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Knowledge of HIV seropositivity is a predictor for initiation of illicit drug use: incidence of drug use initiation among female sex workers in a high HIV-prevalence area of China

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Abstract

Background—Drug use and sex work have had facilitative roles in the transmission of HIV/AIDS in China. Stopping drug use among sex workers may help to control the growth of the HIV/AIDS epidemic among Chinese sex workers.

Methods—From March 2006 to November 2009, female sex workers (FSW) in Kaiyuan City, Yunnan, China were recruited into an open cohort study. Participants were interviewed and tested for drug use and HIV/sexually transmitted infection (STI) prevalence. Follow-up surveys were conducted every six months. Multivariate Cox proportional hazards regression model with time dependent variables was used to measure the associations between independent variables and drug initiation.

Results—During the course of the study, 66 (8.8%) FSWs initiated drug use yielding an overall incidence of 6.0 per 100 person years (PY) (95% confidence interval [CI], 4.67–7.58). In the multivariate Cox proportional hazards regression model, being HIV-positive and aware of positive serostatus (adjusted hazard ratio [AHR] 2.6, 95% CI 1.24–5.55), age at initiation of commercial sex work <20 years (AHR 1.8, 95% CI 1.12–3.01), and working in a high-risk establishment (AHR 1.9, 95% CI 1.14–3.04) were associated with illicit drug initiation.

Conclusions—Being HIV-positive and aware of positive serostatus was the most salient predictor for the initiation of illicit drug use. Interventions offering sources of education, treatment, support, and counseling to HIV-positive FSWs need to be implemented in order to help promote self-efficacy and safe behaviors among this group of high-risk women.

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Keywords

illicit drug use; drug use initiation; HIV/AIDS; female sex workers; China

1. Introduction

China is home to one of the largest injection drug user (IDU) populations in the world (Mathers et al., 2008). Chinese border provinces, in particular, have large drug using populations because of their geographic proximity to large drug producing and trafficking regions in Southeast and Central Asia. As a result, provinces such as Yunnan and Guangxi have felt the hardest impact of the HIV/AIDS epidemic in China. Drug users make up nearly 40% of the estimated 700,000 HIV-positive individuals living in China (China Ministry of Health and UN Theme Group on HIV/AIDS in China, 2007) and preventing the initiation of, continuation of, and risky behaviors associated with drug use is critical in stemming the Chinese HIV/AIDS epidemic.

Understanding drug use, sexual behavior, and HIV-risk among women is especially important because of the unique risks that female drug users may be exposed to. Female IDUs are more likely than their male counterparts to be HIV-positive (Choi et al., 2006) and recent surveillance data indicates that HIV incidence among women is increasing (Jia et al., 2010). He et al. and Gu et al. respectively found that 60% and 40.7% of female IDUs had also worked as female sex workers (FSWs) (Gu et al., 2009; He et al., 2003), and other research has documented the use of commercial sex work among drug users as a means of financing their drug use (Choi et al., 2006). FSWs who use drugs may not only be at increased HIV risk because of their drug-use practices, but increased economic pressure and drug addiction may compromise an FSW's ability to negotiate condom use (Choi et al., 2006; Gu et al., 2008; Strathdee et al., 2008) in turn exposing them to higher risk of sexual HIV transmission. HIV prevalence rates as high as 19.6% and 49.3% have been reported among drug-using and injection drug-using FSWs (Wang et al., 2009). Drug-using FSWs thus may pose further risk of transmitting the virus to lower-risk populations through sex with their clients.

Although previous research in China has characterized the risks associated with drug use and sex work and reported retrospective reasons for drug initiation (Li et al., 2002; Wu et al., 1996; Yang et al., 2009), no studies that we are aware of have determined incidence of drug initiation using a prospective cohort and characterized the associated risk factors in China. A study of Vietnamese FSWs found that 65% of drug-using FSWs initiated drug use after initiation of sex work (Tran et al., 2005) and sex workers may be at greater risk for initiating drug use than other population groups. We hypothesized that FSWs working out of high-risk establishments (defined as locations with fee-per-service less than 100 RMB (Wang et al., 2009) would be more likely to initiate drug use because previous research has found significantly more drug users in high-risk establishments (27.6%) than in lower risk establishments (9.4%) (Wang et al., 2009). Exploring this hypothesis and characterizing other risks associated with drug use initiation may help to inform future interventions that work to prevent the initiation of drug use. To find and characterize the incidence of drug initiation among FSWs, we conducted an open cohort study of FSWs in Kaiyuan City, Yunnan Province, China.

