoki H, Kellogg TA, Geibel S, et al. Prevalence of HIV, sexually transmitted infections, and risk behaviours among female sex workers in Nairobi, Kenya: results of a respondent driven sampling study. *AIDS Behav* 2015; 19: S46–S58.
39. Ameyan W, Jeffery C, Negash K, et al. Attracting female sex workers to HIV testing and counselling in Ethiopia: a qualitative study with sex workers in Addis Ababa. *Afr J AIDS Res* 2015; 14: 137–144.
40. Wanyenze RK, Musinguzi G, Kiguli J, et al. “When they know that you are a sex worker, you will be the last person to be treated”: perceptions and experiences of female sex workers in accessing HIV services in Uganda. *BMC Int Health Hum Rights* 2017; 17: 11.
41. Nakanwagi S, Matovu JKB, Kintu BN, et al. Facilitators and barriers to linkage to HIV care among female sex workers receiving HIV testing services at a community-based organization in periurban Uganda: a qualitative study. *J Sex Transm Dis* 2016; 2016: 1–8.
42. World Health Organization. Consolidated guidelines on HIV prevention, diagnosis, treatment and care for key populations, www.who.int/hiv/pub/guidelines/keypopulations/en/ (2014, accessed 19 November 2018).
43. Boeras DI, Hraber PT, Hurlston M, et al. Role of donor genital tract HIV-1 diversity in the transmission bottleneck. *Proc Natl Acad Sci USA* 2011; 108: E1156–E1163.
44. Carlson JM, Schaefer M, Monaco DC, et al. HIV transmission. Selection bias at the heterosexual HIV-1 transmission bottleneck. *Science* 2014; 345: 1254031.
45. Haaland RE, Hawkins PA, Salazar-Gonzalez J, et al. Inflammatory genital infections mitigate a severe genetic bottleneck in heterosexual transmission of subtype A and C HIV-1. *PLoS Pathog* 2009; 5: e1000274.
46. Bogaerts J, Ricart CA, Van Dyck E, et al. The etiology of genital ulceration in Rwanda. *Sex Transm Dis* 1989; 16: 123–126.
47. Pepin J, Plummer FA, Brunham RC, et al. The interaction of HIV infection and other sexually transmitted diseases: an opportunity for intervention. *AIDS* 1989; 3: 3–9.
48. Allen S, Meinzen-Derr J, Kautzman M, et al. Sexual behavior of HIV discordant couples after HIV counseling and testing. *AIDS* 2003; 17: 733–740.
49. Evans JL, Couture MC, Stein ES, et al. Biomarker validation of recent unprotected sexual intercourse in a prospective study of young women engaged in sex work in Phnom Penh, Cambodia. *Sex Transm Dis* 2013; 40: 462–468.
50. Luchters S, Chersich MF, Rinyiur A, et al. Impact of five years of peer-mediated interventions on sexual behavior and sexually transmitted infections among female sex workers in Mombasa, Kenya. *BMC Public Health* 2008; 8: 143.
51. Crankshaw TL, Smit JA and Bekinska ME. Placing contraception at the centre of the HIV prevention agenda. *Afr J AIDS Res* 2016; 15: 157–162.
52. Shayo EH, Kalinga AA, Senkoro KP, et al. Prevalence and risk factors associated with female anal sex in the context of HIV/AIDS in the selected districts of Tanzania. *BMC Res Notes* 2017; 10: 140.

53. Maheu-Giroux M, Baral S, Vesga JF, et al. Anal intercourse among female sex workers in Cote d’Ivoire: prevalence, determinants, and model-based estimates of the population-level impact on HIV transmission. *Am J Epidemiol* 2018; 187: 287–297.

54. Veldhuijzen NJ, van Steijn M, Nyinawabega J, et al. Prevalence of sexually transmitted infections, genital symptoms and health-care seeking behaviour among HIV-negative female sex workers in Kigali, Rwanda. *Int J STD AIDS* 2013; 24: 139–143.

55. Steen R, Chersich M, Gerbase A, et al. Periodic presumptive treatment of curable sexually transmitted infections among sex workers: a systematic review. *AIDS* 2012; 26: 437–445.

56. Wall KM, Kilembe W, Vwalika B, et al. Risk of heterosexual HIV transmission attributable to sexually transmitted infections and non-specific genital inflammation in Zambian discordant couples, 1994–2012. *Int J Epidemiol* 2017; 46: 1593–1606.

57. Salow KR, Cohen AC, Bristow CC, et al. Comparing mail-in self-collected specimens sent via United States Postal Service versus clinic-collected specimens for the detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in extra-genital sites. *PLoS One* 2017; 12: e0189515.

58. Jang D, Ratnam S, Gilchrist J, et al. Comparison of workflow, maintenance, and consumables in the GeneXpert infinity 80 and panther instruments while testing for *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. *Sex Transm Dis* 2016; 43: 377–381.

59. Mayanja BN, Kabunga E, Masiira B, et al. Personal barriers to antiretroviral therapy adherence: case studies from a rural Uganda prospective clinical cohort. *Afr Health Sci* 2013; 13: 311–319.

60. Lyons CE, Ketende S, Diouf D, et al. Potential impact of integrated stigma mitigation interventions in improving HIV/AIDS service delivery and uptake for key populations in Senegal. *J Acquir Immune Defic Syndr (1999)* 2017; 74: S52–S59.