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Correlates of Injection Drug Use among Female Sex Workers in Two Mexico-U.S. Border Cities

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Abstract

Objective: To characterize the overlap between injection drug use and sex work by women in Tijuana and Cd. Juárez, situated on the Mexico-U.S. border.

Methods: FSWs aged ≥ 18 years who were not knowingly HIV-positive and reported having unprotected sex with ≥ 1 client in the prior two months underwent interviews and testing for HIV, syphilis gonorrhea and Chlamydia. Logistic regression identified factors associated with injecting drugs within the last month.

Results: Of 924 FSWs, 18.0% had ever injected drugs. Among FSW-IDUs (N=114), prevalence of HIV, syphilis titers $>1:8$, gonorrhea and Chlamydia was significantly higher at 12.3%, 22.7%, 15.2% and 21.2% compared to 4.8%, 13.1%, 5.2% and 11.9% among other FSWs (N=810). FSW-IDUs also had more clients in the past six months (median: 300 vs. 240, $p=0.02$). Factors independently associated with injecting drugs in the past month included living in Tijuana, being younger, being married/common-law, longer duration in the sex trade, speaking English, earning

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Contributors

Drs. Patterson and Semple designed the behavioral intervention study (NIMH R01 MH065849), supervised data collection, and contributed to manuscript writing. Dr. Strathdee planned the analysis, assisted with interpreting results, and wrote the majority of the manuscript. Ms. Philbin and Ms. Pu conducted the analyses and assisted with interpreting results and writing the manuscript. Drs. de la Torre, Amaro, Magis, Salazar assisted with study design and interpreting results and revising the manuscript. Drs. Lozada, Staines, Martinez and Fraga supervised data collection and assisted with the manuscript. Ms. Orozovich supervised data collection and provided oversight of the intervention study. All authors contributed to and have approved the final manuscript.

Conflict of Interest

The authors have no conflicts of interest to disclose.

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less for sex without condoms, often using drugs before sex, and knowing other FSWs who injected drugs.

Conclusions: FSW-IDUs had higher STI levels, engaged in riskier behaviors and were more vulnerable to having unsafe sex with clients compared to other FSWs, indicating that this subgroup is an important bridge population requiring focused prevention.

Keywords

female sex worker; prostitution; injection drug use; needle sharing; Mexico; women

1. Introduction

Tijuana, Baja California and Ciudad (Cd.) Juarez, Chihuahua, are sister cities of San Diego, CA and El Paso, TX, respectively, and are the largest Mexican-U.S. border cities. Of the 5.5 million people who live on the Mexican side of the border, approximately half live in either of these cities (U.S. Environmental Protection Agency, 2003). Urban areas in Mexico typically have a regulated '*Zona Roja*' [red light district] where prostitution is tolerated. Although reports vary, the most widely cited estimate of the number of female sex workers (FSWs) in Tijuana is 9,000 (Brouwer et al., 2006b), whereas there are at least 4,000 FSWs in Cd. Juarez (Patterson et al., 2006).

In Tijuana, FSWs are required to obtain permits if they wish to work without prosecution in the *Zona Roja*, but in practice, more than half of FSWs operate without and work within and outside of the *Zona Roja*. In Cd. Juarez, a permit is not required and two *Zonas Rojas* exist. In both cities, FSWs operate out of cantinas, bars, hotels, nightclubs and street corners that cater to men of different cultural backgrounds. Carrier identified nine different types of FSWs in Mexico, ranging from "street walkers" and call girls to companions for parties and vacations (Carrier, 1989). Although some FSWs in these cities are relatively high income earners, most are from lower socioeconomic strata. Most enter prostitution out of economic necessity (Bucardo et al., 2004); for example, due to a failed relationship or intolerable working conditions in *maquiladoras* (Grossman et al., 1985), (i.e., assembly plants that use their low labor costs to attract manufacturing contracts from foreign firms). Factors related to their mobility, such as extreme poverty and low social support, may heighten their vulnerability to HIV/STIs (Fernandez, 1998, Rangel et al., 2006).

Tijuana and Cd. Juarez are central corridors for smuggling illicit drugs into the U.S. After Colombia, Mexico is the second most important source of heroin entering the U.S., accounting for 30% of all heroin sold in the U.S. and 98% of heroin sold west of the Mississippi river (Bucardo et al., 2005). Approximately 90% of all methamphetamine entering the U.S. is produced in Mexico, and 70% of all cocaine entering the U.S. passes through Mexico en route from South America (Brouwer et al., 2006a). Illicit drug use—particularly injection drug use—has increased in Tijuana and Cd. Juarez over the past ten years as local drug consumption markets have emerged along trafficking routes (Magis-Rodríguez et al., 2002).

