



Short-term cessation of sex work and injection drug use: Evidence from a recurrent event survival analysis



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HIGHLIGHTS

- We examined factors related to stopping sex work among female injection drug users.
- A survival analysis was applied to account for quit–re-entry patterns of sex work.
- Over half of participants stopped sex work during a 1-year period.
- Injection drug use was inversely associated with stopping sex work.
- Drug treatment and counseling combined with other supportive services are needed.

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ABSTRACT

Objective: This study quantitatively examined the prevalence and correlates of short-term sex work cessation among female sex workers who inject drugs (FSW-IDUs) and determined whether injection drug use was independently associated with cessation.

Methods: We used data from FSW-IDUs ($n = 467$) enrolled into an intervention designed to increase condom use and decrease sharing of injection equipment but was not designed to promote sex work cessation. We applied a survival analysis that accounted for quit–re-entry patterns of sex work over 1-year stratified by city, Tijuana and Ciudad Juarez, Mexico.

Results: Overall, 55% of participants stopped sex work at least once during follow-up. Controlling for other characteristics and intervention assignment, injection drug use was inversely associated with short-term sex work cessation in both cities. In Ciudad Juarez, women receiving drug treatment during follow-up had a 2-fold increase in the hazard of stopping sex work. In both cities, income from sources other than sex work, police interactions and healthcare access were independently and significantly associated with shorter-term cessation.

Conclusions: Short-term sex work cessation was significantly affected by injection drug use. Expanded drug treatment and counseling coupled with supportive services such as relapse prevention, job training, and provision of alternate employment opportunities may promote longer-term cessation among women motivated to leave the sex industry.

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1. Introduction

Female sex workers (FSWs) experience increased rates of HIV and other sexually transmitted or blood-borne infections, which is elevated among FSWs who inject drugs (FSW-IDUs) (Strathdee et al., 2008). Given the nature of their work, FSWs are likely to experience violence,

including physical and sexual abuses (Ulibarri et al., 2011; Urada et al., 2013) and isolation from health and social services (Rekart, 2005). As a result of experiences with psychological trauma, many women use substances as a coping mechanism (Ulibarri et al., 2013). For some, sex is primarily exchanged to finance a substance dependency (Ohlund & Gronbladh, 2009; Potterat, Rothenberg, Muth, Darrow, & Phillips-Plummer, 1998).

However, among women that desire to leave the sex industry, multiple barriers exist (Sanders, 2007). Studies have described a

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combination of factors including financial necessity, drug addictions, intimate relationships, having children, coercion from others, criminal records, and lack of resources as reasons to remain in sex work (Baker, Dalla, & Williamson, 2010; Cimino, 2012; Ingabire et al., 2012; Manopaiboon et al., 2003). Absent is an empirical assessment on the extent to which these factors independently predict cessation. Understanding this information may inform interventions addressing the health and social needs of women who use drugs and are attempting to leave the sex industry.

In cities situated along the Mexico–U.S. border sex work is quasi-legal. An estimated 9000 FSWs in Tijuana, Mexico (adjacent to San Diego, California) and 4000 FSWs in Ciudad Juarez, Mexico (adjacent to El Paso, Texas) operate from a mix of establishments (Patterson et al., 2008a). In Tijuana, sex work is tolerated in the city's red-light district (Curtis & Arreola, 1991), whereas Ciudad Juarez dismantled its red-light district and displaced sex workers to more hidden locations (Wright, 2004). In 2006, HIV prevalence was estimated at 6% among FSWs and 12% among FSWs that injected drugs in these two cities (Patterson et al., 2008b).

Tijuana and Ciudad Juarez are also situated along major drug trafficking routes into the United States. Both cities have experienced a rise in HIV prevalence and injection drug use (Bucardo et al., 2005) with IDUs estimated at 10,000 and 6500, respectively (Ramos et al., 2009). Mexico's growing HIV epidemic has been linked to structural conditions that increase HIV risk behaviors and other adverse outcomes among IDUs (Beletsky et al., 2013). Therefore, it is important to understand the context in which sex work and drug use are co-occurring in order to inform efforts that address sex work cessation.