2. Methods

2.1 Study Participants

This open cohort study was conducted by the Chinese Center for Disease Control and Prevention (China CDC) in conjunction with the Yunnan provincial and Kaiyuan local CDC. From March 2006 to November 2009, outreach workers recruited FSWs in Kaiyuan City who worked out of any of the known sex work venues in the area (we aimed to survey all venues in the area). Outreach workers explained the purpose and procedure as well as the possible risks and benefits of participation to eligible FSWs and their bosses. Inclusion criteria stipulated that women who were 16 years old, had self-reported commercial sex work within the last three months, and were willing to undergo HIV and sexually transmitted infection (STI) testing and counseling were eligible to participate. All women who met the inclusion criteria were invited to participate in the research study. Written informed consent was obtained for all subjects and FSWs were compensated 50 RMB (7 USD) upon each survey completion. Study protocol received approval from the institutional review boards of the National CDC and the Yunnan Provincial CDC.

2.2 Data Collection

Specialists from the National Center for AIDS/STD Control and Prevention (NCAIDS) and the Yunnan Provincial CDC trained local staff members from the Kaiyuan CDC to give HIV/STI pre and post-test counseling. All interviewers and outreach workers were trained in Good Clinical Practice (GCP).

Information regarding FSW demographics, drug use behavior (including history of drug use, types of drugs used, drug use methods, duration of drug use and needle sharing), and other risky behaviors was elicited in face-to-face interviews with trained CDC staff members. All subjects were contacted through provided contact information and reminded to return for post-test counseling, which was offered 1 month after every survey period, and to return to future survey and testing periods, which were conducted at 6 month intervals over the three and a half year study period (8 survey and testing periods were conducted in all). After survey completion, blood was collected and tested for HIV-1 antibodies (enzyme-linked immunosorbent assay (ELISA), Vironostika HIV Uni-Form plus O, bioMerieux, Holland), herpes simplex virus type 2 antibody (HSV-2, HerpeSelect-2 ELISA IgG, Focus, USA), and syphilis (rapid plasma reagin (RPR) test, Diagnosis kit, Xinjiang Xindi company, China). Positive HIV-1 ELISAs were confirmed by western blot (Diagnostics HIV Blot 2.2, Genelabs, USA) and positive RPR tests for syphilis were confirmed by the *Treponema pallidum* particle assay (TPPA) test (Serodia-P-PA-Fujirebio, Fuji, Japan). Endocervical swabs were collected and tested for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* by polymerase chain reaction (PCR, AMPLICOR, Roche, USA). Vaginal swabs were collected and a wet mount was prepared to detect *Trichomonas vaginalis* (TV). Urine was collected for opiate screening (MOP One Step Opiate Test Device, ACON Laboratories, Inc., USA). Participants were classified as using illegal drugs if they self-reported as such and/or had urine that tested positive for opiates. Subjects were scheduled for follow-up visits 4–6 weeks after the initial visit to receive test results and post-test counseling. FSW participants with STIs were referred to the Kaiyuan Dermatology Hospital, where participants were entitled to receive a 60% discount on STI treatment. Those who tested HIV-positive were referred to the Kaiyuan People's Hospital, where antiretroviral therapy was offered (when applicable) through the support of the Clinton Foundation. Special efforts were made to contact and notify all subjects who tested positive for HIV/STIs but did not return at the 4–6 week follow-up.

2.3 Statistical Analysis

Statistical tests were performed using SASTM 9.1 software (SAS Institute Inc, Cary, NC, USA). Those who reported ever having used drugs and/or had urine that tested positive for opiates at baseline were excluded from the analysis. Chi-square tests were used to compare demographic and behavioral characteristics of participants who returned for follow-up and subjects who did not return. Incidence of drug initiation was calculated by using the number of subjects who initiated drug use as the numerator and the amount of non-drug-using time in follow-up as the denominator. The follow-up time for each participant was calculated as the time between first report/detection of no drug use and the most recent report/detection of no drug use (if drug use was not initiated) or first report/detection of drug use (if drug use was initiated). For the purpose of calculating incidence of drug use initiation, we estimated date of drug use as the midpoint between the last report/detection of no drug use and the first report/detection of drug use. Poisson 95% confidence intervals (CI) were calculated for overall incidence.