The highest consumption of illegal drugs in Mexico is in Baja California, whose largest city is Tijuana. Tijuana has one of the fastest growing injection drug user (IDU) populations in Mexico (Magis-Rodríguez et al., 2002, Secretaría de Salud, 2002). The proportion of the general population in Tijuana aged 12–65 years who reported having ever used an illegal drug was 15%, three times the national average. In Mexico overall, men were 13 times more likely than women to have ever used illicit drugs, but in Tijuana the ratio was 6:1, indicating a high proportion of female drug users (Secretaría de Salud, 2002). In 2003, officials estimated there were ~6000 IDUs attending '*picaderos*' (shooting galleries) in Tijuana (Morales et al., 2004), but the total number is thought to be closer to 10,000. Among Mexican cities, Cd. Juarez

is ranked second only to Tijuana in the number of illicit drug users, which is twice the national average (Lloyd, 2003). In 2001, it was estimated that there were ~6,000 'heavy heroin users' in Cd. Juarez (Cravioto, 2003).

Many FSWs in Tijuana and Cd. Juarez turn to stimulants like methamphetamine or cocaine—alone or in combination with heroin—to help them cope or stay awake (Patterson et al., 2006). FSWs who inject drugs (FSW-IDUs) may experience an elevated risk of acquiring both sexually transmitted infections (STIs) and blood borne infections. In cases where drugs are injected, women who share injection equipment are at risk of acquiring HIV or other blood borne infections such as viral hepatitis. Although HIV prevalence is generally low in Mexico, the prevalence of hepatitis C virus infection among IDUs in Tijuana and Cd. Juarez exceeds 90%, whereas prevalence of hepatitis B exceeds 80% (White et al., 2007).

In contrast, STI prevalence among FSWs in Mexico has been high for decades. The prevalence of active syphilis, Chlamydia and gonorrhea among FSWs in Mexico City was 23.7%, 12.8% and 11.6%, respectively (Valdespino-Gómez et al., 1998), and prevalence of HSV-2 and oncogenic HPV strains was 60% and 43%, respectively (Uribe-Salas et al., 1999, Juarez-Figueroa et al., 2001). Among FSWs on the Mexico-Guatemala border, prevalence of syphilis, Chlamydia, gonorrhea, HSV-2 and HIV was 9%, 14%, 12%, 86% and 0.6%, respectively; low HIV prevalence was attributed to the low prevalence of injection drug use, which likely differs from Mexico's northern border with the U.S.

Despite the overlapping nature of sex work and injection drug use in various international settings, little research has been conducted on the subgroup of women who engage in both behaviors. We characterized recent injection drug use among FSWs in Tijuana and Cd. Juarez, which may help to inform prevention efforts in both Mexico and the U.S.

2. Methods

2.1. Settings

This study was conducted in two cities (Tijuana and Cd. Juarez) that were part of a larger multi-site behavioral intervention study. Tijuana is the largest Mexican-U.S. border city, is home to an estimated 1,410,700 persons and is adjacent to San Diego, California. Tijuana and San Diego together form the world's largest binational metropolis. Roughly half of Baja California's population lives in Tijuana (Instituto Nacional de Estadística Geografía e Informática, 2000), although over half of the city's inhabitants were born outside the state (Brouwer et al., 2006b). In 1999, the gross regional product (per capita) in Tijuana was \$6,800, over four times less than that of San Diego (International Community Foundation, 2004). The border crossing between Tijuana and San Diego is the busiest in the world. In 2005, there were 45 million registered northbound crossings from Tijuana to San Diego County (U.S. Department of Transportation), and 42,000 persons who live in Tijuana cross northbound to work in San Diego, California every day (Coubes, 2006).

Cd. Juarez is the largest city in the state of Chihuahua and has a population of 1,313,338. In 2000, 36% of Cd. Juarez's inhabitants were born outside Chihuahua (Instituto Nacional de Estadística Geografía e Informática, 2000). In 1999, the gross regional product of Cd. Juarez was almost 2.5 times less than that of El Paso, Texas; \$7074, and \$17,216 respectively (International Community Foundation, 2004). In 2005, there were 29 million northbound border crossings from Cd. Juarez to El Paso, Texas (U.S. Department of Transportation). As in Tijuana, the main industry in Cd. Juarez is *maquiladora* assembly plants.