Given that previous studies have primarily been qualitative with small sample sizes (Baker et al., 2010; Cimino, 2012; Ingabire et al., 2012; Manopaiboon et al., 2003), the goal of this study is to empirically examine the prevalence and correlates of stopping sex work during a one-year period among FSW-IDUs participating in an HIV prevention intervention to reduce sexual and injection risk behaviors, and determine whether injection drug use independently associates with cessation after controlling for other characteristics. Knowledge gained may aid in the development of support services promoting longer-term sex work cessation.

2. Methods

2.1. Study population

From October 2008 to 2009, outreach workers recruited 584 HIV-negative FSW-IDUs into a behavioral intervention to reduce high risk HIV-related behaviors. Briefly, women were randomized into one of four groups combining either an interactive or didactic version of an intervention to promote condom use and the reduction of injection paraphernalia sharing. The interactive intervention incorporated theory-driven skill-building elements that focused on: 1) improving one's ability to negotiate condom use within the context of her or her partner's substance use and/or 2) reduce receptive and/or distributive sharing of injection equipment. Under the didactic version, women received information on safer sex and/or safer injection in lecture-style formatted using printed materials provided from a local health center; there were no theory-driven skills-building elements under this version (see Vera et al., 2012 for a detailed description of the intervention).

Eligibility criteria included being ≥ 18 years; having unprotected vaginal or anal sex with a male client in the previous month; injecting illicit drugs and sharing injection equipment in the past month; test HIV-negative at baseline; speaking Spanish or English; no plans to move out of the city for a 12-month period; providing informed consent; and accepting free sexually transmitted infection (STI) testing and treatment. The present study includes an additional 33 participants that were HIV-positive at baseline who were randomized into an intervention group.

2.2. Data collection

Participants were administered face-to-face interviews and biological testing for HIV/STIs at baseline with 3 follow-up visits occurring approximately at 4, 8, and 12 months after enrollment. Interviews covered a range of questions, including sociodemographics, health, sexual and drug using behaviors. Follow-up rates were 89.6% at 4-month, 87.7% at 8-month, and 87.1% at 12-month visits.

Trained nurses obtained biological samples from participants at each visit. HIV status was ascertained using the "Determine"® rapid HIV antibody test (Abbott Pharmaceuticals, Boston, MA). Syphilis serology was conducted using the rapid plasma regain test (Determine™ Syphilis TP; Abbott Pharmaceuticals, Boston, MA). Positive samples were subject to confirmatory testing. *Neisseria gonorrhoea* (GC) and *Chlamydia trachomatis* (CT) were detected from vaginal swabs using a rapid test kit (BioStar® OIA® GC and CHLAMYDIA). Participants with a positive GC/CT test or symptoms were treated free on-site. The study was approved by the Institutional Review Boards at the University of California San Diego, the General Hospital in Tijuana, and the Universidad Autonoma de Ciudad Juarez.

2.3. Measures

2.3.1. Outcome

The outcome was short-term cessation of sex work, measured in days. Participants were identified as leaving sex work if they answered yes to the following question during follow-up "In the past 4 months, have you stopped trading sex for money, drugs, or other goods (food, clothing, etc.) for a period of at least 30 days?". Of the $n = 617$ participants, we excluded 27% for the following reasons: 1) completed baseline interview only $n = 19$, 2) death for reasons unrelated to study participation $n = 10$ or 3) missed at least one follow-up visit $n = 140$. As these women were engaged in sex work and drug use, we could not assume their missed visits were random events; a requirement for censoring observations (see, for example, Ranganathan & Pramesh, 2012). Our concern was that participants missed follow-up visits for reasons related to the study such as they had stopped sex work, they were institutionalized (e.g., incarcerated or in drug treatment), or they were entrenched in sex work and drug use; although reasons for missed visits were not assessed. Therefore, a total of 467 participants were included in the current analysis. Lastly, we allowed for recurrent events since 28% of the participants ($n = 132$) stopped sex work more than once during follow-up.

2.3.2. Independent variables

Several baseline covariates were considered: sociodemographics, years injecting drugs, sex work history, testing positive for HIV, Chlamydia, gonorrhoea, and/or active syphilis (titers $\geq 1:8$), lifetime pregnancies or induced abortions, condom availability, police extortion, history of forced/coerced sex with client, and history of physical abuse and rape. We only considered what was reported at study enrollment since there was little variation over time among these covariates.

