Predictors of Injection Cessation and Relapse among Female Sex Workers who Inject Drugs in Two Mexican-US Border Cities

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ABSTRACT We know little about predictors of injection drug cessation and relapse among female sex workers who inject drugs (FSW-PWID) at the US-Mexico border. Among HIV-negative FSW-PWID taking part in a behavioral intervention study in Tijuana and Ciudad Juárez, Cox regression was used to identify predictors of time to first cessation of injection, which was defined as reporting not having injected drugs for a period of 4 months or longer, and among that subset, we examined predictors of time to injection relapse. Among 440 women, 84 (19 %) reported ceasing injection during follow-up (median time to cessation = 9.3 months); of these, 30 (35 %) reported relapse to injection (median time to relapse = 3.5 months). The rate of injection cessation was lower for women reporting trading sex prior to age 18 (adj. hazard ratio (HR) = 0.64, 95 % confidence interval (CI) = 0.41–1.01), ever being sexually abused (adj. HR = 0.44, 95 % CI = 0.27–0.71), and a higher number of vaginal sex acts with casual clients (adj. HR = 0.99 per transaction, 95 % CI = 0.98–1.00). The rate of cessation was higher for women who spent more hours on the streets on a typical day (adj. HR = 1.04/h, 95 % CI = 1.01–1.08) and who lived in Tijuana vs. Ciudad Juárez (adj. HR = 2.15, 95 % CI = 1.14–4.07). The rate of relapse was higher among women reporting regular drug use with clients (adj. HR = 2.17, 95 % CI = 0.96–4.89) and those scoring higher on a risk injection index (adj. HR = 2.04, 95 % CI = 1.15–3.61). The rate of relapse was lower for FSW-PWID with higher than average incomes (adj. HR = 0.40, 95 % CI = 0.18–0.89). These findings have important implications for the scale-up of methadone maintenance treatment programs (MMTPs) in Mexico and indicate a need for gender-specific programs that address sexual abuse experiences and economic vulnerabilities faced by FSW-PWID.

KEYWORDS Injection drug use, Cessation, Relapse, Female sex work, Methadone maintenance, Treatment, Mexico

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BACKGROUND

Tijuana, adjacent to San Diego, CA, and Ciudad Juárez, abutting El Paso, TX, are located on major drug trafficking routes; the number of people who inject drugs (PWID) living in these cities is estimated at 10,000 and 6000, respectively.¹ In both cities, sex work is quasi-legal, with an estimated 9000 female sex workers (FSW) in Tijuana and 4000 FSW in Ciudad Juárez,² which attracts large numbers of clients from the USA and elsewhere. Since the communities where sex work is tolerated overlap those with heavy drug use, a significant proportion of FSW inject drugs; in Tijuana and Ciudad Juárez, about 18 % of FSW report ever injecting drugs.³

The connection between injection drug use and sex work is important for understanding women's health because injection drug use may precipitate entry into sex work, sex work can predispose women to initiation of injection drug use,⁴ and because some FSW report that they use drugs to stay awake while working or to emotionally cope with sex work.^{3, 5} FSW who are drug-dependent or inebriated may have greater difficulty negotiating condom use or safer injection, and experiencing drug withdrawal symptoms can lead FSW to agree to clients' demands for unprotected sex.⁶ As a result, HIV prevalence among FSW who inject drugs (FSW-PWID) was 12 % compared to 5 % among other FSW in these two cities.³ Given the risks of HIV associated with injection drug use and sex work and the considerable social, economic, and medical consequences, there is a need to assess strategies that encourage or support cessation of injection as a primary goal of harm reduction for FSW-PWID.