2.2. Study Population

Between January 2004 and March 2005, a total of 920 FSWs were recruited in Tijuana (N=470) and Cd. Juarez (N=450) into a behavioral intervention study that aimed to increase condom use. Eligibility requirements included being at least 18 years of age, providing informed consent and having traded sex for drugs, money, or other material benefit within the previous two months. Since this was an intervention study, women were also required to have had unprotected vaginal sex with at least one client in the past two months, and were excluded if they reported that they had previously tested HIV-positive. Exclusion criteria included: (1) consistent use of condoms/dental dam for vaginal, oral and anal sex with all clients during the previous month; and (2) employed as a sex worker for less than one month (i.e., to match our period of recall); and (3) under 18 years of age. The latter exclusion criterion was imposed because it is illegal for women under the age of 18 to engage in prostitution in Mexico. Since injection drug use was not an inclusion criterion, study staff did not validate reports on injection drug use by inspecting injection stigmata; however, all subjects received the same reimbursement regardless of their injector status/

In both cities, recruitment involved both clinic-based and street outreach approaches using clinic staff and *promotoras* (outreach workers) who were all trained on study procedures prior to beginning the study. All staff recruiters were Mexican, most were female, some were ex-drug users or former sex workers, and all had extensive experience conducting community-based outreach to high risk populations on the streets in these cities. Clinic-based staff included psychologists, counselors and nurses who approached FSWs who were attending clinics where FSWs were known to seek health services. At clinics, women were approached by these staff recruiters after they checked in for their appointment and were offered participation in a non-coercive manner. Street outreach took place in areas where FSWs worked, such as streets, bars, brothels and massage parlors, both inside and outside the *zonas rojas*. Street recruitment was facilitated through storefront offices in locations where FSWs worked, and through the use of mobile clinics equipped with an examination room and a counseling room. On the streets and in sex work venues, *promotoras* approached FSWs at all hours of the day and night, explained the study, and invited them to participate in a non-threatening manner.

2.3. Data Collection

The face-to-face interview was conducted as part of a safer sex intervention which focused on motivational interviewing and increasing self efficacy among FSWs, as previously described (Patterson et al., 2006). The interview was conducted by trained, Spanish speaking female counselors in private clinic rooms or outreach offices and took place prior to the intervention, lasting approximately 35 to 40 minutes. All study measures were developed and piloted with the aid of our binational team of Latina and Mexican researchers, who advised on issues relating to gender and cultural-sensitivity. All measures were translated into Spanish and back-translated into English through the collaborative efforts of Mexican and Latina researchers. Because of low reading level, all materials were administered verbally.

The interview covered a range of topics including sexual risk behaviors, working conditions, financial need, victimization and trauma, use of alcohol and illicit drugs, social support, social influence, life experiences, mood, self-esteem, social cognitive factors, sociodemographic characteristics, physical health variables and psychiatric health variables. Details on the psychometric properties of specific scales are provided in an earlier paper (Patterson et al., 2006).

We examined the extent to which four domains differed between FSW-IDUs and other FSWs: i) baseline sociodemographic characteristics, ii) social influences, iii) risk behaviors, and iv) HIV/STIs. Social influences included whether their sex partners and other FSWs injected

drugs, their number and type of sex partners, whether or not they had a pimp, and their main sex work venue. Working conditions included work site (e.g., brothel, street, bar), and type of sex worker they mainly considered themselves to be (e.g., dance hostess, street worker).

Risk behaviors of interest included unprotected sex with clients and their regular partner; number of clients; number and type of other sex partners (non-clients) and how much money they earned with and without a condom. FSWs were asked to report their use of alcohol, and a variety of illicit drugs (e.g., marijuana, cocaine, heroin, and methamphetamine), whether drugs and alcohol were used before/during sex with clients and if their clients and other sex partners used and injected drugs. Participants also provided a blood draw and cervical swab and were compensated \$30 US.

2.4. Laboratory Testing

The “Determine” rapid HIV antibody test was initially conducted to determine the presence of HIV antibodies (Abbott Pharmaceuticals, Boston, MA). All reactive samples were then tested using HIV-1 antibody by EIA and Western Blot.