Due to skip patterns in questionnaire items measuring substance use behavior among those who had not injected drugs between follow-up visits, we only included what was reported at baseline for the following: heroin, methamphetamine and cocaine use in the month prior to study enrollment, drug use with clients in the month prior to study enrollment, and a continuous measure of safer injection self-efficacy previously developed by a U.S. intervention study (Garfein et al., 2007).

Covariates that varied over the study period included housing status, injection frequency, income outside of sex work, healthcare access, drug treatment, police confiscation of drug paraphernalia, increased police presence, incarceration, and a continuous measure of condom use self-efficacy previously developed by a Mexico intervention study (Patterson et al., 2008a).

2.4. Recurrent event analysis

Given that participants could have recurrent reports of stopping sex work during follow-up, we applied a conditional proportional hazards model proposed by Prentice, Williams, and Peterson (1981) or PWP model using STATA 11 (StataCorp, LP, College Station, TX, USA). The PWP model assumes that a subject is not at risk for a later event until the all previous events have been experienced. The ordering of events is tracked by stratifying the data where the stratum indicates the event number for which the subject is at risk (see Ezell, Land, & Cohen, 2003 for detailed description of PWP model and its application). Therefore, the model is conditional in the sense that a subject is not at risk for the 2nd event until the 1st event has occurred and the baseline hazard is event-specific.

The time interval in which a subject was at risk of experiencing the event was defined using a counting process formulation. Under the counting process, time at risk is not defined by the beginning of the study – similar to “resetting the clock” to zero each time an event occurred; rather time at risk is defined by the previous event (e.g., the right time of the prior event defines the left time of the next event). We applied this risk interval since we assumed that subsequent reports of stopping sex work would be a function of time since the previous reported events. As a result, the PWP-counting process method allowed us to model the time to an event while simultaneously accounting for the repeated occurrence of the same type of event (e.g., stopping sex work) and the order in which these events occurred. We corrected for the correlation of events within a subject by adjusting the covariance matrix of the parameter estimates using a robust variance estimator (Lin & Wei, 1989).

The assumption of proportional hazard model was tested using a generalized least-squares score test (Grambsch & Therneau, 1994). Nonparametric methods were applied to generate estimates of the survival function by the different patterns of sex work cessation.

Models were stratified by site since sex work is regulated differently across cities. Univariate models tested for associations between sex work cessation and the covariates of interest. The multivariate model was manually built in a stepwise fashion by including covariates with a p-value < 0.25 from the univariate analysis followed by a backward selection eliminating covariates with a p-value > 0.10 in the multivariate model. To ensure that potential confounders were not prematurely removed, we re-entered covariates initially excluded and they were retained if the coefficient estimates of other variables changed by 10% and the Akaike information criterion decreased.

3. Results

3.1. Sample characteristics

The median age of participants across both cities was 33 years (Interquartile Range, IQR: 28–41) with a median of 12 years in sex work (IQR: 6–18) and 11 years of injection drug use (IQR: 5–18). The majority of women (97%, n = 452) reported heroin use and slightly more than one-third reported methamphetamine use (38%, n = 179) or cocaine use (34%, n = 159) in the month prior to study enrollment.

Table 1
Number of reports on sex work cessation during follow-up by site (n = 467).

Number of reports	Overall (n = 467)	Tijuana (n = 233)	Ciudad Juarez (n = 234)
0	211 (45.2%)	55 (23.6%)	156 (66.7%)
1	124 (26.6%)	68 (29.2%)	56 (23.9%)
2	83 (17.8%)	68 (29.2%)	15 (6.4%)
3	49 (10.5%)	42 (18.0%)	7 (3.0%)