Previous studies of injection drug cessation tend to focus on treatment-based, rather than community samples, and have been concentrated in high-income countries.^{7, 8} This research has also focused more frequently on male drug users.^{9, 10} These studies show that younger age, stable housing, employment, HIV seropositivity, abstinence from alcohol, having a lower frequency of injecting, and not having a PWID sex partner are all predictive of cessation of injection drug use.^{7, 8, 11-14} Aside from these factors, having depressive symptoms, a history of incarceration or involvement in illicit or marginal activities, such as sex work, or having a partner involved in illegal activities lowers the likelihood of stopping injection drug use.^{7, 10, 11, 15, 16} Some of these characteristics also predict relapse: younger age, homelessness, HIV seropositivity, use of alcohol, and sexual abstinence are associated with a shorter time to injection relapse.^{7, 8} Importantly, participation in methadone maintenance, detoxification, or drug treatment programs are key predictors of cessation.^{7, 8} Methadone maintenance treatment programs (MMTPs) and other opioid substitution therapies are one of the most effective treatment options available for opioid dependence, reducing drug use and drug-related morbidity and mortality.^{17, 18}

Given the different policy, social, and economic contexts of injection in low- and middle-income countries (LMICs), and the gendered dynamics of injection-related risks, there is a need for research on factors that support injection cessation attempts for female drug injectors in diverse settings. We identified predictors of injection cessation and relapse among FSW-PWID in Tijuana and Cd. Juárez.

METHODS

Participants in this study were HIV-negative FSW-PWID taking part in a behavioral intervention study, which has been described previously, aimed at promoting safer

sex in the context of drug use and safer injection behaviors.^{19, 20} The study compared four brief, single-session conditions combining either an interactive social cognitive theory-based intervention using motivational interviewing techniques or a didactic version of a sexual risk intervention to promote safer sex in the context of drug use, and an injection risk intervention to reduce sharing of needles/injection paraphernalia.²⁰ From October 2008 to 2009, outreach workers recruited 584 FSW-PWID from venues frequented by FSW and PWID (e.g., motels, brothels, shooting galleries, bars, street corners). Interested participants were then referred to the project office or a mobile unit for eligibility screening. Eligibility criteria were as follows: aged 18 years or older, reported injecting drugs and sharing injection equipment within the last month, trading sex and having unprotected sex with clients within the last month, living in Tijuana or Ciudad Juárez, and testing HIV-negative at baseline, since HIV seroconversion was a study endpoint. Women underwent quarterly interviewer-administered surveys and testing for HIV and four STIs (syphilis, gonorrhea, chlamydia, and trichomonas) over 12 months of follow-up. Follow-up rates were 89.6 % at 4-month, 87.7 % at 8-month, and 87.1 % at 12-month visits.

Measures

For the purpose of this analysis, we defined injection cessation as not having injected drugs for a period of at least 4 months. An “injection risk score” was calculated using an index developed for the Drug User’s Intervention Trial that creates an average score between responses based on a variety of injection risk indicators (e.g., sharing of needles and other injection paraphernalia), with higher scores representing higher risk.²¹ We also calculated a “drug activity score” that reflects the extent to which a participant was engaged in the drug trade. This measure, which was influenced by Sherman and Latkin’s work on drug users’ involvement in the Baltimore drug economy,²² was created by taking a count of the number of drug-related activities in the past 6 months that the participant was involved in, ranging from zero to seven. Activities included selling or running drugs, packaging drugs, producing/preparing drugs, transporting drugs, acting as a lookout, acting as a hit doctor, or operating a shooting gallery. A variety of other variables were also included as possible predictors of cessation or relapse, including sex work-related experiences, drug use patterns, experiences of violence, and past participation in a detoxification program or other drug treatment program. Age, income, marital status, housing stability, and years of education were explored as potential confounders.

Predictors were measured at baseline and referred to lifetime experiences or behaviors that occurred in the 1 month prior to the baseline interview, allowing us to ensure that behaviors preceded injection cessation. The functional form of each covariate in the bivariate and multivariable models was assessed by plotting the cumulative martingale residuals against the values of the covariate in question²³ and by the Kolmogorov-type supremum^{24, 25} test based on a sample of 1500 simulated residual patterns.