Syphilis serology was conducted using the rapid plasma reagin (RPR) test (Macro-Vue, Becton Dickinson, Cockeysville, MD, USA). All RPR-positive samples were subjected to confirmatory testing using the *Treponema pallidum* hemagglutinin assay (TPHA) (Fujirebio, Wilmington, DE, USA). *Neisseria gonorrhea* and *Chlamydia trachomatis* were detected from vaginal swabs collected by trained nurses, using the Aptima® Combo 2 collection device (Genprobe, San Diego, CA) which allows for a direct target-amplified nucleic acid probe test. Specimen testing was conducted at either the San Diego Health Department laboratory (for Tijuana STI samples, and all HIV confirmatory tests) or El Paso Health department (for Cd. Juarez STI samples). HIV/STI test results were provided to participants and women who tested positive were referred to local municipal health clinics for free medical care.

2.5. Statistical Analysis

Statistical analyses focused on comparisons between FSWs who reported injecting drugs within the last two months (FSW-IDUs) compared to FSWs who did not. Analyses were conducted on baseline data only. Continuous data were examined using Wilcoxon rank sum tests for differences in group distributions while binary data were examined using Fisher's exact tests.

Univariate and multiple logistic regression was performed to identify factors associated with injection drug use within the last two months. In multiple logistic regression analyses, models were developed using a manual procedure where all the variables of interest that attained a significance level <10% were considered in multivariate analyses in order of most to least significant. The likelihood ratio statistic was used to compare nested models, retaining variables that were significant at the 5% level. Although site specific models were examined, results are presented for the overall sample due to the relatively small sample of FSW-IDUs in each site, and because site-specific associations were generally similar.

3. Results

A total of 924 eligible FSW were enrolled (474 in Tijuana and 450 in Ciudad Juarez), of whom 166 (18.0%) reported ever injecting drugs and 114 (12.3%) reported injecting illicit drugs within the last month. Relative to Cd. Juarez, higher proportions of FSWs in Tijuana reported ever injecting drugs (21.7% vs. 14.0%, $p=0.002$), or injecting drugs within the last month (15.8% vs. 8.7%, $p=0.001$).

Among FSWs who injected drugs within the last month (N=114), polydrug use was common. The majority reported injecting heroin (93.9%), cocaine/heroin combinations (i.e., “speedball”; 50.0%), cocaine alone (36.0%) or methamphetamine (21.1%). Not unexpectedly, FSW-IDUs were also more likely to report non-injection use of other drugs, including marijuana/hash, heroin and methamphetamine (Table 1). In the past month, 52.6% reported using a needle someone else had used, 73.7% had passed on their own needle to someone else, and 70.3% had shared injection paraphernalia (i.e., cottons, cookers, rinse water). One fifth reported sharing needles with a sex trade client (18.9%).

Compared with FSWs who did not inject drugs within the past month FSW-IDUs were slightly younger (30 vs. 33 years), more likely to be married/common-law, speak English, mainly work on the street rather than a bar, and have been a sex worker for a longer duration. In contrast, compared to other FSWs, FSW-IDUs were less likely to have had children, live in their own home, and reported living with fewer people (Table 1).

In terms of social influence, FSW-IDUs were more likely to report having a steady partner who was also an IDU and fellow FSWs who injected drugs, but were no more likely to report having a pimp or to have clients who used drugs compared to non-IDUs. Compared to other FSWs, FSW-IDUs had greater numbers of clients, and were paid significantly less for sex with a condom. There was no significant difference between FSWs and FSW-IDUs for average amount earned for sex without a condom, or in the median difference earned for vaginal sex with and without a condom (Table 1).

In terms of risk behaviors, the groups did not differ in terms of the proportions who had vaginal sex without a condom, although FSW-IDUs were marginally less likely to use a condom for anal sex. FSW-IDUs were less likely to use alcohol before or during sex, but were more likely to use illicit drugs in these situations. FSW-IDUs were also more likely than other FSWs to report at least one IDU sex partner in the last month and have male clients that currently use or inject drugs (Table 1).

Compared to other FSWs, FSW-IDUs were more likely to have an STI at baseline including HIV, syphilis, Chlamydia, and gonorrhea. HIV prevalence was 12.3% among FSW-IDUs, relative to 5.1% among other FSWs. Overall, 44.7% of FSW-IDU had at least one of these STIs, compared to 24.4% among other FSW ($p<0.01$) (Table 1).

