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Correlates of HIV infection among female sex workers in Vietnam: Injection drug use remains a key risk factor

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Abstract

Objective: Women who sell sex and use drugs have dual risks for HIV infection. Despite increasing reports of drug use among female sex workers (FSW) in Vietnam, FSW HIV interventions remain focused mainly on sexual risk reduction. We assessed the impact of drug use and inconsistent condom use on HIV infection among FSW in Vietnam, which few studies have quantified.

Methods: We surveyed 5298 women aged ≥18 years who had sold sex in the past month from ten geographically dispersed provinces. We performed multivariate logistic regression on data from provinces with high (≥10%) or low (<10%) HIV prevalence among FSW.

Results: Compared to FSW who never used illicit drugs, the odds of HIV infection among FSW who had ever injected drugs and those who reported non-injection drug use were 3.44 (CI 2.32–5.09) and 1.76 (CI 1.14–2.71), respectively, in high-prevalence provinces. FSW who always used condoms with clients had lower odds of HIV infection than those who did not (AOR = 0.71; CI 0.52–0.98). In low-prevalence provinces lifetime injection drug use (AOR 22.05, CI 12.00–40.49), but not non-injecting drug use or inconsistent condom use, was significantly associated with HIV infection.

Conclusions: Because injection drug use and inconsistent condom use were key risk factors for HIV infection in high-prevalence provinces, drug injection risk reduction should be as much a

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Contributors

LNL coordinated the study, conducted the analyses and led the manuscript writing; TAN and HVT helped coordinate the study, assisted with study implementation and interpretation of results; TCD and HTT assisted with study implementation and interpretation of results; NG and PN assisted with interpretation of results; LM, KS and JK assisted with analyses, study design and interpretation of results. All authors contributed to and have approved the final manuscript.

Conflict of interest

All authors declare no conflict of interest.

focus of HIV prevention as sexual risk reduction. Where HIV prevalence remains low in FSW, a more general emphasis on harm reduction for all drug users will benefit FSW.

Keywords

HIV; Drug use; Female sex workers; Risk factors; Harm reduction; Vietnam

1. Introduction

Despite growing evidence linking injection drug use to HIV infection among female sex workers (FSW) globally (Agarwal et al., 1999; Benotsch et al., 2004; Karapetyan et al., 2002; McKeganey, 1994; Medhi et al., 2012; Nguyen et al., 2004, 2009b; Panda et al., 2001; Platt et al., 2007; Sosa-Estani et al., 2003; Strathdee et al., 2008; Tuan et al., 2007; Wang et al., 2009; Xu et al., 2012), sexual risk reduction remains the primary focus of prevention efforts among FSW (Semini et al., 2013; Shahmanesh et al., 2008). Recent reports indicating high prevalence of illicit drug use, including non-injection use, among FSW in Southeast Asia suggest that drug use and sex work increasingly intersect in this region (Chhorvann and Liu, 2007; Couture et al., 2012; Liao et al., 2012; Medhi et al., 2012; National AIDS Control Program, 2011; Vietnam Administration of HIV/AIDS Control, 2006). In addition to the risk of acquiring HIV through unprotected sex and sexual violence by intimate partners and sex clients, FSW who use or inject drugs are at risk of HIV infection through re-use of injecting equipment and increased likelihood of unprotected sex while under the influence of drugs or experiencing withdrawal (El-Bassel et al., 2012; Maher et al., 2011).

In Vietnam FSW, people who inject drugs (PWID) and men who have sex with men constitute the majority of the estimated 260,000 people living with HIV. Epidemic modeling shows stabilizing HIV prevalence among the general population at 0.3%, but warns of increasing prevalence among FSW, currently at 7% nationally, in provinces with high rates of drug use (Vietnam Administration of HIV/AIDS Control, 2013). Surveys among FSW in Vietnam indicate that drug use, mostly measured as any illicit drug use but with some surveys including injection drug use, has increased rapidly since 1998 (Grayman et al., 2005; National AIDS Standing Bureau, 2001; Nemoto et al., 2008; Thuy et al., 1998; Tran et al., 2005a; Tuan et al., 2007; Vietnam Administration of HIV/AIDS Control, 2006). Consistent with the international literature, street-based FSW in Vietnam report higher levels of drug use, including injection drug use, than non-street-based FSW (Nemoto et al., 2008; Nguyen et al., 2009a, 2009b; Tran et al., 2005b; Vietnam Administration of HIV/AIDS Control, 2006).

Results from a limited number of studies indicate strong associations between HIV infection and lifetime illicit drug use among FSW in Vietnam (Nguyen et al., 2009b), drug injection (Nguyen et al., 2004; Tuan et al., 2007), and sharing of injecting equipment (Tuan et al., 2007). These studies were conducted in single locations or in a limited number of geographic regions and produced large variance on the measures of association. Previous studies have tended to focus on injection drug use and syringe sharing, but few studies have examined the role of non-injection drug use or reported a significant association between inconsistent condom use and HIV infection (Thuy et al., 1998; Tuan et al., 2007). In this

study, we explore the extent to which FSW across Vietnam are at risk for HIV infection through unprotected sex and non-injection drug use and examine these effects in the context of the province and type of venue in which FSW work.

