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Correlates of Disclosure of HIV Status for Female Sex Workers in Kigali, Rwanda

By

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Master of Public Health

Global Epidemiology

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Correlates of Disclosure of HIV Status for Female Sex Workers in Kigali, Rwanda

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An abstract of
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Abstract

Correlates of Disclosure of HIV Status for Female Sex Workers in Kigali, Rwanda

By Gelsey Hughes

Background: The prevalence of HIV in Rwanda is 3% in the general population, but it is nearly 51% in female sex workers (FSW). Prior research suggests that disclosure of HIV status between partners is important for the prevention of incident HIV infections, yet there has been little investigation into disclosure between FSW and their clients. This study seeks to describe the behavioral, sociodemographic and clinical characteristics of HIV-negative FSW in Kigali, Rwanda, and to determine factors associated with disclosure of an HIV status by these FSW to their clients.

Methods: Cross-sectional data were gathered on n=444 FSW in Kigali, Rwanda who tested negative for HIV. Univariable analyses were conducted between all covariates and the dichotomized outcome of interest, discloses an HIV status to clients versus never discloses. Variables found significant in univariable analyses were considered for inclusion in a multivariable logistic model. Correlates of the outcome were reported with adjusted odds ratios and p-values.

Results: Fertility goals; literacy level; frequency of sex under the influence of alcohol; condom disuse due to client refusal; recruiting clients by referral from other FSW or from previous clients; and self-reported vaginal itching varied significantly with disclosure of HIV status in both univariable and multivariable analyses.

Conclusions: There are several factors associated with disclosure of an HIV status by FSW, including high literacy, the desire to have more children, and the ability to recruit clients via referral, which may imply stronger communication skills and social networks. However, disclosure may have different implications depending on true serostatus, the serostatus that is disclosed, and whether these are the same. Further investigation is recommended to determine whether the disclosure of false or variant serostatus is used as a condom use negotiation tactic and what health outcomes are associated with these variations in disclosure behaviors.

Key words: Disclosure, FSW, HIV, Rwanda, serostatus

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Literature Review

FSW as a Key Population

Female sex workers (FSW) constitute one of the highest-risk groups for HIV infection due to a number of biological, economic and social factors. Throughout sub-Saharan Africa, FSW exhibit high mobility, concurrent sexual partnerships and inconsistent condom use as a result of their occupational environment. In general, FSW experience "little or no promotion of safer sex, scant control over clients' behavior and compelling incentives for high client turnover," all of which contribute to elevated HIV risk (1-3). Furthermore, in sub-Saharan Africa (SSA), sex workers tend to be poorly organized, operating outside the protection afforded by brothels or other networks. This limits their autonomy to negotiate condom use or protect themselves from violence (3). As a consequence, FSW in SSA have up to fourteen times increased odds of living with HIV compared with women in SSA not engaged in sex work (2). This is in a context where women could be considered a high-risk population even outside the context of sex work, as women are more physiologically and sociocontextually susceptible to HIV and consequently experience about twice the HIV prevalence as men in SSA (4).

Although FSW are considered a key group for HIV prevention due to their elevated risk, few studies explicitly acknowledge the critical role of FSW in heterosexual HIV transmission within the general population. This is despite the fact that the majority of FSW in SSA (66% in Rwanda) report that their most frequent clients are married men, and almost two-thirds of new infections in SSA occur among cohabitating heterosexual couples (5, 6). While there appears to be a clear link between the hyperepidemic in FSW and persistent generalized epidemics throughout the region, the role of key populations is difficult to determine due to limited data, particularly in countries where sex work is illegal. Even in countries with limited prevalence and incidence data, studies show that FSW generally have high numbers of sex partners; experience sexual and other physical violence; and have limited access to health care, HIV testing, and treatment; all of which

place them and their clients at high risk of HIV infection (2). Furthermore, this elevated risk creates a cyclical problem of poverty and increased risk behaviors. Numerous qualitative studies link poverty and food insecurity with sex work and HIV infection, which in turn lead to stigma, limited social support, deepening poverty, and fewer options outside of sex work (7, 8).

FSW in Rwanda are experiencing a concentrated epidemic. HIV prevalence in FSW in Rwanda's capital, Kigali, was most recently estimated at 51%, compared with 3% in adults of reproductive age nationwide and 7.3% in Kigali generally (9). In some studies, FSW in Kigali have also exhibited a high prevalence of co-infections with ulcerous STIs, which increases the likelihood of HIV transmission. In one study, 59.8% of a cohort of Kigali-based FSW were found to be infected with HSV-2, and 87% of HIV-positive FSW in the cohort were co-infected (10). A separate study of HIV-negative FSW estimated the prevalence of STIs at 30%, suggesting a high risk even among FSW who have not seroconverted (11).

Reported condom use is unusually high among Kigali-based FSW, but only with paying clients. One study found that 74% of FSW reported consistent condom use with paying clients, but only 20% with non-paying partners (10). FSW elsewhere in SSA report similar patterns of condom use (3), but in countries with very high prevalence (>10%) such as Zambia and Swaziland, condom use by FSW is lower overall (2, 12). This suggests that even in contexts such as Rwanda where FSW are readily accessing condoms as a means of HIV protection, the reasons for condom use and disuse are nuanced.

Since 2013, Rwandan government has collaborated with USAID and numerous nongovernmental organizations (NGOs) to organize HIV prevention trainings for FSW. The stated purpose of these trainings "improving comprehensive knowledge on HIV prevention [including] HIV and STIs prevention, condom use promotion, [and] referral for HIV testing and STI diagnosis" (9). However, most FSW captured in national survey data report basic knowledge of HIV and STI prevention, including correct condom use and the importance of regular testing (5, 9). Some studies

suggest that condom use negotiation presents the greatest barrier to the reduction of HIV incidence in FSW, as opposed to a lack of health literacy (3). Additionally, qualitative data on healthcare-seeking behavior among Rwandan FSW demonstrate that even when the importance of regular testing is acknowledged, many FSW avoid going to the clinic for fear of being treated disrespectfully by doctors and healthcare workers (11). Effective prevention strategies require an understanding of the tactics used by FSW to navigate the complex social and structural forces that make them vulnerable to HIV infection, because increased knowledge of condoms and HIV testing will not result in better health outcomes unless FSW have the structural capacity to engage in HIV prevention (13).

Characteristics of FSW in Kigali, Rwanda

The number of FSW in Rwanda is estimated at about five thousand, with the majority concentrated in Kigali (8). Despite recognition by the Rwandan government of FSW as a key group for HIV prevention, there has been limited systematic surveillance of HIV/STIs, sociodemographic characteristics and behavioral risk factors in the FSW population, with most known characteristics of Rwanda FSW derived from independent studies (10). Similar to their counterparts in Zambia, Swaziland, South Africa, Ethiopia and Kenya (2, 3, 12), these studies show that FSW in Rwanda are generally in the 20-30 age range, have not completed primary school and have never been married (10).