We examined correlates associated with being an FSW-IDU in univariate logistic regression models. A generally risky pattern emerged. FSW-IDU were more likely to describe oneself as a street worker (OR=5.05, 95% CI 3.00-8.51), be married/common-law (OR=2.35, 95% CI 1.56-3.55), and live in Tijuana as opposed to Ciudad Juarez (OR=1.98, 95% CI 1.30-2.99). The odds of being an FSW-IDU were lower for those who lived in their own home and those who worked mainly in a bar. Sex workers whose steady partner was an IDU (OR=12.19, 95% CI 6.24-23.79) and who reported that most fellow FSWs were IDUs were more likely to be FSW-IDUs (OR=1.80, 95% CI 1.50-2.16). Sex workers who often or always used drugs before sex and those who had more clients with whom they had unprotected vaginal sex acts were much more likely to be FSW-IDUs. Finally, FSW-IDUs were more likely to be HIV positive (OR=2.63, 95% CI 1.38-4.99) and to test positive for at least one STI (Table 2).

In the final multivariate model, a number of factors were independently associated with recent injection drug use within this FSW population. After controlling for site and all other factors, FSW-IDUs were more likely to describe themselves as a street worker (OR=3.85), speak English (OR=2.79), be married/common law (OR=2.01), have worked in the sex trade for more than four years (OR=2.12), to have lived for a longer duration in the study location and to report that some of their fellow sex workers were IDUs (OR=2.42) (Table 3). In contrast to other FSWs, those who injected drugs were younger, less likely to live in their own home, and

less likely to have had children. They were also less likely to live and work in the same location, and were more likely to have been paid less than \$30 US on average for sex with a condom.

Variables that did not retain significance at the 5% level in the multivariate model included being born in the state where they now live, education level, total number of people they live with, mainly working in a bar, whether their steady partner was an IDU, having at least one IDU sex partner in the last month, having male clients who currently use drugs or have injected drugs, median number of clients in the last six months, number of unprotected vaginal sex acts with clients in the last six months, often or always having protected anal sex, and often or always using alcohol before vaginal sex.

Repeating the analysis to compare FSWs who ever injected drugs to those who had never injected yielded similar findings (results not shown).

4. Discussion

This study of FSWs in two Mexican-U.S. border cities found that those who recently injected drugs presented with a markedly different and higher risk profile of sociodemographic and sexual risk behaviors relative to other FSWs. This may help explain why nearly half of FSW-IDUs tested positive for one of four STIs, including HIV. Overall, more than one sixth of the study sample reported ever injecting drugs, with higher proportions of FSW-IDUs in Tijuana, compared to Cd. Juarez. Although reports vary widely, international literature suggests that 21-80% of female IDUs report ever trading sex for money or drugs (Spittal et al., 2003, Lowndes et al., 2003, Latkin et al., 2003, Kozlov et al., 2006, Benotsch et al., 2004) and 9%-82% of FSWs have ever injected drugs (McMahon et al., 2006, Ward et al., 1993, Vandenhoeck et al., 1989, Deren et al., 1997; A. Valdez, personal communication, 2006). Overlap between FSW and IDU populations is especially high in parts of Asia (Agarwal et al., 1999, Choi et al., 2006, Chen et al., 2005), Russia (Karapetyan et al., 2002, Platt et al., 2007), and Argentina (Sosa-Estani et al., 2003), and is a growing concern elsewhere in South America (Bautista et al., 2006).

HIV prevalence among FSW-IDUs was more than twice that of FSWs who did not inject drugs (12% vs. 5%). This suggests that the window of opportunity for HIV prevention is closing rapidly in these cities, since IDU-associated HIV epidemics are often explosive and quickly become generalized (Strathdee et al., 1998, Aceijas et al., 2004). The high prevalence of syphilis titers consistent with active infection is worrisome, because untreated syphilis can cause debilitating illness and congenital blindness. Syphilis, gonorrhea and Chlamydia can also lead to infertility and are known cofactors of HIV transmission (Laga et al., 1993). The states of Baja California and Chihuahua have the highest rates of adult and congenital syphilis among Mexico's 32 states (CENSIDA, 2006). Although cases of active syphilis, gonorrhea and Chlamydia are eligible for free treatment under Mexico Ministry of Health guidelines regardless of health insurance status, the tendency to rely on a passive system for treatment, rather than an active system involving contact tracing and partner notification, may contribute to these elevated infection rates.