2. Methods

2.1. Data collection

During September, 2009–February, 2010, women aged ≥18 years who sold sex in the past month (n = 5298) were recruited using two-stage cluster sampling in ten provinces. The provinces were geographically dispersed and included four northern (Hanoi, Haiphong, Quangninh, Yenbai), two central (Danang, Nghean), and four southern (Angiang, Cantho, Ho Chi Minh City (HCMC), Dongnai) provinces (Fig. 1). Seven of these provinces were receiving a large amount of the United States' President's Emergency Plan for AIDS Relief (PEPFAR) support and, therefore, were selected to provide data to inform programming. In each province, two subpopulations of FSW, street-based sex workers (SSW) who recruited clients on the streets, in parks, or other openly public spaces; and venue-based sex workers (VSW) who worked in entertainment or service establishments such as bars, cafés, restaurants, hotels or massage parlors, were sampled separately with a target sample size of 300 participants per subpopulation per province. Sample size calculations were powered to detect differences in key indicators from a previous IBBS survey (Vietnam Administration of HIV/AIDS Control, 2006). Separate SSW and VSW samples were obtained because of the higher risk of HIV documented among SSW (Nemoto et al., 2008; Nguyen et al., 2009a; Vietnam Administration of HIV/AIDS Control, 2006). Targeted sample sizes were reached or almost reached in most provinces. About half of the required sample size was reached for SSW in Cantho, Quangninh and SSW and VSW in Yenbai. Response rates were not obtained.

Prior to recruitment, locations where FSW congregated were mapped over two weeks, during which HIV outreach workers led study staff to hotspots to estimate the number of FSW at each location and inquire about and visit other locations not previously known. Separate sampling frames were created for SSW and VSW samples. The primary sampling unit was a cluster of locations, selected with probability proportional to size. In the second stage, survey participants were recruited at locations in the selected clusters (Family Health International, 2000). Self-weighted samples were obtained for all provinces except HCMC and Cantho, where recruitment numbers by cluster differed from their designated sample sizes, so we conducted weighted analysis to adjust for the unequal number of sex workers in the primary units (Karon and Wejnert, 2012). For SSW in Cantho, Quangninh and Yenbai and VSW in Yenbai, we recruited all eligible FSW encountered because the size estimate obtained through mapping was smaller than the targeted sample size.

Potential participants were offered invitational coupons to enroll in the survey at fixed study centers, located at governmental Provincial AIDS Centers (PAC) or houses specifically rented to facilitate recruitment. Trained PAC staff conducted individual structured face-to-face interviews with eligible participants who provided verbal voluntary informed consent. No personal identifying information was collected. Participants were remunerated 50,000–100,000 VND (2.7–5.5 USD) based on locale and consultation with FSW key informants

during formative assessments. The questionnaire collected information on sociodemographic characteristics; sex work; condom use practices; drug related risks; self-perceived risks; HIV knowledge; incarceration history; and access to HIV services. Illicit drug use indicators included a series of questions on lifetime use of the following drug types: opium, heroin, valium/Seduxen/Benzo, ecstasy, methamphetamine, marijuana, ketamine, magic mushrooms, cocaine, and 'other' as specified by the respondent. The interviewer asked if each drug type was used at any time up to the time of the interview, and if the respondent answered yes, whether the drug was used in the past month. The second set of questions followed the same sequence about injection for each injectable drug type. Other drug-related questions included daily injection; having a sex partner who injected illicit drugs in the past month; ever sharing needles and syringes or other injecting equipment; sharing needles and syringes with a sex partner in the past month. Consistent condom use, defined as used condoms for every vaginal and anal sex act with clients in the past month, was obtained by asking how often condoms were used in the past month (i.e. all of the time, sometimes, rarely, never) by client type. HIV knowledge was measured using core indicators from the United Nations General Assembly Special Session on HIV/AIDS (UNAIDS, 2009) and an additional question about HIV acquisition through needle and syringe sharing.

Women were asked to provide venous blood samples for anonymous HIV testing and given appointment cards to return to receive their results and referrals for HIV care where indicated. Trained PAC laboratory staff performed venipuncture at the study centers. The PAC or Preventive Medicine Center in each province conducted HIV antibody testing using Genscreen HIV-1/2 (Bio-Rad) and confirmed by Determine HIV-1/2 test (Abbott Laboratories) and Murex HIV-1.2.O (Murex Biotech Ltd). The National Institute of Hygiene and Epidemiology (NIHE) provided external quality assurance on the testing. The study protocol was approved by the Institutional Review Boards of NIHE and the U.S. Centers for Disease Control and Prevention.