The Cox proportional hazards regression model was used to assess the independent effect of both fixed covariates (e.g., education level, nationality, and age at initiation of sex work) and time-dependent covariates (e.g., HIV/STIs infection status and sexual behaviors) on time to drug initiation. Factors that were significantly associated in univariate analysis ($p < 0.20$) were included in a stepwise Cox proportional hazards multiple regression model with entry criteria of $p < 0.20$ and exit criteria of $p < 0.05$ (factors with $p > 0.05$ were excluded from the final model).

Awareness of infection status was determined through questionnaire and post-test counseling. HIV sero-positive FSWs who knew they were HIV-positive before the study (identified through self-report) and those who both tested HIV-positive at study testing and followed up for result disclosure were grouped as “being HIV positive and aware of HIV positive status.” This category also included the HIV sero-positive subjects who had more than one follow-up visit (and tested HIV-positive at a previous survey period) as HIV/STI testing results were disclosed to those who did not attend post-test counseling, but did participate in subsequent surveys. HIV-positive individuals who did not attend post-test counseling or further surveys were grouped as “being HIV positive but unaware of HIV-positive status.”

Higher risk venues were defined as locations where FSWs generally charged less than 100 RMB (about \$14 USD) per sexual service, including beauty salons, temporary sublets, and street walkers. Lower risk venues were defined as locations where FSWs generally charged 100 RMB or more per sexual service, including karaoke clubs, nightclubs, saunas, and hotels (Wang et al., 2009).

3. Results

3.1 Characteristics of Study Participants

By the end of the eighth survey in November 2009, there were 2282 FSWs cumulatively recruited in the study cohort. A total of 1866 (81.8%) participants reported never using illegal drugs prior to the baseline survey and of these 1866 participants, 751 (40.2%) FSWs returned for at least one follow-up visit. Among the FSW cohort, the majority was of Han ethnicity (68.3%), had registered residence in other cities in Yunnan (58.7%), and was relatively well educated (61.8% had more than 9 years of education). Most participants worked out of low-risk entertainment venues (65.9%) and reported that they had always used condoms with the previous week's clients (84.9%). Although reported condom use was high, STI prevalence was also high: 4.9% were HIV positive, 7.3% were *N. gonorrhoeae*

positive, 23.3% were *C. trachomatis* positive, 7.3% were TV positive, 60.2% were HSV-2 positive, and 7.5% were syphilis positive.

3.2 Differences between those in the cohort and those lost to follow-up

Table 1 shows the demographic and behavioral characteristics of FSWs at baseline. The subjects who completed at least one follow-up survey were generally older, from other provinces, working in lower risk entertainment venues, and living in apartments (as opposed to living with family or in brothels). This subset of participants also had generally worked in the commercial sex industry for a longer duration, had fewer clients in the previous week, and charged a higher fee-per-service, but had a higher syphilis prevalence.

Of the 37 FSWs who were HIV-positive at baseline and participated in at least one follow-up, 14(37.8%) subjects were unaware of their serostatus at first follow-up. Of the 43 FSWs who were HIV-positive at baseline and were lost to follow-up, 25(58.1%) subjects were unaware of their serostatus.

3.3 Incidence of drug initiation

During the three and a half years of the study (1099 PY of follow-up time), 66 (8.8%) FSWs initiated drug use yielding an overall incidence of 6.0 per 100 person years (PY) (95% CI, 4.67–7.58). Of the 66 FSWs who initiated drug use, 7 (10.6%) were IDUs and all of them injected heroin at initiation of drug use. The remaining 59 subjects who were not IDUs reported ketamine (49.2%), ecstasy (32.2%), methamphetamine (22.0%), heroin (20.3%), marijuana (15.3%), and Dolantin (3.4%) use; 23 (39.0%) FSWs used two or more illicit drugs after drug initiation.