In terms of sociodemographic characteristics, FSW-IDUs were more likely to live in Tijuana than Cd. Juarez, were younger, more likely to speak English and less likely to have had children or live in their own home. The fact that FSW-IDUs were more likely to speak English may reflect the tendency for Mexicans who are more acculturated to a North American lifestyle, to have higher rates of drug use (Grant et al., 2004). The higher proportion of FSWs who reported injection drug use in Tijuana is consistent with the fact that Baja California has historically had the highest prevalence of substance abuse across Mexico (Magis-Rodríguez et al., 2002, Secretaría de Salud, 2002).

We observed that FSWs who injected drugs tended to have social networks that may perpetuate their drug use. FSW-IDUs were more than twice as likely to report that most of the sex workers they knew injected drugs, which could suggest a group dynamic through which women buy and use drugs together. Although studies on female drug users in Mexico are sparse, a study of young female IDUs in Baltimore suggested that women initiated other women to inject drugs (Doherty et al., 2000). FSW-IDUs were also twice as likely as other FSWs to be married or live in a common-law relationship. A qualitative study among male and female IDUs in Tijuana and Cd. Juarez found that female IDUs often used drugs within the context of a sexual relationship with a drug using male partner (Cruz et al., 2007). International literature suggests that female IDUs tend to have greater overlap in their sexual and drug use networks relative to males (Latkin et al., 2003, Sherman and Latkin, 2001, Cruz et al., 2007), which can contribute to being “second on the needle” (Cruz et al., 2007, Harvey et al., 1998). In a study of Hispana female IDUs on the U.S. side of the U.S.-Mexico border, Andrade and Estrada highlight the importance of sociocultural and gender norms to be taken into account when considering their vulnerabilities (Andrade and Estrada, 2003). The extent to which network and sociocultural influences may interact with needle sharing or sexual behaviors require further study.

In general, we observed a riskier pattern of sexual behaviors among FSW-IDUs compared to other FSWs in these cities. FSW-IDUs were marginally more likely to have unprotected anal sex with clients compared to other FSWs, although this association did not persist after adjusting for other confounders. FSW-IDUs were almost seven times more likely to use illicit drugs before sex than other FSWs. This is troubling because sex work conducted under the influence of drugs has been associated with lower rates of condom use in other settings (Plant et al., 1989, Paone et al., 1999, de Graaf et al., 1995). In a study conducted in the United Kingdom (Gossop et al., 1995), FSWs' drug use was associated with having unprotected sex with clients in exchange for more money, which is not surprising since women suffering from withdrawal symptoms may be more likely to acquiesce to demands for unsafe sex to support their drug habit. On average, we found that FSW-IDUs earned less money for sex with and without condoms than other FSWs, which in turn may lead them to have greater numbers of clients and/or more unprotected sex.

This study was limited because we lacked a number of unmeasured contextual variables (e.g., relating to recruitment venue and study site) that may differ between FSW-IDUs and FSW non-IDUs. We were also lacking information on the context of sexual behaviors with clients, particularly the extent to which they exchanged sex for drugs rather than money, which has been reported elsewhere (Edlin et al., 1994, Sterk, 1998, Inciardi, 1995, McMahon et al., 2006). However, nearly half of all the FSWs in our study reported that their clients used drugs and one fifth reported sharing needles with clients. These circumstances may predispose FSWs to using drugs during sex, and could contribute to their difficulties negotiating safer sex.

Since women were recruited through convenience sampling and higher risk women were selected for the purposes of testing an intervention study, our findings may not reflect the experience of FSWs who consistently use condoms with clients. Future studies using respondent driven sampling would improve upon these estimates (Heckathorn, 2002). Finally, small cell sizes precluded us from comparing ever, never and former injectors using ordinal regression. However, results were similar in a re-analysis comparing FSWs who ever versus never injected.

Although simple models implicating sex work in HIV epidemics are inappropriate (Ward and Aral, 2006), our analysis suggests that FSW-IDUs in Tijuana and Cd. Juarez meet criteria for ‘bridge’ populations that can lead to generalized HIV epidemics (Benotsch et al., 2004, Platt et al., 2007, Nguyen et al., 2004). This could occur through two potential transmission routes: unprotected sex and/or needle sharing with intimate partners, clients, and peers. Since the HIV

epidemic in Mexico is at an early stage, identifying subgroups with higher infection rates that can act as bridge populations are of great importance, especially in this resource-limited setting. The overlap between FSW and IDU populations in northern Mexico—as in many other low and middle income countries—suggests that interventions that focus only on safer sex or safer injection will be of limited effectiveness in curtailing these HIV epidemics. Further studies are needed to characterize the circumstances through which these risk behaviors occur in order to develop culturally appropriate interventions.