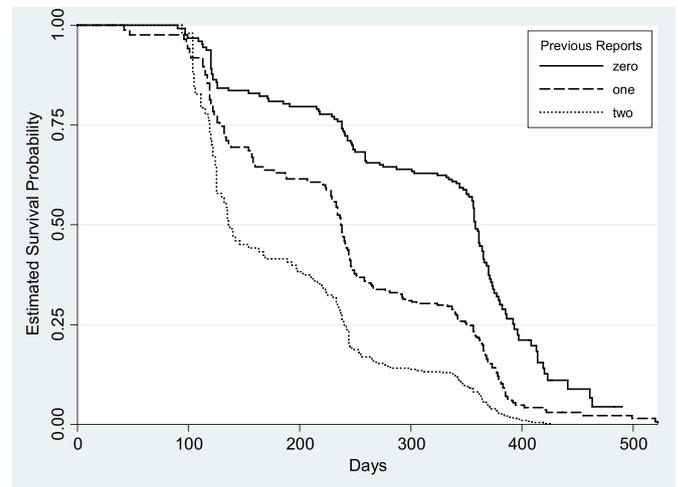


Fig. 1. Median time to sex work cessation dependent on previous reports of stopping sex work.

3.2. Time to stopping sex work

Over half (55%; n = 256) of participants stopped trading sex for 30 days or longer at least once during follow-up. As shown in Table 1, nearly three-fourths of the Tijuana sample stopped sex work at least once during follow-up. By contrast, 33% stopped sex work at least once in Ciudad Juarez.

Across the entire sample, the time to sex work cessation decreased throughout follow-up and varied by the number of previous reports of stopping sex work (Fig. 1). The median time to the first report of stopping sex work was 233 days followed by 113 days for the second occurrence; and among those with at least two prior reports, the median time to the third occurrence of sex work cessation was 22 days.

3.3. Reasons for stopping sex work

Across both cities, the most common reason for stopping sex work was a desire for a new life or being tired of sex work (Table 2). In Tijuana, additional reasons included: 1) entering drug treatment (33.7%), 2) incarceration (20.8%) or 3) health concerns (18%). In Ciudad Juarez, women mentioned their fear of acquiring HIV/STIs (11.5%) and health concerns (11.5%) as reasons to stop sex work.

3.4. Univariate analysis

In both cities, sleeping somewhere other than ones' own place and injection frequency significantly decreased the unadjusted hazard of

Table 2
Reasons for leaving sex work at least once during follow-up by site (n = 256).

Reason for leaving sex work	Overall (n = 256)	Tijuana (n = 178)	Ciudad Juarez (n = 78)
Tired of trading sex/want a different life	123 (48.0%)	76 (42.7%)	50 (64.1%)
In drug treatment	65 (25.4%)	60 (33.7%)	5 (6.4%)
Incarcerated	38 (14.8%)	37 (20.8%)	1 (1.3%)
Health concerns (including pregnancy)	27 (10.5%)	18 (10.1%)	9 (11.5%)
Fear of getting HIV/STIs	24 (9.4%)	15 (8.4%)	9 (11.5%)
Found another/better occupation	20 (7.8%)	16 (9.0%)	4 (5.1%)
Family or partner concerns	20 (7.8%)	18 (10.1%)	2 (2.6%)
Could not work for health or other reasons	11 (4.3%)	9 (5.1%)	2 (2.6%)
Needed more money than sex work provided	8 (3.1%)	6 (3.4%)	2 (2.6%)
Didn't want/need the money	8 (3.1%)	4 (2.3%)	4 (5.1%)
Fear of physical/sexual abuse	6 (2.3%)	5 (2.8%)	1 (1.3%)
Fear of pregnancy	3 (1.2%)	2 (1.1%)	1 (1.3%)

sex work cessation, whereas having an income from sources other than sex work and receiving drug treatment significantly increased the unadjusted hazard of sex work cessation (Tables 3 and 4).

3.5. Multivariate analysis

In the adjusted model, FSW-IDUs in Tijuana who had financial dependents, used methamphetamine, started sex work before age 18 or experienced sexual abuse by the police were significantly more likely to stop sex work than those without these characteristics; those reporting extortion of money by the police had a decreased hazard of stopping sex work (Table 3).

In Ciudad Juarez, FSW-IDUs with a history of paying a pimp or that reported increased police presence were less likely to stop sex work independent of other characteristics in the model (Table 4); whereas receiving drug treatment increased the hazard of sex work cessation.