FSW in Rwanda a unique set of risk factors for HIV infection. Unlike sex workers in West African countries such as Senegal, but similar to FSW in nearby countries such as Zambia (3, 12), Rwandan FSW do not operate within brothel systems, instead recruiting client independently, on the street or through social networks (8, 10). Furthermore, it was found in one prior study of n=192 Kigali-based FSW that a majority (>50%) of women reported regular alcohol consumption; a history of sexual violence or forced sex; or had tested once or never for HIV; all of which were associated with significantly increased odds of HIV infection (10). No prior studies have been

conducted as to the effect of HIV status disclosure among Rwandan FSW on HIV infection or any other health outcome.

HIV Status Disclosure

Knowledge and disclosure of HIV status between partners have been cited in numerous studies as critical for HIV prevention, particularly in high-risk groups (1, 14-16). This is attributed to the fact that HIV status disclosure is "an important component to decreasing sexual behaviors that risk HIV transmission [and] may facilitate open discussions about risk and safe sex" (17). For cohabitating heterosexual couples, serostatus disclosure has been shown to protect against seroconversion of one or both partners, particularly when partners undergo HIV testing and counseling together (6, 18). Dunkle et al. argue that "couples need to know their joint serostatus and have access to information which enables them to reduce the risk of infection both within and outside the union," and that such information is particularly important for women, "who might not have the cultural freedom to negotiate condom use and sexual activity within a union" (18). However, it is unclear whether individual testing and subsequent disclosure has the same protective effect, or whether disclosure of a negative status is as important for HIV prevention within and outside of a partnership as disclosure of a positive one.

Despite the salience of claims about the importance of HIV status disclosure, there has been limited investigation into patterns of disclosure between FSW and their clients and implications of such patterns for HIV transmission. Studies in Senegal and Mexico found a high acceptability of voluntary counseling and testing for HIV among FSW (1, 16), suggesting that FSW in diverse contexts are interested in knowing their HIV status. This alone is not suggestive of HIV disclosure, however. Testing positive for HIV was strongly associated with non-disclosure between FSW and their clients in U.S.-Mexico border cities, with many women citing fear of violence as their reason for not disclosing (16). Qualitative research in numerous populations suggests that HIV status disclosure is "affected by various complex individual, relational and social factors," (17),

and that mechanisms of disclosure and associated risk behaviors vary widely based on context (8, 10, 16, 17, 19). In order to understand why FSW do or do not disclose their HIV status to clients, it may be necessary to explore not only factors inhibiting disclosure of serostatus for FSW specifically, but how these factors differ between HIV-positive and HIV-negative FSW, and how disclosure is used to influence other health behaviors, such as condom use. To date, investigation of these factors has been limited in scope.

Introduction

Despite advances in the treatment and prevention of HIV/AIDS over the last three decades, the majority of countries in sub-Saharan Africa (SSA) still suffer from profound HIV epidemics. The World Health Organization (WHO) estimates that there are 25.8 million people in SSA living with HIV as of 2015, comprising 68% of the global HIV burden (20). The consequences of these epidemics extend beyond morbidity and mortality; high poverty levels and unemployment resulting from HIV cyclically fuel the spread of national epidemics, with implications for the economic and political stability of countries throughout the region (21). Current HIV/AIDS initiatives in SSA focus largely on prevention and treatment through the provision of anti-retroviral therapy (ART), voluntary male circumcision, condoms, and risk-reduction counseling in the general population (2, 22). For these efforts to be effective and sustainable, however, special attention must be paid to HIV prevention in high-risk sub-populations.

Female sex workers (FSW) constitute one of the highest-risk groups for HIV infection in SSA, and a key group for preventing heterosexual HIV transmission (2). In Rwanda, where the prevalence of HIV is 3% in adults of reproductive age, it is estimated that more than half (51%) of FSW are HIV-positive (9). FSW face unique social, economic and occupational challenges with respect to HIV prevention, and interventions targeting FSW require accurate information regarding their behavioral, clinical and socio-contextual risk factors. Previous studies suggest that success of HIV prevention and treatment depends upon high levels of serostatus disclosure between partners, yet there has been little prior research into serostatus disclosure by sex workers, particularly between FSW in Rwanda and their clients (10, 15).

The present study has two objectives. The primary objective is to determine the sociodemographic, behavioral and clinical factors associated with the disclosure of HIV status to clients by FSW in Rwanda's capital, Kigali, who previously tested negative for HIV. A secondary objective is to describe the characteristics of this same FSW population. Frequencies of FSW

characteristics are reported and a logistic model of the correlates of HIV status disclosure is presented with disclosure as a binary outcome, ever disclose to clients versus never disclose. Together, these results have critical implications for the effective prevention of HIV infection in FSW, and by proxy, the general population in Rwanda.

Methods

Data source

The Rwanda Zambia HIV Research Group (RZHRG) is a HIV prevention research organization that supports Couples Voluntary Counseling and Testing (CVCT) for HIV throughout sub-Saharan Africa. The organization was founded in 1986 by Dr. Susan Allen in Kigali, Rwanda, under the name Projet San Francisco (PSF). During the Rwandan Genocide in 1994, the organization relocated to Lusaka, Zambia, prompting the creation of the Zambia Emory HIV Research Project (ZEHRP). Currently, RZHRG has research sites operating in Kigali, Rwanda, Lusaka, Zambia, and the Copperbelt region of Zambia, as well a research headquarters at Emory University (23). This study draws on data gathered by RZHRG's Rwandan subsidiary, PSF.

Participant recruitment and screening

In 2012, RZHRG initiated a prospective cohort study to determine the incidence and risk factors of HIV among female sex workers (FSW) and single, sexually active women in urban areas of Rwanda and Zambia. Initial recruitment was conducted by trained community workers and peer FSW recruiters who delivered written invitations to FSW at known areas of commercial sex work throughout Kigali, Lusaka and the Copperbelt. Participants were offered HIV testing, syphilis and STI screening, and free long acting reversible contraceptives (LARC) at their initial clinic visit. In Kigali, 1259 FSW responded to invitations.

In order to qualify for study enrollment, FSW were required to be adult women of reproductive age (between 18 and 45 years), engaged in commercial sex work, unmarried, based in Kigali, and HIV-negative. Engagement in sex work was verified at screening by nurses using verbal

questioning, with variation from invitee to invitee in order to prevent rehearsed responses from non-FSW. Verified FSW were tested for HIV and those who tested positive were referred to their government clinic for ARV triage. HIV-negative FSW were invited to return in one week for enrollment.

Study enrollment and follow-up

All 1259 FSW who responded to invitations were screened for enrollment. At the enrollment visit, PSF staff explained the study procedures and eligibility criteria, acquired informed consent, collected unique identifiers for all enrollees (fingerprints taken electronically or with ink and paper), collected contact information for all enrollees, performed a rapid HIV test and counseling, and collected demographic and HIV risk assessment data, including HIV status disclosure. Participants were asked to return for follow-up at months 1, 2 and 3, and quarterly thereafter for as long as they remained eligible. Each clinic visit included an HIV test, symptom-driven STI diagnosis and treatment, family planning counseling with LARC methods offered, and demographics questionnaires. Participants found to be HIV-positive during follow-up were referred to their nearest government clinic for treatment and were subsequently dropped from the study.