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Table 1
Characteristics of IDU and Non-IDU FSWs in Tijuana and Cd. Juarez

	TOTAL (N=924)	FSW-IDU (N=114)	FSWs Non-IDU (N=810)	p-value
Baseline Characteristics				
Median age (IQR) *	32 (26-39)	30 (26,35)	33 (26,40)	<0.01
Speaks English	181 (19.7%)	44 (38.9%)	137 (17.0%)	<0.01
Born in the state where now live	359 (39.0%)	61 (54.0%)	298 (36.9%)	<0.01
Highest year of school completed (IQR)	6 (4,8)	6 (5,9)	6 (4,8)	0.08
Total number of people lived with (IQR)	2 (1,4)	1 (0,2)	2 (1,4)	<0.01
Married/common-law	22 (24.2%)	45 (39.8%)	177 (22.0%)	<0.01
Years in sex work (IQR)	4 (2, 10)	5 (3, 10)	4 (2,10)	0.01
Had children	862 (93.7%)	100 (88.5%)	762 (94.4%)	0.02
Described self as street worker	512 (55.4%)	96 (84.2%)	416 (51.4%)	<0.01
Live in own home	213 (23.1%)	11 (9.6%)	202 (25.0%)	<0.01
Live in Tijuana (vs. Cd. Juarez)	474 (51.3%)	75 (65.8%)	399 (49.3%)	<.01
Years lived in study location	13 (6,26)	17 (8,27)	12 (5,25)	0.02
Lived and worked in same location	137 (14.9%)	10 (8.8%)	127 (15.7%)	0.05
Social Influences				
Reported having a pimp	25 (2.7%)	5 (4.4%)	20 (2.5%)	0.22
Steady partner was an IDU	82 (28.0%)	41 (71.9%)	41 (17.4%)	<0.01
Median # Clients (last 6 months)	240 (93-480)	300 (120-672)	240 (84-480)	0.01
Earned ≤ \$30 US on average for vaginal sex with a condom	687 (75.5%)	96 (85.7%)	591 (74.1%)	0.01
Earned ≤ \$30 US on average for vaginal sex without a condom	38 (42.1%)	44 (38.6%)	344 (42.6%)	0.48
Median difference earned for vaginal sex without versus with a condom	10 (0,20)	10 (1,20)	10 (0,20)	1.0
Fellow FSWs injected drugs	390 (42.4%)	77 (68.1%)	313 (38.8%)	<0.01
Main workplace was a bar	325 (35.2%)	14 (12.3%)	311 (38.4%)	<0.01
Risk Behaviors				
# unprotected vaginal sex acts with clients (last mo) > 12	411 (46.1%)	61 (55.5%)	350 (44.8%)	0.04
Often/always used condoms for anal sex with clients	79 (30.0%)	8 (18.2%)	71 (32.4%)	0.07
Often/always used condoms for vaginal sex with clients	399 (43.3%)	44 (38.6%)	355 (43.9%)	0.31
Often/always used alcohol before/during vaginal sex	207 (22.4%)	11 (11.4%)	194 (24.0%)	<0.01
Often/always used drugs before/during vaginal sex	131 (14.2%)	54 (47.4%)	77 (9.5%)	<0.01
Had at least one IDU sex partner last month	194 (21.4%)	46 (41.8%)	148 (18.6%)	<.01
Fellow sex workers used drugs/alcohol with their clients	828 (90.0%)	105 (92.9%)	723 (89.6%)	.32
Had male clients who currently use drugs	676 (73.2%)	94 (82.5%)	582 (71.9%)	.02
Had male clients who have injected drugs	292 (31.7%)	57 (50.0%)	235 (29.1%)	<.01
Smoked Marijuana/Hash last month	173 (18.7%)	48 (42.1%)	125 (15.4%)	<.01
Non-injection use of any heroin last month	35 (3.8%)	13 (11.4%)	22 (2.7%)	<.01
Non-injection use of any cocaine last month	163 (17.6%)	25 (21.9%)	138 (17.0%)	0.24
Non-injection use of any methamphetamine last month	189 (20.5%)	56 (49.1%)	133 (16.4%)	<.01
Number of drinks of alcohol you had on a typical day (IQR)	5 (0, 10)	0 (0,5)	6 (1,12)	<0.01
HIV and STI Test Results				
HIV-positive	55 (6.0%)	14 (12.3%)	41 (5.1%)	<0.01
Syphilis titer ≥1:8	130 (14.2%)	25 (22.7%)	105 (13.1%)	<0.01
Gonorrhea	51 (6.4%)	15 (15.2%)	36 (5.2%)	<0.01