Across both cities, injecting drugs during follow-up was inversely associated with stopping sex work (Tijuana adj HR: 0.55, 95% CI: 0.43, 0.72; Ciudad Juarez adj HR: 0.45, 95% CI: 0.24, 0.86); whereas income from sources other than sex work (Tijuana adj HR: 3.83, 95% CI: 2.64, 5.55; Ciudad Juarez adj HR: 4.42, 95% CI: 2.44, 8.02) and increased access to health services (Tijuana adj HR: 1.48, 95% CI: 1.10, 1.99; Ciudad Juarez adj HR: 3.29, 95% CI: 1.73, 6.27) increased the hazard of stopping sex work. Further, women receiving the sexual and/or injection risk intervention were not significantly more likely to stop sex work than those in the control group. There was substantial overlap in the 95% confidence intervals suggesting a similar effect between intervention groups in both cities.

4. Discussion

This study identified individual and structural circumstances affecting short-term sex work cessation among FSW-IDUs that routinely

Table 3
Unadjusted and adjusted hazard ratios (95% CIs) for leaving sex work among FSW-IDUs in Tijuana (n = 233).

	Unadjusted HR (95% CI)	p-Value	Adjusted HR (95% CI)	p-Value
<i>Sociodemographics</i>				
Steady partner/spouse at enrollment	0.71 (0.55, 0.92)	0.010		
Has ≥ 1 financial dependents at enrollment	0.80 (0.62, 1.03)	0.088	0.73 (0.55, 0.96)	0.026
Children < 18 living with you at enrollment	0.79 (0.61, 1.03)	0.086		
Average monthly income < 3500 pesos	1.42 (1.08, 1.86)	0.012	1.35 (0.98, 1.86)	0.063
Slept somewhere other than own place ^a	0.58 (0.46, 0.73)	<0.001		
Lived in city of study enrollment entire life	1.34 (1.03, 1.76)	0.030		
Age (5-year increase)	1.05 (0.97, 1.13)	0.247		
<i>Substance use</i>				
Heroin ^b	1.86 (0.99, 3.42)	0.051	1.87 (0.88, 3.99)	0.104
Methamphetamine ^b	0.68 (0.52, 0.90)	0.007	0.72 (0.54, 0.96)	0.026
Cocaine ^b	0.78 (0.57, 1.07)	0.130	0.78 (0.57, 1.06)	0.109
Often/always used drugs with clients ^b	0.96 (0.72, 1.26)	0.751		
Injected drugs in the past month ^a	0.44 (0.34, 0.57)	<0.001	0.55 (0.43, 0.72)	<0.001
Years as injection drug user (5-year increase)	1.01 (0.94, 1.08)	0.853		
Injected more than once a day in the past month ^a	0.57 (0.44, 0.73)	<0.001		
Self-efficacy towards safer injection	0.88 (0.71, 1.08)	0.226		
<i>Sex work history</i>				
Street-based sex worker	1.10 (0.83, 1.45)	0.513		
>50% of clients are regular	1.07 (0.82, 1.39)	0.625		
Ever paid a pimp	0.66 (0.34, 1.28)	0.217		
Poor working conditions	1.22 (0.93, 1.58)	0.146		
Income from sources other than sex work ^a	4.66 (3.29, 6.60)	<0.001	3.83 (2.64, 5.55)	<0.001
Started sex work before age 18	0.85 (0.65, 1.10)	0.219	0.71 (0.54, 0.92)	0.009
Years as sex worker (1-year increase)	1.01 (0.99, 1.02)	0.360		
<i>Sexual health</i>				
HIV positive	1.24 (0.69, 2.25)	0.474		
Self-efficacy towards condom use ^a	0.91 (0.67, 1.23)	0.547		
Any STI at enrollment	0.87 (0.64, 1.19)	0.386		
Had an induced abortion during lifetime	1.06 (0.68, 1.64)	0.792		
Number of pregnancies during lifetime (1-unit increase)	1.02 (0.95, 1.09)	0.591		
<i>Structural factors</i>				
Increased access to health services ^a	0.84 (0.62, 1.15)	0.275	1.48 (1.10, 1.99)	0.011
Received drug treatment ^a	1.46 (1.15, 1.83)	0.001		
Police confiscated drug paraphernalia ^a	0.74 (0.54, 1.03)	0.073		
Increased police presence ^a	0.67 (0.53, 0.83)	<0.001		
Arrested ^a	0.83 (0.64, 1.08)	0.164		
Sexual abuse by the police in lieu of arrest ^c	1.36 (0.99, 1.87)	0.059	2.22 (1.55, 3.17)	<0.001
Police took money in lieu of arrest ^c	0.71 (0.54, 0.93)	0.012	0.52 (0.39, 0.70)	<0.001
Ever forced/coerced into having sex with client	1.04 (0.76, 1.42)	0.829		
History of physical abuse by client	0.99 (0.72, 1.35)	0.967		
History of rape	0.85 (0.65, 1.11)	0.236		
<i>Intervention group</i>				
Both didactic injection and sex risk (control)	1.00		1.00	
Interactive injection risk and didactic sex risk	0.93 (0.69, 1.26)	0.643	0.92 (0.63, 1.33)	0.653
Interactive sex risk and didactic injection risk	1.09 (0.81, 1.45)	0.582	0.91 (0.64, 1.30)	0.617
Both interactive injection and sex risk	0.93 (0.69, 1.26)	0.645	1.01 (0.69, 1.46)	0.976