Statistical Analyses

Cox regression was used to identify predictors of time to first cessation of injection. Among the subset of women who reported injection cessation, Cox regression was then used to identify predictors of time to injection relapse. Covariates with statistical significance at $p \leq 0.10$ in the univariate models were considered for entry

in the multivariate models. A manual selection process that took into consideration multicollinearity between the predictors was used to determine variables included in the multivariate models. Intervention assignment was controlled for in all multivariate models. Other potential covariates considered were location, age, income, and years of education; however, only those variables that maintained their significance level of $p \leq 0.05$ were retained in the final models.

The proportional hazards assumption for the Cox models was assessed by plotting log (cumulative hazard function) against log (time). Additionally, we examined the interaction terms between each predictor in the model and time. The p values yielded by the Chi-square tests associated with these terms were not significant, indicating that the proportional odds assumptions were not violated. Akaike information criterion (AIC) and the Bayesian information criterion (BIC) were used to compare non-nested models. In the multivariate models, multicollinearity was assessed by examining variance inflation factors and the largest condition indexes. Data was analyzed using SAS Software Version 9.4.²⁶

RESULTS

Of 584 FSW-PWID recruited into the intervention study, 440 women (75 %) were eligible for this analysis (222 in Tijuana and 218 in Ciudad Juárez) because they had complete follow-up data (i.e., baseline and three follow-up interviews). The median age was 33 [inter-quartile range (IQR)=27–41], and median age at first injection and first engagement in sex work were 20 and 19 years, respectively (IQRs=17–25 and 16–25). Although 53 % had ever had some form of drug abuse treatment, only 12 % had ever been enrolled in an MMTP. As shown in Fig. 1, of the 440 women, 84 (19 %) reported ceasing injection during follow-up (median time to cessation=9.3 months), and of these, 30 (35 %) reported relapse to injection during follow-up (median time to relapse=3.5 months). Although numerous variables were explored as potential confounders, we found no association between housing stability and cessation or relapse in univariate models, so this variable was dropped from the analysis.

Predictors of Injection Cessation

In univariate models (Table 1), a range of factors related to sociodemographic characteristics, drug use practices, and sex work experiences were predictive of injection cessation. A *higher rate of* injection cessation, which is indicated by a higher hazard ratio, was associated with working in Tijuana (vs. Ciudad Juárez), older age, having had more years of education, using methamphetamine, and having a higher drug activity score. Sex work experiences associated with a higher rate of cessation included spending more time on the streets per day, often/always injecting drugs with clients, earning more per sex transaction, and having to pay a manager or pimp. Factors associated with a *lower rate of* injection cessation included having a spouse or steady partner, having a greater number of people reliant on them for financial support, first injecting before age 18, trading sex before age 18, and ever being raped or physically abused. Additionally, women who injected drugs more frequently, those who injected with a sexual partner or other sex worker, injected cocaine, or those who reported more sexual transactions with casual clients had a lower rate of injection cessation. Having ever been in a detoxification program and having ever had an HIV test were also predictive of a lower rate of cessation in the bivariate analysis.

FIG. 1 Longitudinal patterns of drug injection and cessation behavior among FSW-PWID in the Mujer Mas Segura intervention study.

In adjusted multivariate Cox models (Table 1), the rate of injection cessation was *lower* for women who reported: first trading sex prior to age 18 (adj. hazard ratio (HR)=0.64, 95 % confidence interval (CI)=0.41–1.01), ever being sexually abused (adj. HR=0.44, 95 % CI=0.27–0.71), and reporting a higher number of vaginal sex acts with casual clients (adj. HR=0.99 per transaction, 95 % CI=0.98–1.00). The rate of injection cessation was *higher* for women in Tijuana vs. Ciudad Juárez (adj. HR=2.15, 95 % CI=1.14–4.07) and those spending more hours on the street on a typical day (adj. HR=1.04/h, 95 % CI=1.01–1.08).

Predictors of Relapse to Injection

In univariate models (Table 2), the rate of injection relapse was higher among FSW-PWID reporting that they shared needles half the time or more, those with higher risk injection scores, and those regularly using drugs with clients. The rate of relapse was lower for those who reported earning higher than average incomes, earning more for having unprotected sex, and those who had ever reported undergoing detoxification.