3.4 Factors associated with incidence of drug initiation

Table 2 presents the demographic and behavioral characteristics associated with incidence of drug initiation in univariate analysis. Participants with registered permanent residence outside of Yunnan province (hazard ratio [HR] 0.4, 95% CI 0.18–0.96) were less likely to initiate drug use while those who were working in higher risk entertainment venues (HR 2.0, 95% CI 1.22–3.19), had 7 clients in the previous week (HR 2.2 95% CI 1.31–3.71), were HIV-seropositive and aware of serostatus (HR 3.0, 95% CI 1.44–6.34), were HSV-2 seropositive (HR 1.9, 95% CI 1.04–3.43), had a younger age at initiation of sex work (HR 1.8, 95% CI 1.10–2.94) and had an increased risk of initiating illicit drug use. Table 3 shows the results of multivariate analysis. Reporting younger age at initiation of sex work (adjusted hazard ratio [AHR] 1.8, 95% CI 1.12–3.01) and working in higher risk entertainment venues (AHR 1.9, 1.14–3.04) were all independent risk factors for drug initiation. Significantly, being HIV-positive was only a risk factor for those who were aware of their HIV-positive status (AHR 2.6, 95% CI, 1.24–5.55), but not significant for those who were HIV-positive and not aware of the result (those who did not know their HIV test result were those who did not return for result disclosure and could not be reached to notify of test results).

4. Discussion

To our knowledge, this is the first study to find the incidence of drug initiation and the associated risk factors among female sex workers. This study found a relatively high incidence of drug initiation of 6.0 per 100 PY (95% CI, 4.67–7.58) and that those who were HIV-positive and knew their diagnosis, were younger at initiation of sex work, and who worked out of high-risk commercial sex venues had an increased risk of initiating illegal drug use. Prevalent drug use was nearly 20% in this population of FSWs and is a serious public health concern, as drug use can facilitate the spread of HIV (Gu et al., 2008). Understanding the dynamics between drug use and sex work is a key component to

characterizing the Chinese HIV/AIDS epidemic and informing the policy and prevention efforts that will help to protect and treat at-risk populations.

Significantly, this study found that HIV-positive FSWs who are aware of their serostatus were 2.6 times more likely to initiate drug use. Research has found that drug-using FSWs are more likely to practice risky sexual and drug use behaviors when compared to both non-FSW drug users (Lau et al., 2008) and non-drug-using FSWs (Strathdee et al., 2008). HIV-positive drug-using FSWs risk transmitting the virus to others and compromising their own health if these risky behaviors continue. Furthermore, HIV-positive drug users are more likely than their non-drug-using counterparts to have poorer health outcomes, including lower body mass index (Quach et al., 2008).

Perhaps more significantly, our findings give unique insight into the dynamics of sex work, drug use, and HIV. Previous research has found high levels of depression among FSWs (Farley and Barkan, 1998; Gu et al., 2010; Hong et al., 2007) and found that some use drugs to cope (Boyd, 1993; Strathdee et al., 2008). Stress and depression were outside of the scope of this study, however drug use may serve a comforting role in the lives of some of the HIV-positive women surveyed in this study and this question should be explored further. Stigma and discrimination against people living with HIV/AIDS (PLWHA) has been documented all over the world. In China specifically, HIV-related stigma is pervasive at all levels (Wu et al., 2007), including among healthcare workers who treat PLWHA (Zhou, 2007). Furthermore, HIV-positive FSWs may feel deeper pressure from discrimination, as some members of the general population blame high-risk groups, including FSWs, for spreading the HIV/AIDS epidemic through “immoral” behavior (Lau et al., 2007; Zhou, 2007). Some PLWHA have reported suicide attempts, psychological crises after diagnosis, and generally negative outlooks on life (Zhou, 2007). We hypothesize that many factors, including post-diagnosis depression lead to the initiation of drug use among HIV-positive FSWs in Kaiyuan. This points to the need for intervention programs that reduce HIV-related stigma (Wu et al., 2007) and offer PLWHA support, counseling, education, and treatment. Little research on the psychological needs of HIV-positive FSWs has been conducted in China and this type of research is needed to better understand our findings and provide evidence-based support for interventions that support HIV-positive FSWs.