2.2. Statistical analysis

Simple frequencies were calculated for separate estimates by province and subpopulation. We calculated 95% confidence intervals (CI) for odds ratios and the population attributable risk (PAR) to show potential impact of reducing injection drug use. All statistical analyses were performed using STATA version 12.0 (StataCorp, 2011). Three mutually exclusive drug use categories were created from responses to questions on lifetime illicit drug use of all drug types: never used illicit drugs, ever used illicit drugs through non-injecting routes of administration, and ever injected illicit drugs.

We conducted random effects logistic regression to account for intra-cluster correlation in examining demographic characteristics, occupational characteristics, and sexual and drug risk factors associated with HIV seropositivity. We entered into the multivariate logistic regression models independent variables associated with HIV seropositivity at $p < 0.20$ from the bivariate analyses, then retained those variables with the Wald statistic of $p > 0.05$ in reduced models. We applied the likelihood ratio test to compare nested models. A total of twenty-four records with missing values for the explanatory variables were omitted from the models. For the predictor 'type of sex work', the variable entered into the models

was the participants' response to whether or not they mainly negotiated sex on the streets and in other public spaces, rather than the subpopulation samples (SSW vs. VSW) into which participants were recruited, as responses did not always match the study sample into which the participant was recruited. To ensure that inclusion of the variable utilizing participant responses about where they mainly negotiated sex in the multivariate analysis did not impact results, we performed a parallel analysis (results not shown) using the sample grouping (VSW vs. SSW) as a covariate, but found no change in the predictors and minimal difference in the magnitudes of the effect.

During preliminary multivariate data analysis, we found that province remained significantly associated with HIV. We therefore created separate models for provinces with high (HIV prevalence among both SSW and VSW ≥ 10%) and low HIV prevalence (<10% for SSW, VSW, or both). The high-prevalence provinces consist of Vietnam's three largest city-provinces (Hanoi, Haiphong, HCMC), and the low-prevalence provinces, which include rural provinces, have smaller population sizes and economies. In order to retain differences among provinces and between SSW and VSW, we retained province and type of sex work in both models as potential confounders.

3. Results

3.1. Sample characteristics

Sociodemographic, occupational and behavioral characteristics are shown in Table 1. The mean current age ranged from 23.7 to 36.0 years and time in sex work from 2.1 to 7.4 years. Educational attainment beyond grade 5 varied widely from 22.0% among Angiang SSW to 91.0% among Hanoi VSW. The lowest mean total monthly income was observed among Angiang SSW (3.0 million VND, or 160 USD) and the highest among Nghean VSW (9.3 million VND, or 500 USD). Consistent condom use was lowest in HCMC SSW (22.8%) and highest in Angiang SSW (84.2%).

3.2. Illicit drug use

Overall, 5% of the sample reported exclusive lifetime non-injection use and 5% reported lifetime injection drug use. In high-prevalence provinces 12% reported lifetime non-injection drug use and 10% reported injection drug use, compared to 2% and 2% in low prevalence provinces, respectively.

In four of the ten study provinces (Cantho, Hanoi, Haiphong, HCMC) more than 18% of FSW reported ever using illicit drugs and over 5% reported ever injecting drugs. Lifetime illicit drug use and injection drug use was <2% among SSW and VSW in Danang, Dongnai and Quangninh and among VSW in Yenbai. Heroin was the most commonly reported drug ever used (76.3%) and ever injected (76.9%) in a majority of the sample populations. Of those who reported having ever injected drugs, 22.3% (n = 186) in high prevalence provinces and 52.3% (n = 65) in low prevalence provinces reported lifetime sharing of injecting equipment (data not shown).

Reported lifetime ATS use was low in low HIV prevalence provinces. However, in high HIV prevalence provinces, lifetime ATS use ranged from 4.7% to 12.3% among SSW and

reached 15.5% among VSW (Table 1). As many VSW in HCMC reported having ever used ATS as opiates (Table 1). Only 1% of those having used ATS reported injecting ATS (data not shown). FSW who reported administering drugs only by non-injectable means used mainly heroin (57%) or ATS (47%). Very few FSW (<2%) reported using or injecting illicit drugs other than heroin or ATS.

3.3. Associations with HIV

HIV prevalence was highest among both subpopulations in Hanoi (19.7% and 16.7%, respectively), Haiphong (23.0% and 11.7%, respectively) and HCMC (16.3% and 13.4%, respectively) and among SSW, but not VSW, in Cantho (19.6% and 3.0%, respectively) (Table 1). In every province, HIV prevalence was greater among FSW who reported lifetime illicit drug use, including injection, compared to those who had never used illicit drugs (Fig. 2).

Bivariate associations between HIV prevalence and other characteristics of interest are shown in Table 2 for high- and low-prevalence provinces. For the high HIV prevalence provinces, drug related factors associated with increased HIV seropositivity included lifetime non-injection drug use, lifetime injection drug use, having ever shared injecting equipment, and having at least one sex partner who injected drugs in the past month. FSW in the low HIV prevalence provinces were more likely to test HIV seropositive if they had ever injected drugs, ever shared injecting equipment, had at least one sex partner who injected drugs in the past month, and shared injecting equipment with a sex partner in the past month.