	TOTAL (N=924)	FSW-IDU (N=114)	FSWs Non-IDU (N=810)	p-value
Chlamydia	104 (13.0%)	21 (21.2%)	83 (11.9%)	0.01
Any infectious STI	249 (26.9%)	51 (44.7%)	198 (24.4%)	<0.01

*
IQR=Inter-quartile Range

Table 2
Factors Associated with Recent Injection Drug Use among FSWs in Tijuana and Cd. Juarez

	Odds Ratio	95% Confidence Interval
Baseline Characteristics		
Age (per year increase)	0.96	0.94–0.99
Speaks English	3.12	2.05–4.75
Born in the state where they now live	2.00	1.35–2.98
Highest year of school completed (per year increase)	1.06	0.99–1.13
Total number of people lived with (per person increase)	0.78	0.69–0.87
Married/common-law	2.35	1.56–3.55
Worked in the sex trade for more than 4 years	1.87	1.25–2.81
Has children	0.45	0.24–0.87
Described self as a street worker	5.05	3.00–8.51
Lived in own home	0.32	0.17–0.61
Lived in Tijuana (vs. Cd. Juarez)	1.98	1.3–2.99
Years Lived in Study Location	1.01	1.00–1.03
Lived and worked in same location	0.52	0.26–1.01
Social Influences		
Reported having a pimp	1.81	0.67–4.93
Steady partner was an IDU	12.19	6.24–23.79
# of clients (Last 6 months) (per 10 fold increase)	1.57	1.10–2.23
Earned ≤ \$30 US on average for vaginal sex with a condom	2.10	1.21–3.65
Earned ≤ \$30 US on average for vaginal sex without a condom	1.18	0.79–1.76
Difference earned for vaginal sex without versus with a condom (per \$10 increase)	0.94	0.87–1.01
Fellow FSWs injected drugs	1.80	1.50–2.16
Main workplace was a bar	0.22	0.13–0.40
Risk Behaviors		
Total number of unprotected vaginal sex acts > 12	1.53	1.03–2.29
Often/always used condoms for anal sex with clients	0.46	0.20–1.05
Often/always used condoms for vaginal sex with clients	0.80	0.54–1.20
Often/always used alcohol before/during vaginal sex	0.41	0.22–0.74
Often/always used drugs before/during vaginal sex	8.53	5.52–13.20
Had at least one IDU sex partner last month	3.15	2.07–4.79
Fellow sex workers used drugs/alcohol with their clients	1.52	0.72–3.24
Had male clients who currently use drugs	1.84	1.11–3.06
Had male clients who have injected drugs	2.43	1.64–3.62
HIV and STI Test Results		
HIV-positive	2.63	1.38–4.99
Syphilis titer ≥1:8	1.96	1.20–3.20
Chlamydia	2.00	1.17–3.41
Gonorrhea	3.29	1.73–6.26
Any infectious STI	2.50	1.67–3.74

Table 3
Factors Independently Associated with Recent Injection Drug Use among FSWs in Tijuana and Cd. Juarez

	Adjusted Odds Ratio	95% Confidence Interval
Age (per year increase)	0.92	0.89–0.96
Speaks English	2.79	1.61–4.86
Married/Common law	2.01	1.21–3.35
Worked in the sex trade for more than 4 years	2.12	1.22–3.68
Has children	0.40	0.17–0.96
Described self as a street worker	3.85	2.05–7.25
Lived in own house	0.30	0.13–0.69
Lived in Tijuana (vs. Cd. Juarez)	4.15	2.31–7.47
Years lived in study location	1.05	1.02–1.07
Lived and worked in the same location	0.42	0.18–0.94
Earned $\leq$ \$30 US on average for vaginal sex with a condom	3.50	1.62–7.53
Often/always used drugs before/during vaginal sex	6.88	3.97–11.91
Fellow FSWs injected drugs	2.42	1.42–4.12