^a Refers to an event occurring since the last follow-up visit.

^b Refers to an event occurring 1 month prior to study enrollment.

^c Refers to an event occurring within 6 months prior to study enrollment.

Table 4
Unadjusted and adjusted hazard ratios (95% CIs) for leaving sex work among FSW-IDUs in Ciudad Juarez (n = 234).

	Unadjusted HR (95% CI)	p-Value	Adjusted HR (95% CI)	p-Value
<i>Sociodemographics</i>				
Steady partner/spouse at enrollment	0.85 (0.53, 1.38)	0.516		
Has ≥ 1 financial dependents at enrollment	0.78 (0.49, 1.26)	0.315		
Children < 18 living with you at enrollment	1.41 (0.89, 2.22)	0.144		
Average monthly income < 3500 pesos	1.20 (0.75, 1.92)	0.450		
Slept somewhere other than own place ^a	0.53 (0.36, 0.79)	0.002		
Lived in city of study enrollment entire life	1.50 (0.93, 2.43)	0.096		
Age (5-year increase)	1.09 (0.96, 1.23)	0.196		
<i>Substance use</i>				
Heroin ^b	0.58 (0.14, 2.31)	0.435		
Methamphetamine ^b	1.54 (0.50, 4.71)	0.448		
Cocaine ^b	0.64 (0.39, 1.05)	0.076		
Often/always used drugs with clients ^b	0.80 (0.50, 1.27)	0.349		
Injected drugs in the past month ^a	0.19 (0.13, 0.28)	<0.001	0.45 (0.24, 0.86)	0.016
Years as injection drug user (5-year increase)	1.02 (0.89, 1.16)	0.811		
Injected more than once a day in the past month ^a	0.25 (0.16, 0.38)	<0.001		
Self-efficacy towards safer injection	0.93 (0.60, 1.43)	0.728		
<i>Sex work history</i>				
Street-based sex worker	0.87 (0.55, 1.40)	0.579	0.69 (0.40, 1.21)	0.196
>50% of clients are regular	0.84 (0.33, 2.17)	0.722		
Ever paid a pimp	0.47 (0.09, 2.42)	0.370	0.33 (0.12, 0.88)	0.025
Poor working conditions	1.36 (0.84, 2.22)	0.216		
Income from sources other than sex work ^a	6.94 (4.22, 11.42)	<0.001	4.42 (2.44, 8.02)	<0.001
Started sex work before age 18	0.58 (0.37, 0.93)	0.023	0.63 (0.36, 1.09)	0.098
Years as sex worker (1-year increase)	0.99 (0.96, 1.01)	0.405		
<i>Sexual health</i>				
HIV positive	2.17 (1.18, 3.97)	0.012		
Self-efficacy towards condom use ^a	1.53 (1.06, 2.20)	0.024		
Any STI at enrollment	0.92 (0.54, 1.56)	0.746		
Had an induced abortion during lifetime	0.66 (0.21, 2.05)	0.473		
Number of pregnancies during lifetime (1-unit increase)	0.96 (0.87, 1.07)	0.464		
<i>Structural factors</i>				
Increased access to health services ^a	1.63 (0.95, 2.82)	0.077	3.29 (1.73, 6.27)	<0.001
Received drug treatment ^a	4.79 (3.13, 7.32)	<0.001	3.43 (1.86, 6.34)	<0.001
Police confiscated drug paraphernalia ^a	0.71 (0.37, 1.40)	0.325		
Increased police presence ^a	0.88 (0.50, 1.52)	0.623	0.48 (0.25, 0.90)	0.023
Arrested ^a	0.80 (0.46, 1.40)	0.441		
Sexual abuse by the police in lieu of arrest ^c	0.58 (0.30, 1.12)	0.103		
Police took money in lieu of arrest ^c	1.12 (0.67, 1.85)	0.671		
Ever forced/coerced into having sex with client	0.62 (0.35, 1.10)	0.104		
History of physical abuse by client	0.84 (0.50, 1.39)	0.492		
History of rape	0.77 (0.48, 1.22)	0.260		
<i>Intervention group</i>				
Both didactic injection and sex risk (control)	1.00		1.00	
Interactive injection risk and didactic sex risk	1.03 (0.62, 1.72)	0.904	0.62 (0.30, 1.30)	0.203
Interactive sex risk and didactic injection risk	0.93 (0.56, 1.56)	0.787	1.04 (0.51, 2.14)	0.909
Both interactive injection and sex risk	1.23 (0.72, 2.08)	0.448	0.78 (0.36, 1.71)	0.539