Survey questionnaires

Several questionnaires were used to gather demographic and HIV risk assessment data on enrolled FSW from baseline. The original demographic and behavioral questionnaire contained 254 items and was administered to 540 HIV-negative FSW. Additional data were collected on screening variables, self-reported gynecologic disruptions, the results of gynecologic exams, and lab test results. Subsequent demographic and behavioral questionnaires were more limited in scope. This study draws on data from the baseline questionnaire administered to HIV-negative FSW, as well as clinical data from a gynecologic exam and lab test results gathered at baseline. The study and all analyses conducted by study personnel, including analyses presented here, received IRB approval.

Participant characteristics and HIV status disclosure

Correlates of HIV status disclosure are drawn from a secondary analysis of data collected PSF's FSW cohort at baseline using the survey tools described above. Statistical Analysis Software (SAS) version 9.4 (Cary, N.C.) was used to convert the multi-level disclosure variable into a dichotomous variable for analysis, comparing ever disclosing any HIV status to clients with never disclosing an HIV status.

Analysis

Frequencies were calculated in SAS for all variables captured at baseline, including demographic, behavioral, and clinical characteristics of the study sample. Variables with greater than 75% missing data were excluded from analysis. Counts and percentages were reported for the entire study sample and by outcome of interest, disclosure of HIV status. For continuous variables, mean and standard deviation were reported for the entire study sample and by disclosure categories. Statistical tests were used to determine the significance of variation by disclosure. For categorical variables, p-values from chi-squared tests were used. For continuous variables, p-values from t-tests were used for normally distributed variables, and p-values from Mann-Whitney tests were used for non-normally distributed variables.

Bivariate analyses were used to calculate crude prevalence odds ratios (cPORs), which were reported for all variables that varied significantly ($p<0.05$) with the outcome of interest. For variables with statistically significant cPORs, a test for multicollinearity was conducted. No variables were found to be collinear. An initial logistic model was fitted using all variables found to be statistically significant in bivariate analyses. Adjusted prevalence odds ratios (aPORs) and p-values were reported. A final logistic model was then fitted excluding variables with non-significant aPORs in the initial model. aPORs and p-values were reported for all variables significantly correlated with the outcome of interest in the final multivariable model.

Results

Of the 1259 women screened at baseline in Kigali, 719 were excluded from the study because they failed to meet eligibility criteria either at baseline or in follow-up. Among those excluded at baseline, 52.3% (n=376) were excluded because they had previously tested positive for HIV; 11.4% (n=82) were not based in Kigali or were planning to leave Kigali within the study period; 6.4% (n=46) were not of reproductive age at the time of screening; 1.6% (n=12) were married or cohabitating; and 4.9% (n=35) were not engaged in commercial sex work. An additional 96 women were excluded because they failed to report the outcome of interest, disclosure of HIV status to clients, resulting in an analytic sample of 444 FSW. Table 1 presents descriptive data for the final analytic sample.

The average age of all FSW in the analytic sample was 27.8 with a standard deviation (SD) of 5.8 years. The majority of FSW (61.5%) were between 20 and 30 years of age, with age quartiles represented in Table 1. The average age of FSW who reported disclosing their HIV status was slightly older than FSW who reported never disclosing, at 28.2 years compared with 27.5 years, but there was not a significant correlation between age and disclosure. The majority of FSW in the analytic sample had been married at some point in their lives (n=184, 58.0%) with 171 (53.9%) having been divorced and 13 (4.1%) having been widowed. Proportions of FSW who had never been married versus ever been married were roughly the same across disclosure groups.

Of the 377 FSW who responded to questions about fertility goals, the majority (n=238, 63.1%) did not plan to have more children, but this varied significantly (p=0.0006) with disclosure. Nearly half of those who disclose an HIV status wanted more children (n=57, 46.7%) compared with about a third of FSW who never disclose (n=82, 32.2%). Most FSW reported using male condoms alone for family planning (n=215, 48.5%). The next most common contraceptives were long-acting methods (n=97, 21.9%) and injectable contraception (n=93, 21.0%). On average, FSW in the final analytic sample had had approximately two live births in their lifetimes (SD=1.5) and had an average of two living children (SD=1.4).

Overall, educational attainment was low. The majority of the analytic sample reported no formal education (n=279, 62.8%) and a substantial proportion were illiterate (n=128, 28.8%). However, there were significant differences (p-value=0.0109) between FSW who disclose and those who do not. Nearly half of FSW who disclose had some formal education (n=68, 45.3%) compared with only a third of FSW who do not disclose (n=97, 33.0%). Similar differences were reflected in degree of literacy (p-value=0.018), with a larger proportion of FSW who disclose reporting high literacy in Kinyarwanda (n=67, 44.7%) compared with those who do not disclose (n=109, 37.1%).

Data on sexual histories did not vary significantly between FSW who disclose and those who do not. The average age at sexual initiation was 17 and the average age at induction into sex work was 23 across the entire analytic sample. The majority of FSW (n=384, 86.5%) reported that their first sexual encounter was not in exchange for money, goods or services. A large proportion (n=153, 34.4%) reported that their first sexual encounter was coerced, with 23% (n=104) having been forced physically. The majority of FSW (n=370, 83.0%) did not use a condom with first sex.

The majority of the analytic sample (n=277, 62.4%) reported having regular partners who were not paying clients. In addition, a greater proportion of FSW who disclose an HIV status had regular partners (n=103, 68.7%) than those who do not disclose (n=174, 59.2%) with marginal significance (p-value=0.511). Data on regular partners were limited, but FSW who responded to questions about sex with regular partners (n=215) appeared use condoms about as often as not, with an average of 3 regular partners in the past month for protected vaginal sex (SD=5.3) and 5 regular partners in the past month for unprotected vaginal sex (SD=7.6) across the whole analytic sample.

By contrast, reported condom use with paying clients was high for both repeat and one-time clients across both disclosure groups. FSW reported an average of 17 repeat clients (SD=24.4) and 25 non-repeat clients (SD=34.1) for protected vaginal sex in the past month, compared with 2 repeat clients (SD=7.5) and 1 non-repeat client (SD=8.5) on average for unprotected vaginal sex. FSW who do not disclose reported a significantly higher number of non-repeat clients for protected

vaginal sex in the past month than those who disclose their status (p-value=0.0017), but otherwise the two groups had similar average numbers of clients in the past month across different types of clients and partners (regular, repeat and non-repeat) and sexual activities (protected vaginal sex and unprotected vaginal sex).