Table 3 illustrates factors independently associated with HIV seropositivity, adjusted for all variables of significance in either of the high- or low-prevalence provinces, type of sex work, and survey province. Among the drug related factors, only lifetime injection and non-injection illicit drug use remained significantly associated with HIV. In high-prevalence provinces, the odds of HIV infection were 1.76 (CI 1.14–2.71) times greater among FSW who reported lifetime non-injecting illicit drug use and 3.44 (CI 2.32–5.09) times greater among those who reported having ever injected drugs compared to FSW who reported never using illicit drugs. FSW from low-prevalence provinces had 22.05 (CI 12.00–40.49) times the odds of being HIV infected if they injected drugs, but non-injecting drug use was not significantly associated with HIV infection. The PARs for having ever injected drugs were 22.0% in high-prevalence provinces and 32.5% in low-prevalence provinces.

Inconsistent condom use was significantly associated with HIV infection in high- but not low-prevalence provinces. FSW from high-prevalence provinces who used condoms every time they had sex with clients had lower odds of HIV infection compared to FSW who did not (AOR = 0.71; CI 0.52–0.98). Other independent predictors of HIV infection in the high-prevalence provinces were older age and being widowed. Compared to FSW aged 18–24 years, FSW aged 25–29 years had the highest odds of HIV infection (AOR = 2.75; CI 1.72–4.40). Widowed FSW had higher odds of HIV infection (AOR = 1.75; CI 1.02–3.00) compared to FSW who had never been married. In the low-prevalence provinces, ever having been married, street-based sex work (AOR = 1.73; CI 1.07–2.78), and having comprehensive knowledge of HIV risk (AOR 1.54; CI 1.04–2.27) were also associated with

HIV seropositivity. When compared to FSW who had never married, widowed FSW were most at risk (AOR = 8.94; CI 4.45–17.61).

4. Discussion

In the largest study ever conducted among Vietnamese FSW, we found that injection drug use remained the key risk factor for HIV infection throughout Vietnam and that inconsistent condom use was an additional risk factor in provinces where HIV prevalence was high. Two previous known published studies in Vietnam have shown, with lower precision, that history of injection drug use was the main predictor of HIV seropositivity (Nguyen et al., 2004; Tuan et al., 2007), although these studies were unable to examine the risk associated with non-injection drug use. Tuan et al. (2007) found a significant association between inconsistent condom use and HIV in Angiang in 2002 when FSW HIV prevalence was over 17%, which is consistent with our finding that FSW had dual sexual and drug use risks in high-prevalence provinces.

The impact of injection drug use on HIV prevalence among FSW in high-prevalence provinces was low compared to low-prevalence provinces. We believe the reduced impact was a result of sexual risk and non-injection drug use having a greater effect rather than injection drug use being less risky in these settings. Injection drug use among FSW was more common in high-prevalence provinces, but service data did not show uniformly greater access to harm reduction interventions for PWID in high-prevalence provinces. The per capita needle-syringe distribution level was lower in HCMC, higher in Haiphong, and average in Hanoi compared to lower-prevalence provinces (Vietnam Administration of HIV/AIDS Control, 2011). Furthermore, HIV prevalence among men who inject drugs varied across provinces and did not correlate with prevalence among FSW who inject drugs (National Institute of Hygiene and Epidemiology, 2011).

Non-injection illicit drug use presents in this study as a predictor of HIV infection among FSW in large urban cities of Vietnam and must be addressed given evidence of its potential to increase sexual HIV risk (Couture et al., 2012; Diehl et al., 2014; Ho et al., 2013; Maher et al., 2011). Across all provinces heroin was the most used non-injection illicit drug, but ATS use was high in HCMC and Hanoi, where corresponding highest levels of inconsistent condom use was reported. In low-prevalence provinces, the association between non-injecting illicit drug use and HIV infection was not statistically significant. The strong association we found between injection drug use and HIV infection in low-prevalence provinces, combined with the lack of an association between inconsistent condom use with clients and prevalent HIV, indicates the need for a continued focus on harm reduction interventions even though a majority of newly detected HIV cases in recent years are reported to have been acquired through sexual transmission [unpublished MOH HIV case reports]. FSW in low-prevalence provinces were much less likely to become HIV infected through unprotected sex than through injection drug use. Given almost one-tenth of all FSW reported having either a client or regular sex partner who injected drugs in the past month, harm reduction interventions to all PWID would in effect reduce HIV transmission by both sex and needle sharing in low-prevalence provinces.

Despite concerns about increases in methamphetamine use (Global SMART Program, 2013), our data provide further evidence of the central role of heroin injection in drug use risk behavior among FSW. ATS use among FSW appears to be confined to large cities in Vietnam and their high cost may make them unaffordable in rural areas (Ho et al., 2013). The proportion of VSW using ATS in HCMC is similar to the proportion using heroin, reflecting the substantial increase in ATS use among other urban FSW populations since 2001 when an estimated 1.5% of all drug users in Vietnam reported lifetime ATS use (Nguyen and Scannapieco, 2008).