^a Refers to an event occurring since the last follow-up visit.

^b Refers to an event occurring 1 month prior to study enrollment.

^c Refers to an event occurring within 6 months prior to study enrollment.

received behavioral risk reduction counseling as part of a larger HIV prevention study. Although increased condom use and decreased sharing of injection equipment were the primary outcomes of the original study, a promising finding of the current study was that despite intervention assignment, decreased frequency of injection drug use, income from sources other than sex work, and healthcare access significantly and independently increased the hazard of leaving sex work. However, several differences were found between these cities, including receipt of drug treatment and police interactions, suggesting that there are unique environmental structures shaping the transition out of sex work.

As demonstrated in qualitative studies (Ingabire et al., 2012; Manopaiboon et al., 2003), we found empirical evidence that injection drug use was an important correlate of short-term sex work cessation. Women that reported injecting drugs had a lower hazard of stopping sex work, independent of other characteristics (e.g., the odds for the time to stopping sex work was lower among those who continued to inject drugs compared to those that did not inject in the past month). This

finding is consistent with an earlier study by our team that found a high proportion of women injected drugs before or concurrent to sex work initiation (Morris et al., 2013). Further, dependence on sex work to support addictions is one reason that women remain in sex work (Deering, Shoveller, Tyndall, Montaner, & Shannon, 2011) and this is more prevalent in street-based sex workers (Cusick, 2006; Inciardi & Surratt, 2001). In the current study, nearly three-fourths of FSW-IDUs in Tijuana and half of FSW-IDUs in Ciudad Juarez primarily operated from street corners. For these women, it may be difficult to discontinue sex work given their entrenchment in a street subculture where violence, exploitation and drug markets coexist (Cimino, 2012; Dalla, 2006).

Among women motivated to leave the sex industry, access to effective drug treatment services and counseling may help them overcome addictions and cease sex work. For example, one study found that 97% of FSWs successfully treated for heroin dependence quit sex work during their first year of treatment (Gunne, Gronbladh, & Ohlund, 1995). In qualitative interviews conducted by our research team, drug using

FSWs identified the lack of effective drug treatment and psychological support as a major barrier to stopping sex work (Goldenberg, Engstrom, Rolon, Silverman, & Strathdee, 2013).