Reasons for condom disuse were recorded at baseline across different client/partner types. In general, reasons for condom disuse were similar for FSW who disclose compared with those who do not disclose, with "not applicable/uses condoms consistently" being the most common response (n=90, 38.5% for regular partners, n=285, 75.4% for repeat clients; and n=334, 88.4% for one-time clients). The second most common response was client/partner refusal (n=62, 26.4% for regular partners; n=33, 8.7% for repeat clients; and n=17, 4.5% for one-time clients). A significantly larger proportion of FSW who do not disclose (p-value=0.0276) reported client refusal as a reason for condom disuse with regular clients (n=28, 10.9%) compared with 4.1% (n=5) among women who disclose an HIV status.

FSW were surveyed on methods of client recruitment and venues used for sex with clients. Across the entire analytic sample, the most popular method of client recruitment was by phone (n=295, 66.4%) followed closely by commercial venues such as bars, pubs and clubs (n=280, 63.1%). A significantly higher proportion of FSW who disclose (p-value=0.0003) recruited clients via referral from clients or other FSW (n=57, 38.0%) compared with women who do not disclose (n=64, 21.8%). In addition, a significantly higher proportion of FSW who disclose (p=0.008) used commercial venues for sex with clients (n=108, 72.0%) compared with FSW who do not disclose (n=174, 59.2%).

A majority of women in the study sample reported drinking alcohol about once a week (n=158, 37.43%) as opposed to daily use or less than weekly use. However, nearly half reported never having sex under the influence of alcohol (n=198, 44.6%). A significantly larger proportion of women who do not disclose (p<0.0001) reported ever having sex under the influence of alcohol (n=73, 34.1%) compared with women who disclose (n=11, 9.7%).

Very few women in the analytic sample presented with gynecologic disruptions or positive STI diagnoses at baseline. Fewer than 30 women reported any of the following: cystitis, vaginal itching, vaginal discharge, dyspareunia, lower abdominal pain, or genital ulcers. A majority reported having had a spontaneous miscarriage (n=379, 85.4%), 12.4% of FSW (n=55) presented with trichomoniasis, and 13.4% (n=57) presented with syphilis. A significantly larger proportion of FSW who disclose reported vaginal itching (n=15, 10.0%) compared with women who do not disclose (n=13, 4.4%); otherwise, the prevalence and incidence of STIs and gynecologic disruptions were similar between disclosure groups.

Table 1. Description of covariates at baseline visit by self-reported HIV serostatus disclosure, HIV- women only, Kigali, Rwanda							
	Total (n=444)		**Disclosed always/sometimes (n=150)** ǂ		**Disclosed never (n=294)**		**p-value (2-tailed)**[ɪ]
Covariates of interest	**N/Mean**	**%/SD**	**N/Mean**	**%/SD**	**N/Mean**	**%/SD**	
Age (quartiles), n=444							0.9201
Under 23	115	25.9	36	24.0	79	26.9	
Between 23 and 27	104	23.4	35	23.3	69	23.5	
Between 27 and 31	108	24.3	28	25.3	70	23.8	
Older than 31	117	26.4	41	27.3	76	25.9	
Marital status, n=317							0.5127
Single, never married	133	42.0	43	39.5	90	43.3	
Divorced, separated or widowed	184	58.0	66	60.6	118	56.7	
Number of live births,* n=444	2	1.5	2	1.4	2	1.5	0.2060
Number of living children,* n=444	2	1.4	2	1.3	2	1.4	0.2485
Do you plan to have more children? n=377							0.0061
Yes	139	36.9	57	46.7	82	32.2	
No	238	63.1	65	53.3	173	67.8	
Family planning method, n=443							0.9102
Long-acting: LARC (IUD or implant) or tubal ligation	97	21.9	70	46.7	62	21.2	
Injectable	93	21.0	31	20.7	62	21.2	
OCP	38	8.6	14	9.3	24	8.2	
Condoms only	215	48.5	70	46.7	145	49.5	
Educational attainment, n=444							0.0109
No formal education	279	62.8	82	54.7	197	67.0	
At least primary level	165	37.2	68	45.3	97	33.0	
Literacy level, n=444							0.0176
Not literate in any language	128	28.8	31	20.7	97	33.0	
Can read a little (Kinyarwanda only)	69	15.5	21	14.0	48	16.3	
Can read well (Kinyarwanda only)	176	39.6	67	44.7	109	37.1	
Can read multiple languages	71	16.0	31	20.7	40	13.6	
Total lifetime partners,* n=443	2088	3006.2	2276	3516.0	1975	2709.4	0.9478
Age at sexual initiation,* n=444	17	3.0	17	3.0	17	3.0	0.4180
Age at first sex work,* n=443	23	5.2	23	4.9	23	5.4	0.5484
Was the first sexual encounter forced? n=444							0.6181

No	291	65.5	102	68.0	189	64.3	
Yes, pressured verbally	49	11.0	17	11.3	32	10.9	
Yes, forced physically	104	23.4	31	20.7	73	24.8	
Was the first sexual encounter transactional? n=444							0.8304
Yes	60	13.5	21	14.0	39	13.3	
No	384	86.5	129	86.0	255	86.7	
Did you use a condom with first sex? n=444							0.5902
Yes	74	16.7	27	18.0	47	16.0	
No	370	83.3	123	82.0	247	84.0	
Do you have regular partners who are not paying clients? n=444							0.0511
Yes	277	62.4	103	68.7	174	59.2	
No	167	37.6	47	31.3	120	40.8	
Number of regular partners in the past month*							
Vaginal sex with a condom, n=215	3	5.3	4	7.3	2	3.7	0.0658
Vaginal sex without a condom, n=215	5	7.6	6	9.8	5	6.0	0.9229
Number of repeat clients in the past month*							
Vaginal sex with a condom, n=346	17	24.4	15	18.6	18	27.0	0.4111
Vaginal sex without a condom, n=342	2	7.5	2	7.3	2	7.7	0.1951
Number of non-repeat clients in the past month*							
Vaginal sex with a condom, n=333	25	34.1	18	27.2	28	36.4	0.0017
Vaginal sex without a condom, n=332	1	8.5	2	8.7	1	8.5	0.1754
Average charge per sex act, repeat clients*							
Vaginal sex with a condom, n=333	3370.87	2684.71	3330.43	2557.14	3392.20	2755.15	0.8666
Average charge per sex act, non-repeat clients*							
Vaginal sex with a condom, n=321	3312.46	3025.59	3326.47	2856.85	3305.94	3107.41	0.7559
Reasons for condom disuse with regular partners							
Partner refused	62	26.4	16	19.5	46	30.1	0.0802
I knew their HIV status	83	35.3	32	39.0	51	33.3	0.3843
N/A, consistently uses condoms	90	38.5	34	41.5	56	36.8	0.4881
Reasons for condom disuse with repeat clients							
Client refused	33	8.7	5	4.1	28	10.9	0.0276
I knew their HIV status	12	3.2	5	4.1	7	2.7	0.4795
N/A, consistently uses condoms	285	75.4	95	77.9	190	74.2	0.4411