Women with an earlier initiation of sex work were also found to be more likely to initiate drug use. Although several studies found women with an earlier sexual debut to have higher risk behaviors (Pettifor et al., 2004), this study only found those with early initiation into sex work to be more likely to start using drugs. Age at initiation of sex work could be a proxy for a number of unmeasured factors that might facilitate the initiation of drug use as a coping strategy (Dube et al., 2003). Women who initiate sex work earlier may do so because of increased economic pressure to support themselves or their families, and this in turn could lead to higher levels of stress among this sub-group. Furthermore, the first commercial sexual experience may differ for women who initiate sex work at a younger age, in terms of their willingness and ability to negotiate safe sex. Significantly, history of rape and “survival sex” were associated with injection drug use initiation in a cohort of adolescents in North America (Roy et al., 2007), and such issues could impact drug use in this group of FSWs who started sex work before age 20. In-depth study of sex work initiation was outside of the scope of this study, but future research should delve into the issues surrounding sex work initiation and the impact that such factors may have on later drug use.

Consistent with our initial hypothesis, FSWs based out of high-risk establishments were almost twice as likely to initiate drug use when compared to their counterparts who were based out of low-risk establishments. Higher risk establishments are not only characterized by lower fee-per-service and more clients per day, but also have a greater presence of drug

use (Wang et al., 2009). FSWs who work in these high risk venues are more likely to be HIV-positive, have a higher risk of HIV-infection associated with drug use and injection drug use (Wang et al., 2009), and are more likely to practice inconsistent condom use (Gu et al., 2009a). The high prevalence of drug use within these types of establishments and the influence of drug-using peers alters the social norms surrounding drug use and may increase the likeliness of drug use initiation. Furthermore, the clients who patronize high-risk establishments may themselves represent a higher risk group than those who patronize low-risk establishments, and high-risk venue client drug use could influence the initiation of drug use among high-risk establishment FSWs. Studies have identified the role of drug-using peers and sexual partners in initiation of injection drug use (Clatts et al., 2010; Parriott and Auerswald, 2009; Small et al., 2009; Strathdee et al., 2008; Tran et al., 2005), but further research is needed to gain a deeper understanding of peer-influenced mechanisms of drug use initiation in this population of FSWs.

Despite significant findings, this study was subject to several limitations. Participants were asked a series of personal and sensitive questions and our results may be affected by social desirability bias. However, to mitigate this bias, biological indicators were used to evaluate drug use and STIs. Urine testing for opiates was the only biological measure used to determine drug use, and thus drug use may be underestimated in those who did not report drug use but used non-opiate illicit drugs. However, surveillance data in the area suggests that the majority of drug users use opiates. In 2008, the study survey was updated to elicit information regarding sexual partner drug use. Drug-using sexual partners may play a significant role in the initiation of FSW drug use, but there was insufficient data to analyze partner drug use. However, future surveys of Kaiyuan FSWs will continue to elicit information on partner drug use and further analysis will help clarify the impact of partner drug use on FSW drug initiation. Nearly 60% of eligible FSWs were lost to follow-up. This is a common problem in cohort studies with high-risk populations, but the high loss to follow-up may impact our results. Those who returned for subsequent surveys may have been less at risk than those who did not return. Incidence of drug initiation may have thus been underreported. However, risk behaviors among those lost to follow-up and those retained in the cohort (presented in Table 1) differed across behaviors and it is difficult to classify one group as more “risky” than the other. Thus it is also difficult to fully define the impact of the high attrition rate on our overall results. Significantly, the low follow-up rate affected the representativeness of our sample and our results should be understood in this context. Finally, this study was conducted in a cohort of Kaiyuan FSWs and the results of this research may not be applicable to all Kaiyuan FSWs or FSWs in other parts of China.