In adjusted multivariate models (Table 2), women reporting that they regularly used drugs with clients (adj. HR=2.17, 95 % CI=0.96–4.89) and those with higher risk injection behaviors (adj. HR=2.04, 95 % CI=1.15–3.61) had higher rates of relapse. Risk for relapse was *lower* for FSW-PWID reporting higher than average incomes (≥3500 pesos/month) (adj. HR=0.40, 95 % CI=0.18–0.89). Neither

TABLE 1 Cox proportional hazard analyses of factors associated with time to injection cessation among female sex workers who inject drugs ($n = 440$) in Tijuana and Ciudad Juárez, Mexico

Predictor	Unadjusted hazard ratio	95 % CI	Adjusted hazard ratio	95 % CI
Interview location (Tijuana vs. Ciudad Juárez)	4.09	(2.39–6.97)	2.15	(1.14–4.07)
Age (per additional year)	1.02	(1.00–1.05)		
Years of education completed (per additional year)	1.07	(1.00–1.14)		
Has a spouse or steady partner (yes vs. no)	0.63	(0.40–1.00)		
On average, past year earned ≥ 3500 pesos/month (yes vs. no)	0.55	(0.35–0.87)		
Living with children under 18 (yes vs. no)	1.08	(0.69–1.67)		
Number of people depending on the participant for financial support (per additional person)	0.82	(0.70–0.96)		
Number of hours spent on the street, on a typical day (per additional hour)	1.05	(1.02–1.09)	1.04	(1.01–1.08)
Age when first injected drugs (per additional year)	1.05	(1.03–1.07)		
Ever physically abused (yes vs. no)	0.43	(0.27–0.69)		
Ever raped (yes vs. no)	0.38	(0.24–0.61)	0.44	(0.27–0.71)
First traded sex <18 years of age (yes vs. no)	0.60	(0.38–0.93)	0.64	(0.41–1.01)
Number of male clients* (per additional client)	0.99	(0.98–1.00)		
Number of times had vaginal sex with non-regular client* (per additional time)	0.98	(0.98–0.99)	0.99	(0.98–1.00)
Number of times had unprotected vaginal sex with non-regular client* (per additional one time)	0.98	(0.97–0.99)		
Dollar amount earned per sex act with condom, on average (per additional USD)	1.01	(1.00–1.01)		
Currently pays someone like a manager or pimp (yes vs. no)	2.09	(1.05–4.12)		
First injected <18 years of age (yes vs. no)	0.53	(0.31–0.90)		
Drug activity score (per one unit increase in score)	1.45	(1.18–1.79)		
Injection risk index (per one unit increase in score)	1.09	(0.88–1.35)		
Injected at least 2–3 days per week* (yes vs. no)	0.26	(0.07–0.92)		
Injected any cocaine (alone or in combination)* (yes vs. no)	0.27	(0.14–0.52)		
Used methamphetamine (alone or in combination)* (yes vs. no)	2.04	(1.32–3.16)		

TABLE 1 *Continued*

Predictor	Unadjusted hazard ratio	95 % CI	Adjusted hazard ratio	95 % CI
Injected drugs with sexual partner* (yes vs. no)	0.28	(0.09–0.88)		
Injected drugs with other sex workers* (yes vs. no)	0.51	(0.27–0.97)		
Often/always injected drugs with a client* (yes vs. no)	2.03	(1.32–3.13)		
Ever enrolled in detoxification program (yes vs. no)	0.41	(0.22–0.76)		
Number of times received treatment for a drug-related problem (per additional time)	0.94	(0.83–1.06)		
Ever had an HIV test (yes vs. no)	0.55	(0.36–0.84)		
Received active injection intervention (yes vs. no)	0.90	(0.59–1.38)	0.79	(0.51–1.22)

*Measured at baseline, referring to 1 month prior to baseline

intervention assignment nor MMTP participation was associated with cessation or relapse in the multivariate models.