Reasons for condom disuse with non-repeat clients							
Client refused	17	4.5	8	6.6	9	3.5	0.1822
N/A, consistently uses condoms	334	88.4	104	85.3	230	89.8	0.1925
Would you be interested in CVCT with a regular partner?							0.9074
Yes	252	90.7	94	90.4	158	90.8	
No	26	9.4	10	9.6	16	9.2	
Venue for client recruitment, n=444							
Bar, pub, club or cabaret	280	63.1	94	62.7	186	63.3	0.9016
Phone	295	66.4	105	70.0	190	64.6	0.2567
On the street	266	59.9	88	58.7	178	60.5	0.7026
At sex worker's house	202	45.5	62	41.3	140	47.6	0.2084
Lodge, guesthouse or hotel	80	18.0	34	22.7	46	15.7	0.0687
Referral from a client or other sex worker	121	27.3	57	38.0	64	21.8	0.0003
Locale used for sex with clients, n=444							
Where sex worker lives	363	81.8	116	77.3	247	84.0	0.0847
Where client lives	241	54.3	88	58.7	153	52.0	0.1850
Lodge, hotel or rented room	282	63.5	108	72.0	174	59.2	0.0080
Car	70	15.8	22	14.7	48	16.4	0.6290
Outside	58	13.1	23	15.3	35	11.9	0.3106
Steps taken to ensure safety and security with clients							
Sex only with known clients, n=443	30	6.8	9	6.0	21	7.2	0.6436
Reduce number of sex partners, n=443	12	2.7	6	4.0	6	2.1	0.2310
Avoid alcohol and drugs, n=443	136	30.7	45	30.0	91	31.1	0.8193
Bring clients home, n=442	75	17.0	24	16.0	51	17.4	0.6975
Make sure others are around/safe place, n=443	19	4.3	6	4.0	13	4.4	0.8300
Ask for money before having sex, n=443	99	22.4	31	20.7	68	23.2	0.5434
Stay calm, be nice to clients, n=443	246	55.5	79	52.7	167	57.0	0.3855
Be honest/do not cheat clients, n=443	195	44.0	57	38.0	138	47.1	0.0679
Have you ever been a victim of violence from a client? n=444							
Yes	108	24.3	37	24.7	71	24.2	0.9044
No	336	75.7	113	75.3	223	75.9	
Ever used lubricants, n=443							
Yes	8	1.8	2	1.3	6	2.0	0.6019
No	435	98.2	147	98.7	288	98.0	
Frequency of alcohol use, n=424							0.9920
At least daily	121	28.5	43	28.9	78	28.4	

At least once a week	158	37.3	55	36.9	103	37.5	
3 times monthly or less	145	32.2	51	34.2	94	34.2	
Frequency of sex under the influence of alcohol, n=327							<.0001
Yes	246	55.4	66	44.0	180	61.2	
Never/no	198	44.6	84	56.0	114	38.8	
Gynecological disruptions present, yes/no, n=444							
Cystitis	12	2.7	2	1.3	10	3.4	0.2037
Spontaneous miscarriage	379	85.4	123	82.0	256	87.7	0.1525
Vaginal itching	28	6.3	15	10.0	13	4.4	0.0222
Vaginal discharge	24	5.4	7	4.7	17	5.8	0.6229
Dyspareunia	8	1.8	5	3.3	3	1.0	0.0831
Lower abdominal pain	27	6.1	13	8.7	14	4.7	0.1034
Acute genital ulcer	6	1.4	2	1.3	4	1.4	0.9813
Chronic genital ulcer	4	0.9	2	1.3	2	0.7	0.4909
Positive lab test results							
Trichomoniasis, n=442	55	12.4	15	10.1	40	13.6	0.2969
Syphilis, n=425	57	13.4	18	12.4	39	13.9	0.6640
Sperm, n=442	31	7.0	10	6.8	21	7.1	0.8808
Positive diagnosis, n=442							
Trichomoniasis	27	6.1	12	8.1	15	5.1	0.2130
Syphilis	9	2.0	1	0.7	8	2.7	0.1507

*Continuous variable
ĦFor categorical variables, p-values from Chi-square tests (or Fisher's Exact)
ĦFor continuous variables, p-values from t-tests (if normally distributed) or Mann-Whitney U (if non-parametric)
ĦOf women who reported disclosing an HIV status to clients, 22 (14.7%) reported falsely disclosing an HIV-positive status and 20 (13.3%) reported disclosing a different status depending on the client.

In univariable analyses, the following variables yielded significant crude prevalence odds ratios (cPORs) for women who disclose compared with women who do not: fertility goals (whether the woman plans to have more children or does not plan to have more children); educational attainment (at least some education versus no formal education); literacy level; having regular non-paying sex partners; number of regular clients for protected vaginal sex in the past month; frequency of sex under the influence of alcohol; condom disuse with repeat clients due to client refusal; client recruitment by referral; the use of commercial locales for sex with clients; and self-reported vaginal itching. In an initial adjusted model, only fertility goals, having regular partners, frequency of sex under the influence of alcohol, condom disuse with repeat clients due to client refusal, client recruitment by referral, and vaginal itching were found to be significant. Crude cPORs, 95% confidence intervals and p-values are reported in Table 2.

FSW who disclose had greater odds of high educational attainment and literacy in univariable analyses. The odds of having at least a primary school education were 1.7 times among FSW who disclose versus FSW who do not (cPOR, 1.68; 95% CI, 1.13-2.52). The odds of being highly literate in Kinyarwanda among FSW who disclose were more than twice the odds among FSW who do not (cPOR, 2.43; 95% CI, 1.31-4.51). Similarly, the odds of being literate in multiple languages among FSW who disclose were nearly twice the odds among FSW who do not (cPOR 1.92; 95% CI, 1.16-3.19). Low-level literacy did not vary significantly with disclosure compared with no literacy.

FSW who disclose an HIV status had lower odds of having sex under the influence of alcohol (cPOR, 0.50; 95% CI, 0.334-0.741), greater odds of recruiting clients by referral (cPOR, 2.20; 95% CI, 1.43-3.39) and greater odds of using a commercial venue for sex (cPOR, 1.77; 95% CI, 1.16-2.71) compared with FSW who do not disclose. FSW who disclose also had fewer non-repeat clients for protected vaginal sex in the past month (cPOR, 0.989; 95% CI, 0.981-0.998) compared with FSW who do not disclose. The odds of self-reported vaginal itching were significantly greater among women who disclose versus women who do not (cPOR, 0.989; 95%

CI, 0.981-0.998). The odds of having a regular non-paying sex partner were 1.5 times among women who disclose versus women who do not, but this result was found to be only marginally significant in univariable analyses and was therefore excluded from the multivariable model.