Selling sex on the streets was significantly associated with HIV infection in low- but not high-prevalence provinces. Our data provide some evidence that drug use levels between SSW and VSW differed more in low-prevalence provinces than in high-prevalence provinces and therefore may have produced an association with HIV for being a street-based sex worker in the low-prevalence provinces only. In addition, there are a higher number of HIV infections in the general population than in the low-prevalence provinces (Vietnam Administration of HIV/AIDS Control, 2013), so clients of sex workers in high-prevalence provinces may have more uniform probability of being HIV infected. HIV infection also significantly differed by marital status, a potential result of the increased economic vulnerability of widowed, divorced, or married FSW, who earned three-quarters the income of single FSW (data not shown). Widowed SSW were most vulnerable, as indicated by their reporting the lowest mean monthly income, the significant association between HIV infection and widowhood regardless of province, and by this association being strongest in low-prevalence provinces, where selling sex on the streets was also significantly associated with HIV infection.

FSW in the high-prevalence provinces are older than in low-prevalence provinces, which explains the age association with HIV only in high-prevalence provinces. Previous correlations of these characteristics with HIV had been inconsistent (Nguyen et al., 2004, 2009b; Thuy et al., 1998; Tuan et al., 2007). An unexpected result was observed in the low-prevalence provinces where correct knowledge of HIV risk was positively associated with HIV infection. This is inconsistent with at least one previous study, but might be explained by increased contact with care and treatment services among HIV-positive FSW, although this was not examined in the current analysis since self-reported HIV serostatus was not collected. Our study has other limitations worth noting. Firstly, even though efforts were made to obtain representative samples by identifying all FSW locations, recruitment took place at only known locations where FSW sold sex or met clients. Secondly, while we were unable to reach the desired sample size in some provinces, we believe this was likely due to an overestimation of the number of SSW present in these settings, rather than to participant refusal. Key informants from the FSW community during the formative assessment stated that client solicitation in the period before the survey had shifted away from the streets and into establishments, and most SSW respondents reported that they were recruited from cafés. Thirdly, self-reports of drug use, particularly injection drug use, are subject to social desirability bias; however, drug users have previously been shown to provide reliable and valid responses (Colon et al., 2010; Darke, 1998). Finally, given limitations on the questionnaire's length, we did not investigate the impact of criminalization, except to examine the effect of having been mandatorily detained for the ostensible purpose of

rehabilitation, which was not an independent predictor. We also did not enquire about violence against FSW, although these are important subjects to cover in future studies.

Our results highlight key differences between high- and low-HIV prevalence provinces in Vietnam. These differences underscore the need to tailor prevention programming to dynamics of local epidemics. In provinces with low HIV prevalence among FSW, effective harm reduction interventions for all drug users, regardless of whether or not they sell sex, are required and may reduce up to one-third of HIV infections among FSW. In the high-prevalence provinces, risk reduction interventions for FSW absent significant PWID prevention components will have weak, or limited, impact. The Vietnamese national HIV/AIDS strategy consists of separate programs for PWID and FSW (National Committee for AIDS Drugs and Prostitution Prevention and Control, 2012), and current HIV prevention programs lack specific harm reduction interventions targeting FSW who use and inject drugs. Even with low numbers of FSW who inject drugs, in epidemics such as Vietnam where injection drug use is key driver of HIV transmission, HIV prevention programming must address risks associated with drug use, as well as sexual risk, among FSW. The World Health Organization's most recent guidance on HIV prevention for sex workers emphasizes access to comprehensive HIV services, including testing and counseling, by FSW who inject drugs (WHO et al., 2013). However, this group constitutes only 0.4% of those presenting to HIV testing and counseling programs in Vietnam (Hong et al., 2011). In high HIV prevalence settings, greater uptake of HIV testing, opioid substitution therapy (OST) and needle and syringe distribution programs by FSW who inject drugs may have important HIV prevention benefits. Similar to other low-income countries where women have limited access to OST (El-Bassel et al., 2012), few of those enrolled in Vietnam's rapidly expanding OST program are women and the proportion of these who engage in sex work is unknown (PEPFAR Vietnam Country Team, 2012). Furthermore, there is scope for integration of surveillance and intervention programs for non-injection drug use, currently scarce worldwide (Shoptaw et al., 2013), into HIV programs to reduce drug-related sexual transmission among populations with high HIV prevalence and, in particular, FSW.

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Fig. 1.
Map of Vietnam and the 10 survey provinces.