DISCUSSION

This study found that both sex work- and drug-related factors independently predicted cessation of injection drug use and injection relapse among FSW-PWID in two Mexican-US border cities. Although one fifth of FSW-PWID reported an injection cessation attempt over a 1-year follow-up period, of those who stopped injecting for at least 4 months, approximately one third re-initiated injection drug use. Our findings suggest that FSW-PWID face unique structural barriers related to both sex work and drug use that necessitate additional efforts to support their attempts to stop injecting drugs.

Numerous studies show that individuals who participate in sex work are less likely to be able to stop injecting drugs and more likely to relapse;^{10, 27} however, these studies did not specifically examine sex worker populations and failed to elucidate how characteristics of sex work and its intersection with drug use may be driving these relationships. They also do not represent women’s experiences of injection drug use and cessation in LMICs. In this study, we found that sex work-related characteristics played an important part in women’s ability to cease injection drug use and their ability to maintain cessation. For instance, women who reported a higher number of sexual acts with casual clients had a lower rate of injection cessation and that women who regularly used drugs with clients were more likely to relapse after a period of cessation. It may be that these women rely on drugs to deal with the difficulties associated with sex work and are therefore less able to discontinue drug use, which is consistent with other studies by our group.^{3, 5} We also found that women who spent more time on the street per day had a shorter time to drug cessation, which was unexpected. It is possible that these women were more likely to come into contact with *promotoras* (outreach workers) who referred them

TABLE 2 Cox proportional hazard analyses of factors associated with time to injection relapse following cessation among female sex workers who inject drugs (n = 440) in Tijuana and Ciudad Juárez, Mexico

Predictor	Unadjusted hazard ratio	95 % CI	Adjusted hazard ratio	95 % CI
Interview location (Tijuana vs. Ciudad Juárez)	1.33	(0.62–2.87)		
Age (per additional year)	1.00	(0.96–1.05)		
Years of education completed (per additional year)	0.98	(0.89–1.08)		
Has a spouse or steady partner (yes vs. no)	0.77	(0.34–1.73)		
On average, past year earned ≥3500 pesos/month (yes vs. no)	0.43	(0.20–0.93)	0.40	(0.18–0.89)
Living with children under 18 (yes vs. no)	0.56	(0.25–1.26)		
Number of people depending on them for financial support (per additional person)	0.90	(0.63–1.27)		
Number of hours spent on the street, on a typical day (per additional hour)	1.04	(0.98–1.11)		
Age when first injected drugs (per additional year)	0.99	(0.94–1.04)		
Ever physically abused (yes vs. no)	0.72	(0.33–1.58)		
Ever raped (yes vs. no)	1.20	(0.57–2.53)		
First traded sex <18 years of age (yes vs. no)	0.79	(0.34–1.81)		
Number of male clients* (per additional client)	0.99	(0.98–1.00)		
Number of times had vaginal sex with non-regular client* (per additional time)	0.99	(0.98–1.00)		
Number of times had unprotected vaginal sex with non-regular client* (per additional time)	1.00	(0.98–1.01)		
Dollar amount earned per sex act with condom, on average (per additional US\$)	0.99	(0.96–1.02)		
Earns more for unprotected sex (yes vs. no)	0.31	(0.14–0.67)		
Currently pays someone like a manager or pimp (yes vs. no)	0.77	(0.17–3.47)		
Years of injecting	1.01	(0.98–1.04)	0.98	(0.95–1.01)
Drug activity score (per one unit increase)	0.94	(0.62–1.41)		
Injection Risk Index (per one unit increase)	1.95	(1.23–3.11)	2.04	(1.15–3.61)
Engaged in receptive needle sharing half the time or more often* (yes vs. no)	2.37	(1.04–5.40)		
Injected any cocaine (alone or in combination)* (yes vs. no)	1.35	(0.32–5.67)		