Table 2. Univariable associations between covariates and HIV serostatus disclosure, HIV- women only, Kigali, Rwanda				
	cPOR	**95% CI**		**p-value**
Covariates of interest				
Do you plan to have more children? Yes vs. no n=377	1.850	1.189	2.879	0.0064
Educational attainment, some education vs. no formal education, n=444	1.684	1.126	2.520	0.0112
Literacy level, n=444				
Can read a little vs. not literate in any language	1.369	0.712	2.630	0.3459
Can read in multiple languages vs. not literate in any language	2.425	1.305	4.505	0.0051
Can read well in Kinyarwanda only vs. not literate in any language	1.923	1.160	3.190	0.0113
Do you have regular partners who are not paying clients? Yes vs. no n=444	1.511	0.997	2.291	0.0517
Protected vaginal sex with non-repeat clients in the past month,* n=333, per client increase	0.989	0.981	0.998	0.0175
Condom disuse with repeat clients because they refused, Yes vs. no n=444	0.348	0.131	0.925	0.0343
Recruits clients by referral from sex workers/clients, Yes vs. no n=444	2.203	1.432	3.388	0.0003
Uses commercial locale (lodge, hotel) for sex with clients, Yes vs. no n=444	1.773	1.159	2.714	0.0083
Sex under the influence of alcohol, Yes vs. never, n=327	0.498	0.334	0.741	0.0006
Vaginal itching, Yes vs. no n=444	2.401	1.111	5.189	0.0259

*Continuous variable
ŧFor categorical variables, p-values from Chi-square tests (or Fisher's Exact)
ŧFor continuous variables, p-values from t-tests (if normally distributed) or Mann-Whitney U (if non-parametric)
cPOR: crude prevalence odds ratio, CI: confidence interval
p-values are two tailed.

Conditional indices for all independent variables considered for a multivariable model were found to be less than 30, indicating no multicollinearity between variables. Table 3 below shows adjusted PORs (aPORs) for an initial multivariable model containing fertility goals; educational attainment; literacy level; number of non-repeat partners for protected vaginal sex in the past month; frequency of sex under the influence of alcohol; condom disuse with repeat clients due to client refusal; recruiting clients by referral; using a commercial locale for sex with clients; and self-reported vaginal itching. Table 4 shows aPORs for a final multivarible model including fertility goals; literacy level; condom disuse with repeat clients because of client refusal; recruiting clients by referral; using a commercial locale for sex with clients; and self-reported vaginal itching.

In the first multivariable model, fertility goals and literacy varied significantly with disclosure. The odds of wanting to have more children were about twice as great among FSW who disclose compared with those who do not (aPOR, 1.99; 95% CI, 1.15-3.43), as were the odds of being literate in multiple languages (aPOR, 2.33; 95% CI, 1.05-5.15). FSW who disclose also had greater odds of recruiting clients via referral (aPOR, 2.30; 95% CI, 1.33-3.99) and much lower odds of having sex under the influence of alcohol (aPOR, 0.39; 95% CI, 0.23-0.66) or disusing condoms with repeat clients due to client refusal (aPOR, 0.21; 95% CI, 0.06-0.71) compared with FSW who do not disclose. Finally, the odds of self-reported vaginal itching among FSW who disclose was nearly 5 times the odds among those who do not disclose (aPOR, 4.94; 95% CI, 1.51-16.12).

In the final multivariable model, FSW who disclose had greater odds of wanting more children (aPOR, 1.90; 95% CI, 1.16-3.08), being literate in multiple languages (aPOR, 2.623; 95% CI, 1.26-5.46) or highly literate in Kinyarwanda (aPOR, 2.38; 95% CI, 1.29-4.14), recruiting clients by referral (aPOR, 2.38; 95% CI, 1.46-3.91) and self-reporting vaginal itching (aPOR, 3.67; 95% CI, 1.34-10.07) compared with FSW who do not disclose. FSW who disclose had lower odds of condom disuse with repeat clients due to client refusal (aPOR, 0.26; 95% CI, 0.09-0.76) or having sex under the influence of alcohol (aPOR, 0.49; 95% CI, 0.31-0.79) compared with women who do not disclose. All covariates included in the final model were highly significant (p-value<0.015).

Table 3. Multivariable associations between covariates and HIV serostatus disclosure, HIV- women only, Kigali, Rwanda				
	aPOR	**95%CI**		**p-value**
Covariates of interest				
Do you plan to have more children? Yes vs. no n=377	1.987	1.150	3.432	0.0138
Educational attainment, some education vs. no formal education, n=444	1.652	0.819	3.334	0.1608
Literacy level, n=444				
Can read a little vs. not literate in any language	1.914	0.805	4.549	0.1419
Can read in multiple languages vs. not literate in any language	1.896	0.633	5.683	0.2531
Can read well in Kinyarwanda only vs. not literate in any language	2.327	1.051	5.148	0.0372
Protected vaginal sex with non-repeat clients in the past month,* n=333, per client increase	0.992	0.982	1.001	0.0784
Condom disuse with repeat clients because they refused, Yes vs. no n=444	0.212	0.064	0.709	0.0118
Recruits clients by referral from sex workers/clients, Yes vs. no n=444	2.300	1.326	3.988	0.0030
Uses commercial locale (lodge, hotel) for sex with clients, Yes vs. no n=444	1.615	0.912	2.859	0.1000
Sex under the influence of alcohol, Yes vs. never, n=327	0.388	0.229	0.660	0.0005
Vaginal itching, Yes vs. no n=444	4.937	1.512	16.119	0.0082

Table 4. Final multivariable model, associations of covariates and HIV serostatus disclosure, HIV- women only, Kigali, Rwanda				
	aPOR	**95%CI**		**p-value**
Covariates of interest				
Do you plan to have more children? Yes vs. no n=377	1.891	1.163	3.077	0.0103
Literacy level, n=444				
Can read a little vs. not literate in any language	1.801	0.844	3.845	0.1285
Can read in multiple languages vs. not literate in any language	2.623	1.260	5.457	0.0099
Can read well in Kinyarwanda only vs. not literate in any language	2.383	1.286	4.414	0.0058
Condom disuse with repeat clients because they refused, Yes vs. no n=444	0.264	0.092	0.755	0.0130
Recruits clients by referral from sex workers/clients, Yes vs. no n=444	2.384	1.455	3.905	0.0006
Sex under the influence of alcohol, Yes vs. never, n=327	0.493	0.308	0.789	0.0032
Vaginal itching, Yes vs. no n=444	3.666	1.335	10.065	0.0117

aPOR: adjusted prevalence odds ratio, CI: confidence interval
p-values are two-tailed

Discussion

The dual purpose of this study was (1) to describe the demographic, behavioral and clinical characteristics of FSW in Kigali, Rwanda who previously tested negative for HIV and (2) to determine the demographic, behavioral and clinical factors associated with HIV status disclosure in the same population. HIV status disclosure has important implications for HIV prevention because it allows both partners to make more informed decisions regarding whether to engage in sexual intercourse, as well as the use of protective measures such as condom use. As such, much of the literature on high-risk groups cite knowledge and disclosure of serostatus as critical for HIV prevention, taking the benefits of accurate disclosure as a matter of course (1, 3). However, the effects of disclosure on risk behaviors and condom use may vary with serostatus and other factors. Accurate disclosure by HIV-negative FSW may result in increased HIV risk, since risk-perception on the part of clients might be lower, and the necessity of condoms less self-evident.