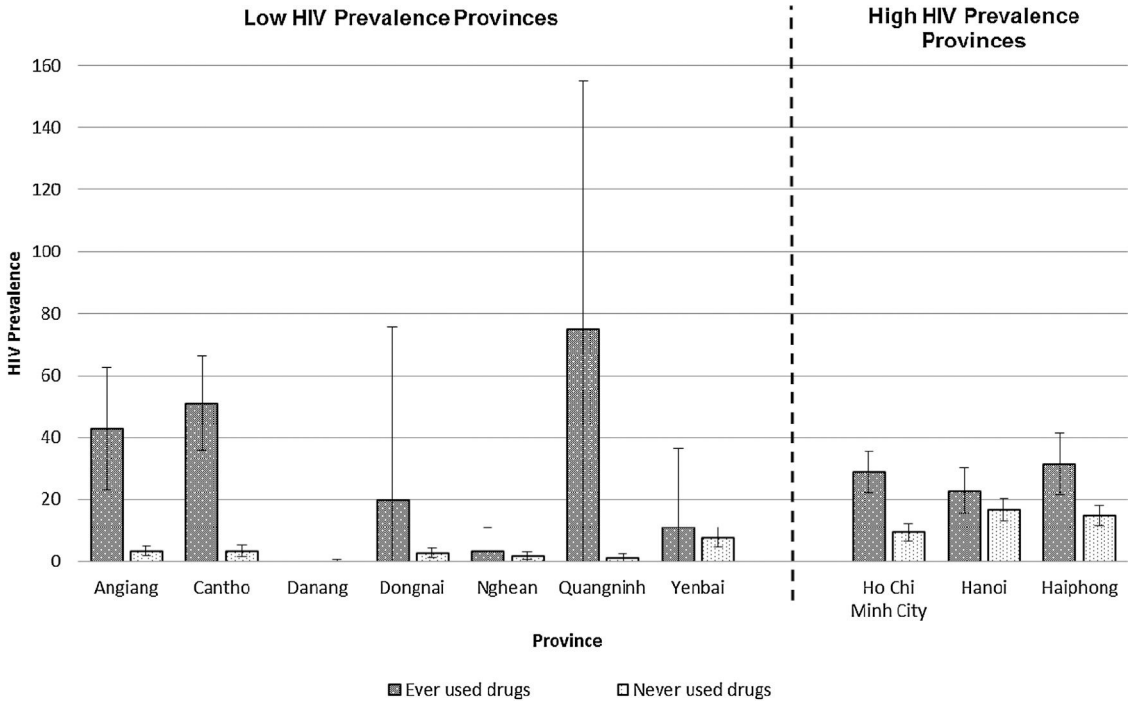

Fig. 2.

HIV prevalence (95% CI) among FSW who have ever used drugs vs. never used drugs in 10 provinces of Vietnam, 2009–2010.

Table 1

Sociodemographic, occupational and behavior characteristics and HIV prevalence of female sex workers in 10 provinces of Vietnam, 2009–2010.

Indicators	Angiang	Cantho	Danang	Dongnai	Hanoi	Haiphong	HCMC[a]	Nghean	Quangninh	Yenbai
Street-based sex workers (N)	300	138	300	300	300	300	300[b]	282	159	151
Age (mean years)	33.0	34.9	36.0	25.1	30.7	31.4	33.5	25.0	25.9	27.8
Obtained grade 6 or higher education (%)	22.0	31.2	62.6	73.0	85.0	76.0	48.0	77.0	82.4	88.0
Years in sex work (mean)	5.5	7.4	6.7	3.3	5.9	5.1	5.6	2.2	2.6	3.6
Mean total monthly income (million VND)	3.0	3.2	3.3	6.0	5.9	4.1	3.9	4.5	4.6	4.2
Consistent condom use with clients in past month (%)	84.2	84.1	75.3	38.9	33.0	81.0	22.8	74.1	62.3	58.3
Ever used or injected drugs illicitly (%)										
Any illicit drug	5.7	26.1	1.7	0.7	26.3	23.0	29.5	5.0	1.3	6.0
Opiates	5.7	23.9	0.3	0	25.0	23.0	22.3	2.1	0.6	6.0
ATS	0	1.5	1.0	0.7	8.0	4.7	12.3	2.8	0.6	2
Illicit drugs used or injected in past month (%)										
Opiates	3.7	17.4	0.3	0	17.0	22.0	10.3	0.7	0.6	4.6
ATS	0	1.5	0.7	0.7	2.7	0	3.4	2.1	0.6	0
Injected any illicit drug (%)										
Ever	4.7	26.1	0.3	0	15.0	17.7	12.8	1.1	0.6	4.6
In past month	3.7	15.2	0.3	0	11.7	17.3	6.8	0.7	0.6	4.6
Ever detained in a rehabilitation center for sex workers	7.3	18.1	4.0	1.3	11.3	16.7	4.7	4.3	0.6	0
HIV prevalence (%)	7.7	19.6	0.3	4.0	19.7	23.0	16.3	3.2	1.3	10.6
Venue-based sex workers (N)	263	354[b]	251	300	300	300	305[b]	274	298	123
Age (mean years)	26.4	27.6	30.1	24.4	30.1	29.4	25.7	23.7	27.7	29.5
Obtained grade 6 or higher education (%)	43.7	55.9	74.8	79.3	91.0	87.7	65.2	82.9	88.6	75.4
Years in sex work (mean)	3.1	3.4	4.3	3.3	5.3	4.0	4.2	2.1	3.7	4.6
Mean total monthly income (million VND)	5.0	5.6	4.5	7.1	7.4	5.5	5.4	9.3	6.8	4.6
Consistent condom use with clients in past month (%)	82.5	78.7	79.6	20.5	38.3	79.7	33.4	83.9	66.8	51.2
Ever used or injected drugs illicitly (%)										
Any illicit drug	4.2	2.2	0.4	1.0	18.7	5.7	28.7	5.1	0.7	0.8
Opiates	3.4	1.7	0	0	18.0	5.7	14.1	0.4	0.7	0.8
ATS	2.3	0.2	0.4	0.3	6.0	1.3	15.5	4.4	0	0