TABLE 2 *Continued*

Predictor	Unadjusted hazard ratio	95 % CI	Adjusted hazard ratio	95 % CI
Used methamphetamine (alone or in combination)* (yes vs. no)	1.76	(0.85–3.64)		
Injected drugs with sexual partner* (yes vs. no)	0.57	(0.12–2.83)		
Injected drugs with other sex workers* (yes vs. no)	0.94	(0.38–2.34)		
Often/always injected drugs with a client around* (yes vs. no)	2.01	(0.91–4.41)		
Often/always used drugs before/during sex with client* (yes vs. no)	2.17	(1.01–4.66)	2.17	(0.96–4.89)
Ever enrolled in detoxification program (yes vs. no)	0.13	(0.02–1.11)		
Number of times received treatment for a drug-related problem (per additional time)	0.98	(0.90–1.07)		
Ever had an HIV test (yes vs. no)	0.97	(0.48–1.96)		
Received the active injection intervention (yes vs. no)	0.78	(0.37–1.66)	0.67	(0.33–1.38)

*Measured at baseline, referring to 1 month prior to baseline

to treatment. Not surprisingly, women who had higher scores on the risk injection index were more likely to relapse, as these women may have been more drug-dependent.

Women who entered sex work as minors and those who reported having been sexually abused (i.e., raped) were also less able to stop injecting drugs. This is consistent with earlier work with FSW-PWID showing that experiences of abuse may underlie sex work- and drug-related vulnerabilities. In a previous study in these cities, early physical abuse accelerated both time to initiating sex work and first initiation of injection drug use, either separately or concurrently.⁴ Further, a large body of literature demonstrates that childhood sexual and physical abuse places females at a higher risk for subsequent injection drug use²⁸ and initiation into sex work,^{29–31} highlighting the importance of addressing both childhood and adult experiences of abuse when developing drug treatment programs for high-risk women. Other research indicates that drug treatment is more effective when providers address issues related to childhood and adult physical and sexual abuse.^{27, 32, 33}

Economic vulnerability also appears to be an important part of women's inability to maintain injection cessation, since women earning less money had a shorter time to relapse. Research shows that socioeconomic conditions often underlie entry into sex work and that economic vulnerability can increase HIV-related risks by reducing women's negotiating power with clients and increasing unprotected sex in exchange for more money.^{34, 35} FSW-PWID who earn less income may be more vulnerable overall and deeply entrenched in drug use. Although having a pimp or manager can also exacerbate economic vulnerabilities, previous research with primarily street-based female sex workers in Tijuana found that only 2.7 % reported having a

“pimp”³ and that these women report maintaining autonomy from men in their work,³⁶ so we do not think that this is a major factor driving this relationship. On the other hand, having a larger income was protective against relapse, suggesting that interventions targeting women’s economic needs (e.g., reducing debt or promoting savings through microfinance programs or providing vocational training) could help women to stop injecting drugs and avoid relapse.³⁷ Substance use treatment programs, such as MMTPs, that seek to engage FSW-PWID in treatment must therefore attend to the economic factors that contribute to both injection drug use and sex work.

MMTP participation was not found to be associated with either injection drug use cessation or relapse in this study. Only one in eight women in our study reported lifetime experience with MMTPs, which may have limited statistical power to detect a significant association. At the time this study was conducted, there was only one publicly funded methadone maintenance treatment program (MMTP) in Mexico, which was situated in Ciudad Juárez, and only three private methadone clinics in Tijuana. Alternatively, this finding may reflect that women most likely to receive MMTP were those with more severe substance use who are also less able to sustain drug cessation. It is also likely that available MMTPs did not include female-specific programs, which have been shown to result in more positive outcomes for drug-dependent women.^{32, 38} Further, existing MMTPs may be unable to accommodate the unique needs of women who are also engaged in sex work. For instance, the potential for economic loss as FSW-PWID take time from their jobs to regularly go for MMTP visits may be an inhibiting factor. These factors, when considered alongside the findings presented here, have salient implications for programming in Mexico.