In this study, disclosure is treated as a binary outcome, where refusal to disclose any serostatus is compared with ever disclosing a serostatus, including a false serostatus. The multivariable model in this study identifies several behavioral and demographic factors associated with disclosure of a serostatus, including high literacy in Kinyarwanda or literacy in multiple languages, compared with low or no literacy; planning to have more children, compared with not wanting more children; and recruiting clients via referral from other FSW or clients, compared with not recruiting via referral. These correlates have implications for the ability of FSW to communicate about HIV, whether they are accurately disclosing their serostatus, deliberately disclosing a false serostatus, or selectively disclosing. Pending further investigation into seroconversion and other clinical outcomes, the effects of accurate versus inaccurate or selective disclosure remain unknown.

Characteristics of HIV-negative FSW in Kigali

Women in the final analytic sample in this study exhibited many of the same demographic and behavioral characteristics as FSW in prior studies in Rwanda as well as other countries in SSA.

Consistent with reports in the literature of FSW having low educational attainment relative to other women (1, 3), only 37.2% of FSW in the final analytic sample had received at least a primary school education, versus 60.7% in the general population (24). Prior studies in Rwanda and Zambia also found that FSW generally fell between the ages of 20 and 30, had experienced sexual initiation in their late teens (16 to 17 years), had entered sex work in their early twenties (20 to 23 years), and had experienced a median of two pregnancies in their lifetimes (8, 10, 12).

Compared with FSW in other countries in SSA, including Zambia and Guinea (1, 12), but consistent with prior studies of FSW in Rwanda (10), the use of condoms appears high in the final analytic sample; a majority of FSW (75.4%) reported using condoms consistently with clients. Whether these self-reported data reflect actual condom use behaviors is open to question, but the salience of reported condom use suggests an understanding that it is a positive health behavior. Furthermore, of FSW who reported inconsistent condom use (n=110), the most-cited reason for disuse was partner refusal. These results are similar to national data collected in Zambia (12) and cohort data in Swaziland (2). This suggests that condom use negotiation is a major barrier for FSW with respect to HIV prevention, as opposed to a lack of knowledge about HIV or condoms.

Despite these similarities with FSW in other studies, the final analytic sample exhibited notable differences with respect to clinical outcomes. There was an extremely low past treatment history for, and current prevalence of, STIs compared with FSW in other studies, which show STI prevalence estimates of half to two-thirds among FSWs throughout SSA (3). For FSW in the present study, data were collected on self-reported past treatment for STIs, but these data were excluded from analysis due to the extremely small numbers of respondents who reported prior treatment. Only 6 women reported having been treated for vaginal ulcer in the past year and less than 1% of FSW (n=43) reported past treatment for vaginal discharge. The number of women positively diagnosed with prevalent STIs at baseline were also extremely small, with 3 or fewer women diagnosed with candida, gonorrhea, chlamydia, herpes and pelvic inflammatory disease (PID); 2% (n=9) with syphilis; and 6% (n=27) with trichomoniasis. By contrast, 59.7% of a cohort

of FSW in Guinea reported treatment for more than one STI in the preceding 3 months (1); 31% of FSW in a national study in Zambia reported seeking treatment for an STI symptom in the past 12 months (12); and 50.8% of FSW in a study in Swaziland reported having STI symptoms in the past 12 months. Interestingly, 59.8% of FSW tested positive for HSV-2 in a prior study in Rwanda (10) compared with only n=2 women in the present study.

Self-reported gynecologic disruptions were low in the present study compared with FSW in studies in Guinea, Swaziland and Zambia, and in a systematic literature review on FSW in SSA (1-3, 12). Based on studies included in the systematic review, half to two-thirds of FSW in SSA experience STI symptoms at any given time (3). By contrast, the only gynecologic disruption present in a majority of the analytic sample was spontaneous miscarriage, but the validity of such is questionable, as it is self-reported. Possible reasons for the low STI prevalence in the final sample are the exclusion of HIV-positive FSW; high self-reported condom use; and low STI prevalence in the general population in Rwanda, with less than 10% of adults of reproductive age having tested positive for any STI (25).

Variations in HIV status disclosure

Of the analytic sample of 444 FSW, 150 (33.8%) reported disclosing an HIV status to clients at least some of the time, whereas the remaining 294 (66.2%) reported never disclosing an HIV status to clients. Of those who disclose, 22 (14.7%) falsely disclose that they are an HIV-positive and 20 (13.3%) disclose a different status depending on the client. These subsets were not examined separately in analysis due to the relatively small number of FSW who reported disclosing a false or variant serostatus. However, the disclosure of a false or variant serostatus bears further examination, potentially as a condom use negotiation tactic, as no prior studies have examined the health impact of FSW deliberately disclosing a false serostatus to clients.

In an open-ended survey question, several FSW said they reported a false positive serostatus to encourage condom use. It may be the case that women who disclose exhibit stronger communication skills, not only with respect to condom use, but other sex and health behaviors.

This would have meaningful implications for policy and programmatic interventions targeting FSW as a key population for HIV prevention, especially since current interventions tend to focus exclusively on accurate information about HIV and accurate serostatus disclosure (26). Both qualitative and quantitative data are needed regarding the possible link between HIV status disclosure, protective behaviors, and communication with clients.

Factors associated with HIV status disclosure

In the final multivariable model, the following factors were associated with an increased prevalence odds of disclosing an HIV status to clients: planning to have more children, having high literacy or literacy in multiple languages versus limited or no literacy in any language; recruiting clients by referral versus venue or phone-based recruitment; and self-reported vaginal itching. Though not significant in multivariable analyses, the use of a commercial venue for sex with clients and recruitment via referral were also associated with HIV status disclosure. Women who disclose appear to have stronger networks and better financial support, as exhibited by their desire to bear more children, their ability to access commercial venues for business, and their utilization of clients and sex worker networks to attain more clients. Furthermore, women who disclose appear better educated and more literate, which may translate to better health knowledge and more effective communication with clients.

There were two factors included in the multivariable model that were associated with a decreased prevalence odds of disclosure: higher frequency of sex under the influence of alcohol, and condomless sex with repeat clients due to client refusal, versus consistent condom use or disuse for other reasons (e.g. not having a condom, preferring not to use a condom). Both the use of alcohol with sex and condom disuse increase HIV risk. Alcohol use inhibits effective condom use negotiation, increases the likelihood of sexual assault and rape (3) and correlates with HIV acquisition in other studies using multivariable models (27). Condom disuse for any reason is causally linked with increased HIV risk, and condom disuse due to client refusal, associated with non-disclosure in the present study, may indicate less agency on the part of some FSW to negotiate

condom use successfully. It may be the case that FSW who do not disclose an HIV status to clients are engaging in less sex communication overall due to less self-perceived agency relative clients, lower health literacy, or some combination of these.

