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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,

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and resident in areas of economic or political upheaval.[3–11] Studies in East Africa confirm high prevalence of HIV and STIs in Uganda[12] and Kenya.[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.[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%;[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;[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).[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.[22] The majority of FSWs in Rwanda are found in Kigali,[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.[20]

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.

Methods

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.

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)

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.[24] Because previous work confirmed that knowledge about these methods was poor,[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.[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[26] and for rapid plasma reagin (RPR) syphilis serology.[27] FSWs also provided a self-administered vaginal swab for microscopic detection of *Trichomonas vaginalis* and sperm (an indicator of recent condomless sex). Women requesting LARC provided a urine sample for pregnancy testing. HIV, syphilis, and *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.[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

Table 1. Screening characteristics of female sex workers by HIV status in Kigali, Rwanda (n = 1168).

	HIV+ (n=587) (50%)		HIV– (n=581)		
	n or mean	% or SD	n or mean	% or SD	p[a]
Sociodemographics					
Age (years)	30.4	6.3	27.6	5.9	<0.0001
Marital status					<0.0001
Single (never married)	141	36%	225	43%	
Divorced/separated	205	52%	281	53%	
Widowed	48	12%	21	4%	
Plans to stay in city for 15 months					0.3499
Yes	277	93%	303	91%	
No	20	7%	29	9%	
HIV testing history					
Previously had an HIV test					0.0416[b]
Yes, previously negative	189	32%	550	95%	
Yes, previously positive	349	59%	NA	NA	
No	49	8%	31	5%	
ART (for those with known HIV)					NA
Yes	260	74%	NA	NA	
No	89	26%			
Condomless sex in past month					0.0573
Yes	405	72%	345	67%	
No	156	28%	171	33%	
Pregnancy and contraceptive use					
Self-reported current pregnancy					0.0409
Pregnant	22	4%	37	6%	
Not pregnant	565	96%	544	94%	
Current contraceptive method					0.0003
IUD	12	2%	14	3%	
Implant	105	19%	111	20%	
Injectable	105	19%	125	23%	
Pills	17	3%	49	9%	
Hysterectomy	1	0.2%	0	0%	
Tubal ligation	3	1%	5	1%	
Condom only/other	322	57%	240	44%	

SD: standard deviation; NA: not applicable. ART; antiretroviral therapy, IUD; intrauterine device.
[a]Two-tailed t-test for continuous variables, 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]Chi square p-value for comparison between any previous HIV testing and no previous HIV testing.

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

Table 2. Reported symptoms at screening of female sex workers by HIV status in Kigali, Rwanda (n = 1168).

	HIV+ (n=587) (50%)		HIV– (n=581)		
	n	%	n	%	p[a]
Reproductive health disturbances					
Cystitis/dysuria					0.0008
Yes, spontaneous and present today	100	18	50	10	
Yes, prompted and present today	38	7	27	5	
Yes, prompted but not present today	7	1	9	2	
No	420	74	431	83	
Vaginal itching					0.0441
Yes, spontaneous and present today	88	16	51	10	
Yes, prompted and present today	42	7	37	7	
Yes, prompted but not present today	16	3	16	3	
No	419	74	413	80	
Vaginal discharge					0.0099
Yes, spontaneous and present today	74	13	36	7	
Yes, prompted and present today	45	8	41	8	
Yes, prompted but not present today	9	2	8	2	
No	436	77	432	84	
Dyspareunia					0.0008
Yes, spontaneous and present today	33	6	10	2	
Yes, prompted and present today	29	5	18	3	
Yes, prompted but not present today	5	1	1	0.2	
No	497	88	488	94	
Lower abdominal pain					<0.0001
Yes, spontaneous and present today	93	16	31	6	
Yes, prompted and present today	51	9	41	8	
Yes, prompted but not present today	7	1	8	2	
No	414	73	437	85	
Acute genital ulcer					0.0027
Yes, spontaneous and present today	26	5	7	1	
Yes, prompted and present today	11	2	9	2	
Yes, prompted but not present today	13	2	4	1	
No	515	91	497	96	
Chronic/recurrent genital ulcer					<0.0001
Yes, spontaneous and present today	21	4	1	0.2	
Yes, prompted and present today	15	3	4	1	
Yes, prompted but not present today	2	0.4	3	1	
No	527	93	509	98	
Reproductive Health Disturbance Score[b]					<0.0001
0	365	65	411	79	
1	81	14	58	11	
2	55	10	26	5	
3	35	6	14	3	
4+	29	5	8	2	

[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.

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

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)		
	n	%	n	%	p[a]
Laboratory testing					
Rapid plasma reagin (RPR)					<0.0001
Positive (+)	250	43	107	19	
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	
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	

[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.

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

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				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	Not included			
Any condomless sex in the past month								
No	*ref*	–	–	–				
Yes	1.29	0.99	1.67	0.0575	Not included			
Self-reported pregnancy								
Not pregnant	*ref*	–	–	–				
Pregnant	0.57	0.33	0.98	0.0432	Not included			
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	Not included			
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,[18] but our findings confirm significant gaps among FSWs. We found 50% of FSWs are living with HIV, which is comparable to previous studies.[23] More than 90% of FSWs in this program reported that they have been previously tested for HIV, a proportion that is similar to that observed in the general population.[21] It is noteworthy that almost one in four FSWs who reported a previous HIV-negative result was found to be HIV-positive upon testing in this program, and that one in four known HIV-positive was not yet on ART. The prevalence of serologic positive tests for syphilis was high and *T. vaginalis* was also common, particularly among HIV-positive women. Symptoms and signs of STIs were also consistently more common among HIV-positive FSWs. Lastly, the high proportion 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.[22]

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.[29] 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.[30] Studies conducted elsewhere in eastern Africa have shown the rate of HIV incidence to be as high as 13.5%/year.[31,32]

In 2014, the UNAIDS set the goal of having 90% of people diagnosed with HIV on ART by 2020.[33] 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.[34] 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[35] because of stigma, a problem that has hampered HIV testing and access to health care for FSWs in Zambia,[36] Zimbabwe,[37] Kenya,[38] Ethiopia,[39] and Uganda.[40,41] 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.[12] 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.[42]

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.[43–47] 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.[54,55] 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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