The results of this study have significant implications for further areas of research and intervention implementation. Being HIV positive and aware of seropositive status was the most salient predictor for drug initiation, and this finding not only speaks to the influence of HIV stigma and discrimination in China, but also indicates weaknesses in the current services available for PLWHA. Accessible psychological treatment and other support services are needed in Kaiyuan and across China. Free antiretrovirals and other services for PLWHA are currently offered in China, but access to such services is limited in some areas and policy implementation needs improvement (Lancet 2009; Zhang et al., 2008). Interventions that support and help PLWHA access services and maintain healthy lifestyles are greatly needed. Those with a younger initiation into sex work were more likely to initiate drug use and further research is needed in this area. Finally, FSWs in high-risk establishments were more likely to initiate drug use. Interventions that target FSWs in high-risk venues are needed as HIV and drug use are already prevalent within them (Wang et al., 2009) and drug use is more likely to be initiated when based in these establishments. In previous research, drug use has been found to be the most salient predictor for HIV among

Kaiyuan FSWs (Wang et al., 2009). Preventing the initiation of drug use in this population of FSWs is a significant step in controlling the HIV/AIDS epidemic.

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Table 1

Comparison of demographic and behavioral characteristics of FSWs in cohort and lost to follow-up

Demographic and behavioral characteristics		Lost to follow up (N=1115)	At least one follow up (N=751)	P value
Age (years)	16–20	431 (38.7)	254 (33.8)	<0.01
	21–25	337 (30.2)	181 (24.1)	
	26–52	347 (31.1)	316 (42.1)	
Ethnicity	Han	738 (66.2)	513 (68.3)	0.34
	Other	377 (33.8)	238 (31.7)	
Place of registered permanent residence	Kaiyuan city	232 (20.8)	145 (19.3)	0.02
	Other cities in Yunnan	697 (62.5)	441 (58.7)	
	Outside Yunnan	186 (16.7)	165 (22.0)	
Education level	<9 years	435 (39.0)	287 (38.2)	0.73
	9 years	680 (61.0)	464 (61.8)	
Marital status	Married/cohabitating	347 (31.1)	244 (32.5)	0.53
	Single/separated/divorced/widowed	768 (68.9)	507 (67.5)	
Commercial sex venue	Lower risk	674 (60.4)	495 (65.9)	0.02
	Higher risk	441 (39.6)	256 (34.1)	
Residence type	Apartment	674 (60.5)	546 (72.7)	<0.01
	Family home	74 (6.6)	64 (8.5)	
	Brothel or other working location	367 (32.9)	141 (18.8)	
Drinks alcohol	No	406 (36.4)	250 (33.3)	0.17
	Yes	709 (63.6)	501 (66.7)	
Duration of commercial sex work (years)	<2	808 (72.5)	492 (65.5)	<0.01
	2–5	217 (19.4)	169 (22.5)	
	5	90 (8.1)	90 (12.0)	
Age at sexual debut	<18	470 (42.1)	291 (38.8)	0.14
	18	645 (57.9)	460 (61.2)	
Age at initiation of commercial sex work	20	685 (61.4)	487 (64.8)	0.13
	<20	430 (38.6)	264 (35.2)	
Number of clients in previous week	<7	835 (74.9)	616 (82.0)	<0.01
	7	280 (25.1)	135 (18.0)	
Always used condom with clients in previous week	Yes	934 (83.8)	638 (84.9)	0.49
	No	181 (16.2)	113 (15.1)	
Has regular sexual partner	Yes	554 (49.7)	357 (47.5)	0.36
	No	561 (50.3)	394 (52.5)	
Always used condom with regular partner in previous week	Yes	98 (17.5)	77 (19.5)	0.41
	No	463 (82.5)	317 (80.5)	
Fee-per-service	100 RMB	695 (62.3)	521 (69.4)	<0.01
	<100 RMB	420 (37.7)	230 (30.6)	
Vaginal douching	No	232 (20.8)	147 (19.6)	0.52
	Yes	883 (79.2)	604 (80.4)	
HIV-1 positive	No	1072 (96.1)	714 (95.1)	0.26

Demographic and behavioral characteristics		Lost to follow up (N=1115)	At least one follow up (N=751)	P value
N. gonorrhea positive	Yes	43 (3.9)	37 (4.9)	0.16
	No	991 (90.8)	687 (92.7)	
C. trachomatis positive	Yes	100 (9.2)	54 (7.3)	0.19
	No	807 (74.0)	568 (76.7)	
T. vaginalis positive	Yes	284 (26.0)	173 (23.3)	0.79
	No	1018 (93.1)	688 (92.7)	
HSV-2 positive	Yes	76 (6.9)	54 (7.3)	0.16
	No	480 (43.1)	299 (39.8)	
Syphilis positive	Yes	635 (56.9)	452 (60.2)	<0.01
	No	1070 (96.0)	695 (92.5)	
	Yes	45 (4.0)	56 (7.5)	