It is unclear from the multivariable analyses whether HIV status disclosure is associated with positive or negative health outcomes. This is because the analytic sample generally exhibited an extremely low prevalence and incidence of STIs and gynecologic disruptions. One exception was self-reported vaginal itching which, interestingly, was significantly associated with HIV status disclosure. It may be the case that self-reported vaginal itching is less an indication of gynecologic disruptions and more reflective of an ability to communicate with clinic staff, since itching is a subjective symptom. The association with, and effect of, HIV status disclosure on the prevalence and incidence of STIs and gynecologic symptoms bears further examination, ideally with a sample that includes both HIV-positive and HIV-negative FSW to assess the effect of disclosure on seroconversion.

Strengths and limitations

Strengths of the present study include location and women included in the analytic sample; eligibility screening; the breadth of survey data gathered; and the use of on-site clinical testing to supplement survey data. FSW in the analytic sample were recruited exclusively from Kigali, which exhibits the highest incidence and prevalence of HIV of any municipality in Rwanda (26). Extensive checks were used at baseline to ensure that the women surveyed were genuinely engaged in sex work. Data were gathered on more than 250 demographic, behavioral and clinical factors, of which 34 were considered for analyses because data were adequately robust. This allowed for a broad range of potential correlates with HIV status disclosure. Finally, self-reported clinical data were accompanied by the results of on-site gynecological exams and clinical testing, which ensured more accurate results than self-reported data alone.

Limitations of the present study include study design, potential bias, and the absence of covariates of potential interest. Analyses used cross-sectional data on HIV-negative FSW gathered

at baseline, which inherently fail to capture any information on the temporality of the outcome or its correlates. As such, causality cannot be established. Furthermore, the analytic sample contained only HIV-negative FSW, which may have resulted in the biased selection of subjects who exhibit fewer risk behaviors, negative clinical outcomes and other traits associated with negative serostatus. This has implications for the generalizability of findings, particularly considering that the majority of FSW in Rwanda (51%) are HIV-positive.

There was also potential for misclassification of the outcome, HIV status disclosure. The outcome was self-reported and may reflect social desirability bias on the part of FSW; pending data on whether FSW feel that disclosure is a positive or negative behavior, the direction of potential bias cannot be determined. Furthermore, the binary treatment of HIV status disclosure obscures women who lie about their status to clients, but the mechanisms of HIV transmission may be very different for these women than for women who disclose their true status. As such, the non-differential treatment of disclosure may have biased results towards the null.

Finally, there were limitations with respect to the covariates used in analyses. Much of the covariate data was historical and self-reported, and therefore subject to recall bias. There were also a number factors of interest that were not captured in the data used in analyses. These include: reasons for HIV status disclosure; information on occupation or income outside of sex work; FSW's level of comfort discussing condom use with clients, and perceived consequences of condom use/non-use; perceived consequences of HIV status disclosure, non-disclosure, and false disclosure; and a comparison HIV status disclosure and its correlates among HIV-positive FSW and HIV-negative FSW.

Conclusions

In much of the epidemiologic literature on HIV prevention, serostatus disclosure is considered a positive health behavior by default. It is assumed that disclosure translates directly to less risky sex behaviors and, consequently, the prevention of HIV transmission. This simplified view of the causal relationship between disclosure and transmission fails to take into account the

complex sociostructural factors that influence not only whether people disclose, but what status they disclose and for what reasons. In the case of FSW in Kigali, serostatus disclosure is nuanced. In the present study, disclosure is neither positively nor negatively associated with any health outcomes, and there is potential for variant types of serostatus disclosure – honest/dishonest, consistent/selective, etc. – to have very different effects. The results of serostatus disclosure by FSW may depend on factors such as clients' HIV risk perception, a FSW's true serostatus, and the relationship between a FSW and her client.

In the present study, FSW who report disclosing a HIV status to clients appear to be more literate, have more resources (evidenced by their use of commercial venues for sex with clients) and have broader professional networks (evidenced by their greater odds of recruiting clients by referral). FSW who disclose may also exhibit more robust health communication, as they had greater odds of reporting a gynecologic symptom (vaginal itching) but were neither more nor less likely to have any negative health outcomes compared with FSW who never disclose their status. However, pending further investigation, the causal relationships between the above-listed correlates, HIV status disclosure and risk of seroconversion remain unknown.

Current interventions targeting FSW in Rwanda aim to educate participants about correct condom usage and other preventative measures. However, given the limited autonomy of FSW to negotiate condom use directly, it may be the case that variant status disclosure constitutes an important tool for self-protection in this population. Further research is needed to determine the health outcomes, sociodemographic characteristics, and health behaviors associated with true, false and variant serostatus disclosure between FSW and their clients. In particular, a comparison between the disclosure practices of HIV-negative and HIV-positive FSW may reveal how various types of HIV status disclosure can serve to protect FSW and their clients from HIV.

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Appendix

Schedules of Procedures – Female Sex Workers				
	(Standard of Care)	**Enrollment**	**Follow-up**	**Seroconversion[1]**
Month	**-1**	**0**	**1, 3, 6, 9,12, 15, etc…**	**Any month > 0**
Consent/Data Collection/Counseling				
Verification of eligibility		X	X	X
Informed Consent		X		
HIV Risk Reduction Counseling	X	X	X	X
Pre/Post HIV test Counseling	X	X	X	X
Family Planning Counseling and offer of LARC to non-pregnant women	X	X	X	X
Demographics		X		
Obstetric and contraceptive history		X		
Risk Assessment		X	X	X
Collect fingerprint (electronic or paper-ink) – Zambia sites only	X[2]	X	X	X
Gynecologic exam for STI screening	X (optional)	X	X (as indicated by signs or symptoms)	X (as indicated by signs or symptoms)
Self-administered vaginal swab for trichomonas screening if gynecologic exam is not done	X	X	X	X
ZEHRP/PSF Laboratory				
HIV rapid test	X	X	X	X
Syphilis test	X	X	X	X
Vaginal swab for trichomonas screening (from gynecologic exam or self-administered swab)[3]	X	X	X	X

Blood processed for quality control and banking for confirmation in subsequent seroconversions (buffy coat/plasma)	X	X		X
HIV-1 p24 antigen testing and PCR[4,5] (last visit prior to seroconverting)		X[4]		X[5]
PCR, Viral load[6]		X[4]		X[5]

[1] Confirmed HIV infection is defined for this study as the detection of HIV specific antibodies by at least two different HIV antibody tests.

[2] Fingerprints at Month -1 will only be collected all women

[3] Vaginal swabs will be collected and analyzed using microscopy as part of STI screening. Swabs will not be stored.

[4] Samples stored at enrollment will be pulled and tested on site for p24 and PCR in the event of a subsequent seroconversion.

[5] Sample storage and testing will be done for all HIV negative participants who become HIV positive

[6] Buffy coat and plasma will be stored for shipment to central laboratory (Atlanta, GA USA) for testing indicated. Further details provided in the analytical plan.