Indicators	Angiang	Cantho	Danang	Dongnai	Hanoi	Haiphong	HCMC[a]	Nghean	Quangninh	Yenbai
Illicit drugs used or injected in past month (%)										
Opiates	1.5	0.7	0	0	8.7	5.7	6.0	0.4	0	0
ATS	0.4	0.2	0	0.3	2.7	1.0	6.5	1.8	0	0
Injected any illicit drug (%)										
Ever	2.7	1.2	0	0.3	4.7	3.7	7.8	0.4	0.7	0
In past month	1.5	0.7	0	0.3	2.7	3.7	4.8	0.4	0.7	0
Ever detained in a rehabilitation center for sex workers	3.0	1.3	0.8	0.3	3.0	11.3	2.3	0.4	1.0	0.8
HIV prevalence (%)	3.0	3.3	0.4	2.3	16.7	11.7	13.4	1.1	2.7	4.9

[a]HCMC, Ho Chi Minh City.

[b]Weighted.

Table 2

Crude association between HIV prevalence and selected characteristics of female sex workers in high and low HIV prevalence provinces of Vietnam, 2009–2010.

Variable	High HIV prevalence provinces[a]			Low HIV prevalence provinces[b]		
	%	OR	95% CI	%	OR	95% CI
Sociodemographic and occupational characteristics						
Age	(*n* = 1798)			(*n* = 3458)		
18–24	22.3	1.00	-	40.7	1.00	-
25–29	30.0	2.98	1.92,4.63	24.1	2.76	1.73,4.40
30+	47.7	2.26	1.48,3.44	35.2	1.28	0.79, 2.08
Obtained grade 6 or higher education (%)	75.5 (*n* = 1805)	0.85	0.61,1.16	66.4 (*n* = 3489)	0.67	.045, 0.98
Marital status	(*n* = 1804)			(*n* = 3488)		
Never been married	32.9	1.00	-	45.2	1.00	-
Married	20.2	1.09	0.73, 1.63	12.2	4.00	2.27, 7.09
Separated/divorced	38.3	1.25	0.93, 1.82	36.4	2.29	1.39,3.77
Widowed	8.6	1.91	1.22,3.23	6.2	8.62	4.75, 15.67
Age at first sex (per year increase)	(*n* = 1787)	0.99	0.94, 1.04	(*n* = 3358)	0.93	0.87, 1.00
Years in sex work (per year increase)	(*n* = 1799)	1.03	1.00,1.06	(*n* = 3304)	1.07	1.03,1.11
Negotiate sex mainly on street or in other public areas	43.1 (*n* = 1804)	1.53	1.12,2.08	18.2 (*n* = 3481)	2.69	1.76,4.10
Price per sexual transaction excluding overnight stay (per $1 US increase)	(*n* = 1799)	0.98	0.96, 1.00	(*n* = 3484)	0.94	0.91, 0.98
Ever sold sex in other provinces	7.5 (*n* = 1804)	0.67	0.41,1.08	18.8 (*n* = 3477)	0.67	0.43, 1.03
Sexual behaviors						
Number of sex clients in past month (per one client increase)	(*n* = 1805)	1.00	0.99, 1.00	(*n* = 3027)	0.99	0.98, 1.00
Consistent condom use with clients in past month	51.9 (*n* = 1800)	0.75	0.56, 0.99	67.5 (*n* = 3479)	1.21	0.77, 1.92
Condom use with clients in last vaginal or anal sex act	68.8 (*n* = 1803)	1.29	0.95, 1.75	78.8 (*n* = 3468)	0.98	0.63, 1.55
Had at least one sex partner who injected drugs in past month	13.9 (*n* = 1804)	1.56	1.08,2.24	5.2 (*n* = 3493)	3.94	2.32, 6.17
Alcohol and drug use behaviors						
Daily alcohol consumption in past month	43.1 (*n* = 1804)	0.93	0.82, 1.05	41.8 (*n* = 3488)	1.07	0.90, 1.27
Illicit drug use (lifetime)	(*n* = 1805)			(*n* = 3493)		
Never used	78.2	1.00	-	96.4	1.00	-
Non-injection drug use only	11.5	1.54	1.02,2.34	1.7	2.57	0.89, 7.44