Table 2

Factors associated with incidence of drug initiation in univariate analysis

Demographic characteristics		HR (95% CI)	χ^2	P
Age (years)	16–20	1.0		
	21–25	0.6 (0.29–1.10)	2.79	0.09
	26–52	0.6 (0.34–1.04)	3.32	0.07
Ethnicity	Han	1.0		
	Other	0.9 (0.53–1.58)	0.10	0.75
Place of registered permanent residence	Kaiyuan city	1.0		
	Other cities in Yunnan	0.8 (0.47–1.49)	0.36	0.55
	Outside Yunnan	0.4 (0.18–0.96)	4.22	0.04
Education level	<9 years	1.0		
	9 years	1.1 (0.64–1.73)	0.04	0.84
Marital status	Married/cohabitating	1.0		
	Single/separated/divorced/widowed	1.1 (0.63–1.77)	0.04	0.84
Entertainment venue	Lower risk	1.0		
	Higher risk	2.0 (1.22–3.19)	7.56	<0.01
Residence type	Apartment	1.0		
	Family home	1.7 (0.83–3.46)	2.07	0.15
	Brothel or other working location	1.1 (0.56–2.21)	0.09	0.76
Drinks alcohol	No	1.0		
	Yes	1.1 (0.63–1.80)	0.06	0.81
Duration of commercial sex work (years)	<2	1.0		
	2–5	1.0 (0.58–1.82)	0.01	0.91
	5	1.4 (0.70–2.66)	0.85	0.36
Age at sexual debut (years)	<18	1.0		
	18	0.6 (0.39–1.04)	3.28	0.07
Age at initiation of commercial sex work (years)	20	1.0		
	<20	1.8 (1.10–2.94)	5.46	0.02
Number of clients in previous week	<7	1.0		
	7	2.2 (1.31–3.71)	8.95	<0.01
Always used condom with clients in previous week	Yes	1.0		
	No	0.8 (0.37–1.80)	0.25	0.62
Had regular sexual partner	Yes	1.0		
	No	1.6 (0.94–2.58)	2.90	0.09
Always used condom with regular partner in previous week	Yes	1.0		
	No	1.3 (0.61–2.81)	0.46	0.50
Fee per service	>100 RMB	1.0		
	100 RMB	1.2 (0.75–2.07)	0.72	0.40
Vaginal douching	No	1.0		
	Yes	1.3 (0.62–2.55)	0.421	0.52
HIV seropositivity and awareness	HIV negative	1.0		

Demographic characteristics		HR (95% CI)	χ^2	P
	HIV positive but unaware of HIV-positive status	1.3 (0.18–9.25)	0.06	0.81
	Aware of HIV-positive status	3.0 (1.44–6.34)	8.49	<0.01
N. gonorrhea positive	No	1.0		
	Yes	2.1 (0.96–4.62)	3.43	0.06
C. trachomatis positive	No	1.0		
	Yes	1.1 (0.60–1.98)	0.08	0.78
T. vaginalis positive	No	1.0		
	Yes	1.0 (0.35–2.65)	0.01	0.94
HSV-2 positive	No	1.0		
	Yes	1.9 (1.04–3.43)	4.42	0.04
Syphilis positive	No	1.0		
	Yes	0.4 (0.10–1.62)	1.65	0.20

Table 3

Factors associated with incidence of drug initiation in multivariate analysis

Risk factors	AHR (95% CI)	χ^2	P
HIV-1 seropositive: aware of result	2.6 (1.24–5.55)	6.32	0.01
HIV-1 seropositive: unaware of result	1.5 (0.20–10.58)	0.14	0.71
Age at initiation of commercial sex work <20 years	1.8 (1.12–3.01)	5.83	0.02
Higher-risk entertainment venue	1.9 (1.14–3.04)	6.22	0.01