The Mexican federal government has placed a high priority on expanding MMTPs, especially in the states of Baja California and Chihuahua, where Tijuana and Ciudad Juárez are located.³⁹ To engage high-risk women in these programs, we suggest that there is a need for gender-specific programming that supports women’s efforts to stop using or injecting drugs. Research shows that women may have sub-optimal treatment outcomes in mixed-gender treatment services and that a lack of gender-specific treatment can prevent women from entering care.^{27, 40, 41} Other barriers to women accessing treatment include stigma,⁴² having a partner who also uses drugs,⁴³ and fearing partner retaliation or violence.^{44, 45} Given the range of issues that FSW-PWID face, including higher rates of both physical and mental health problems, drug treatment programs should identify and treat women’s mental health needs, while building support structures for women in treatment.^{27, 46, 47} To mitigate barriers related to loss of income due to regular MMTP visits, alternative treatment programs, such as “take-home” doses, may also be beneficial for FSW-PWID populations who are already economically vulnerable.

Although we did not find an association between living with children under the age of 18 and either injection cessation or relapse, research from other contexts shows that family responsibilities, fear of losing custody of children, and lack of childcare during treatment can act as barriers to engagement in care and can have a negative impact on treatment outcomes.^{32, 44, 45} For FSW at the US-Mexico border, a large majority have dependent children and financial responsibilities for them has frequently been cited as a key reason for entering sex work.^{36, 48} Previous studies by our group suggest, however, that FSW-PWID are less likely to report living with their children than other FSWs,^{19, 49} perhaps because they have been apprehended

by child welfare agencies. The provision of child care and support for child custody may then be an important motivator for women to enter and stay in MMTPs or other harm reduction programs.⁵⁰ More research examining motivations for entering drug treatment among FSW-PWID in this context is needed.

Successful scale-up of MMTPs that hope to engage women who are most at risk must address the diverse challenges faced by FSW-PWID. Doing so could have synergistic effects on both drug-related morbidity and mortality and on risks associated with participation in sex work. Other research by our group with FSW-PWID shows that injection drug use is inversely associated with short-term cessation of sex work in both Tijuana and Cd. Juárez.⁵¹ This work also demonstrated that participation in drug treatment was predictive of stopping sex work.⁵¹ When combined with the findings from this study, we see that improving support for the cessation of injection drug use could have an impact beyond substance use alone. The expansion of drug treatment programs that recognize the vulnerabilities FSW-PWID face and that address injection drug use and sex work-related harms in tandem, is crucial to improving public health efforts at the US-Mexico border.

The results presented here should be interpreted with some caution. Injection drug use cessation is rare, leaving us with a small sample size. A larger sample could have resulted in a greater number of significant predictors. Additionally, 25 % of the original sample was excluded from this analysis because they missed one or more follow-up visit. This could bias our results if participants either stopped injecting drugs or if they did not attend their follow-up visit due to being more heavily involved in drug use; however, when comparing included vs. excluded participants, we found no significant difference by drug use characteristics or by reports of injection cessation during at least one follow-up visit. Lastly, because our sample was drawn from an intervention study that recruited high-risk women reporting recent unprotected sex and sharing of injection equipment, the findings may not be generalizable to other women with lower risk profiles. Despite these limitations, this study presents findings of high importance to public health efforts and policy and contributes to the broader literature on injection cessation in its unique focus on a community sample of high-risk women in LMICs. Overall, the creation of women-only drug treatment programs could be instrumental to decreasing FSW-PWID vulnerability by changing the physical and social context within which risk and treatment occur.⁵⁰

CONCLUSIONS

This study identifies factors associated with injection drug use cessation among FSW-PWID and demonstrates that these women are in great need of programs designed to address the multiple structural barriers to drug cessation that they face. In particular, programs that support injection drug use cessation should be gender-specific and account for the additional challenges posed by participation in sex work. As Mexico scales up MMT, there is an opportunity to create programs that are equipped to help FSW-PWID stop injecting drugs and, for those women who want it, to transition out of sex work. All programs, however, must be sensitive to the unique needs of FSW-PWID, accounting for both past and current experiences of physical and sexual abuse, for women's ties to their family and children, and to the economic vulnerabilities that are part of everyday life for FSW-PWID.

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