Our findings further illustrate this contention since receipt of drug treatment was positively associated with stopping sex work, although this was only significant in Ciudad Juarez after adjusting for other characteristics. A possible reason for this observation is that during the time of the study, Ciudad Juarez had a publicly funded methadone program, whereas only private methadone clinics were operating in Tijuana. Mexican policymakers are planning to scale-up opioid substitution treatment across the country. Our study findings suggest that in doing so, there may be benefits to the cessation of drug use and sex work.

Financial capacity was another important factor since income outside of sex work was positively associated with stopping sex work. Prior studies have found that legal employment opportunities and job stability not only enabled FSWs to leave sex work but also sustained their ability to avoid returning to sex work (Dalla, 2006; Ingabire et al., 2012). This suggests the need for interventions that target women's economic situations through vocational training and/or microfinance programs, especially since financial necessity to support dependent children was frequently cited as a key reason for entering sex work in this region (Bucardo, Semple, Fraga-Vallejo, Davila, & Patterson, 2004; Patterson et al., 2005).

Police interactions were also independently associated with short-term cessation of sex work. In Tijuana, FSW-IDUs who reported sexual abuse from police in lieu of arrest stopped sex work at twice the hazard of those not reporting such abuses. Violence such as physical or sexual assaults, more often reported by street-based FSWs, has been a catalyst for contemplating withdrawal from sex work due to FSWs' concern for their physical safety (Sanders, 2007). Further, violence against FSWs has been associated with HIV risk in these cities and other settings (Beletsky et al., 2013; Shannon & Csete, 2010) and women's decision to leave sex work may be influenced by her perceived HIV risk (Manopaiboon et al., 2003).

In comparison, we found that extortion of money by the police (in Tijuana only) and increased police presence (in Ciudad only) were inversely associated with sex work cessation. These women may have encountered the criminal justice system more frequently and felt compelled to remain in sex work to pay fines (Sanders, 2007) since they were actively injecting drugs at study enrollment. These findings may also be proxy for women feeling less in control of their environment.

By study design, this analysis has limitations that warrant consideration. First, differential recall of the exact time a participant left sex work is a potential source of bias since we often did not ascertain this until several months after it occurred. Instead, we used follow-up time as our time scale for the outcome variable, which has been suggested in other studies (Fieberg & DelGiudice, 2009; Pencina, Larson, & D'Agostino, 2007). This analytic approach allowed us to consider multiple reports rather than the first or any occurrence of sex work cessation and included characteristics that varied over time (for example, frequency of injection drug use, receiving drug treatment and income outside of sex work). Second, 27% of the original sample was excluded because of loss to follow-up. This may have biased our results if participants stopped trading sex or conversely, they did not attend their follow-up visit due to being entrenched in drugs and sex work. Women excluded from the analysis were significantly less likely to have ever received drug treatment or report any abuses by the police at baseline. Lastly, our findings may not be generalizable to other drugs using FSWs since our sample consisted of women engaged in risky behaviors (e.g., unprotected sex and sharing injection equipment). However, this lack of representation also makes our sample of high importance to public health and public policy given that these women engaged in behaviors that increase their likelihood of acquiring and transmitting HIV and other blood-borne infections.

5. Conclusions

The current study is among the first to quantitatively identify factors associated with short-term sex work cessation including the cessation of injection drug use. Although substantial barriers to stopping sex work exist, the current findings suggest a particular need for support services among those motivated to leave the industry. Expanded drug treatment and counseling, including relapse prevention, job training, employment, and microfinance programs may be the most important strategies to reduce women's reliance on sex work and promote capacity towards the transition out of sex work (Cusick, Brooks-Gordon, Campbell, & Edgar, 2011). However, future research should also consider the need for support services for those who desire to remain in sex work. Lastly, since sex work is regulated differently across jurisdictions, our results highlight the need for policy reforms focusing on exploitive policing practices that make it more difficult for women to leave sex work and expose them to multiple health problems.

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Contributors

All of the authors contributed to the writing of the manuscript. TLG and SAS originated the study. TLG led in writing the draft of the manuscript and conducted data analysis; LAU assisted with literature review; GM and GR supervised field activities relating to data collection; LAU, SMG, ER, TLP, and SAS assisted with the interpretation of results. All authors critically reviewed multiple versions and approved the final manuscript.

Conflict of interest

All authors declare that they have no conflict of interest.

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