Variable	High HIV prevalence provinces[a]			Low HIV prevalence provinces[b]		
	%	OR	95% CI	%	OR	95% CI
Injection drug use	10.3	3.87	2.64, 5.69	1.9	47.49	26.29, 85.76
Ever sharing needles and syringes or other injecting equipment	2.3 (*n* = 1805)	3.55	1.74,7.23	1.0 (*n* = 3493)	35.66	15.6,81.0
Shared needles and syringes with a sex partner in past month	0.7 (*n* = 1805)	1.24	0.30, 5.22	0.2 (*n* = 3493)	26.9	4.39, 164.88
Used or injected heroin in past month	11.5 (*n* = 1805)	2.88	1.99,4.17	1.6 (*n* = 3493)	35.02	18.04,67.98
Used or injected ATS in past month	2.8 (*n* = 1805)	0.78	0.32, 1.87	0.6 (*n* = 3493)	2.81	0.54, 14.68
Access to condoms						
Condoms available where meet clients	64.6 (*n* = 1792)	0.88	0.66, 1.17	79.2 (*n* = 3363)	0.69	0.45, 1.07
Knowledge						
Correctly identified HIV risks and rejected common misconceptions	58.2 (*n* = 1804)	1.35	1.01,1.79	44.6 (*n* = 3493)	1.58	1.08,2.32
Incarceration history						
Ever detained in rehabilitation center for sex workers	8.2 (*n* = 1804)	1.66	1.06,2.61	2.8 (*n* = 3493	6.08	3.16, 11.69
STI						
Genital pain and ulcers in past 12 months	16.2 (*n* = 1803)	1.41	1.00,1.99	17.9 (*n* = 3481)	1.03	0.63, 1.67
Province	(*n* = 1804)			(*n* = 3493)		
Hanoi		1.00	-			
Haiphong		0.86	0.56, 1.32			
Ho Chi Minh City		1.10	0.77, 1.59			
Angiang					1.00	-
Cantho					1.74	0.92, 3.30
Danang					0.06	0.01, 0.26
Dongnai					0.58	0.29, 1.15
Nghean					0.38	0.17, 0.86
Quangninh					0.37	0.16, 0.83
Yenbai					1.66	0.80, 3.44

[a] High HIV prevalence provinces (HIV prevalence > 10% among both SSW & VSW) = Hanoi, Haiphong, Ho Chi Minh City.

[b] Low HIV prevalence provinces (HIV prevalence ≤10% among either SSW or VSW or both) = Angiang, Cantho, Danang, Dongnai, Nghean, Quangninh, Yenbai.

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Table 3

Adjusted correlates of HIV infection among female sex workers in high and low HIV prevalence provinces of Vietnam, 2009–2010.

Variable	High HIV prevalence provinces[a]		Low HIV prevalence provinces[b]	
	Adjusted OR	95% CI	Adjusted OR	95% CI
Age				
18–24	1.00	-	1.00	-
25–29	2.75	1.72, 4.40	1.60	0.96, 2.65
30+	1.95	1.20, 3.14	0.68	0.38, 1.20
Marital status				
Never been married	1.00	-	1.00	-
Married	1.08	0.70,1.67	2.83	1.48, 5.41
Separated/divorced	1.01	0.69,1.47	2.28	1.30, 3.99
Widowed	1.75	1.02, 3.00	8.94	4.54, 17.61
Negotiate sex mainly on street or in other public areas	1.34	0.97, 1.85	1.81	1.11, 2.95
Consistent condom use with clients in past month Illicit drug use (lifetime)	0.71	0.52, 0.98	0.90	0.56, 1.43
Never used	1.00	-	1.00	-
Non-injecting drug use only	1.78	1.16, 2.74	2.17	0.72, 6.56
Injecting drug use	3.44	2.32, 5.09	22.05	12.00, 40.49
Correctly identified HIV risks and rejected common misconceptions Province	1.31	0.98, 1.78	1.51	1.02, 2.25
Hanoi	1.00	-		
Haiphong	1.01	0.68, 1.52		
Ho Chi Minh City	0.80	0.52, 1.24		
Angiang			1.00	-
Cantho			1.33	0.75, 2.35
Danang			0.09	0.02, 0.40
Dongnai			1.11	0.53, 2.35
Nghean			0.69	0.32, 1.53
Quangninh			0.60	0.25, 1.42
Yenbai			1.42	0.71, 2.82

Variables in multivariate model are adjusted for all other variables in model.

[a]High HIV prevalence provinces (HIV prevalence > 10% among both SSW and VSW) = Hanoi, Haiphong, Ho Chi Minh City; $N = 1797$.

[b] Low HIV prevalence provinces (HIV prevalence ≤ 10% among either SSW or VSW or both) = Angiang, Cantho, Danang, Dongnai, Nghean, Quangninh, Yenbai; $N = 3477$.