



Full length article

Predictors of injecting cessation among a cohort of people who inject drugs in Tijuana, Mexico



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ABSTRACT

Introduction: Little is known about the cessation of injecting drug use (IDU) among people who inject drugs (PWID) in low and middle-income settings, where access to effective interventions for reducing drug use (e.g., opioid substitution treatment; OST), may be limited. We measured the incidence and identified predictors of IDU cessation among a cohort of PWID in Tijuana, Mexico.

Methods: Data were drawn from 621 participants in Proyecto El Cuete IV, a prospective cohort of PWID recruited in 2011 and interviewed biannually to 2016. A multivariable Extended Cox model was constructed to identify socio-demographic, drug use, risk environment and health-related predictors of IDU cessation (no IDU for \geq six months).

Results: 141 participants (23%) reported at least one IDU cessation event during follow-up. The crude IDU cessation rate was 7.3 per 100 person-years (95% Confidence Interval [CI]: 6.2–8.7). IDU cessation was negatively associated with injecting at least daily on average and heroin/methamphetamine co-injection in the past six months, and positively associated with testing HIV positive at baseline, being on methadone maintenance therapy in the past six months, and recent arrest. Concern for personal safety was also independently associated with IDU cessation.

Conclusions: The rate of IDU cessation among PWID in Tijuana was low. These findings underscore the importance of expansion of services including OST to help reduce drug use and facilitate IDU cessation for those who wish to do so. In this setting, interventions addressing individual-level economic barriers as well as broader social and structural barriers to harm reduction services are integral.

1. Introduction

Injecting Drug Use (IDU) is associated with myriad health, social and economic harms, including increased risk of mortality and transmission of HIV and Hepatitis C virus (Degenhardt et al., 2011; Mathers et al., 2013, 2008; Nelson et al., 2011). Typically, people who inject drugs (PWID) usually have long injecting ‘careers’ and experience multiple transitions in and out of IDU (Galai et al., 2003; Genberg et al., 2011b; Xia et al., 2015). Identifying factors which promote episodes of injecting cessation is essential for the development of interventions to reduce the harms associated with IDU and to facilitate long-term cessation for those who wish to become abstinent from drug use.

A growing number of prospective cohort studies have examined

short-term IDU cessation (commonly defined as reporting no IDU for six or twelve months), with cessation incidence rates ranging from 4.1 to 32.6 per 100 person-years (PY) (Evans et al., 2009; Genberg et al., 2011a; Langendam et al., 2000; Nambiar et al., 2015; Shah et al., 2006; Steensma et al., 2005). Factors positively associated with IDU cessation have included younger age, being employed (Huo et al., 2006; Luchenski et al., 2015; Nambiar et al., 2015; Shah et al., 2006; Steensma et al., 2005) lower frequency of IDU, engagement in drug treatment, particularly opioid substitution treatment (OST), and reporting a previous cessation (DeBeck et al., 2011; Evans et al., 2009; Hadland et al., 2017; Huo et al., 2006; Langendam et al., 2000; Shah et al., 2006; Steensma et al., 2005; Werb et al., 2013; Xia et al., 2015). Conversely, homelessness, residing in a disadvantaged neighbourhood,

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incarceration, and alcohol and non-injection drug use have been inversely associated with IDU cessation (Bruneau et al., 2004; Evans et al., 2009; Genberg et al., 2011a; Hadland et al., 2017; Kimber et al., 2010; Luchenski et al., 2015; Nambiar et al., 2015; Shah et al., 2006; Steensma et al., 2005; Werb et al., 2013). Further, qualitative studies have emphasised the importance of social, structural and environmental factors such as having a desire to reduce potential negative consequences arising from drug use (e.g. criminal justice involvement, overdose risk) and having access to instrumental and social support, in facilitating IDU cessation (Boeri et al., 2009; Boyd et al., 2017; Knight et al., 2017; Weiss et al., 2014).

Studies of IDU cessation have been primarily conducted in high-income settings including North America (e.g. DeBeck et al., 2011; Evans et al., 2009; Genberg et al., 2011b; Luchenski et al., 2015), Europe (e.g. Kimber et al., 2010; Langendam et al., 2000) and Australia (e.g. Nambiar et al., 2015; Teesson et al., 2015). As a result, an important gap exists in knowledge about injecting trajectories across other geographic settings. In particular, research is needed to understand IDU cessation and inform responses to IDU in low and middle-income countries (LMIC), where effective harm reduction interventions such as needle and syringe exchange programs and OST may be unavailable or coverage is inadequate (Des Jarlais et al., 2013; Dutta et al., 2012; Mathers et al., 2010).

Among the 13 million PWID living in LMIC, approximately two million reside in Latin America (Mathers et al., 2008). Mexico is a leading producer of cocaine, methamphetamine, and heroin destined for the United States (U.S.) (Bucardo et al., 2005; United Nations Office on Drugs and Crime, 2016). In the past decade, IDU epidemics have emerged in cities located along drug trafficking routes in Mexico, including in Tijuana, Baja California, a densely populated metropolitan area located directly across the border from San Diego, California (Brouwer et al., 2006; Bucardo et al., 2005; Strathdee et al., 2012). The lifetime prevalence of illicit drug use in Baja California is estimated at 13.5%, exceeding the national average, and IDU plays an important role in driving Tijuana's burgeoning HIV epidemic (Brouwer et al., 2006; Instituto Nacional de Salud Pública, 2017; Strathdee et al., 2012). IDU is particularly prevalent among key populations, estimated at 60% among female sex workers and their male partners (Robertson et al., 2014b) and 6% among men who have sex with men (Pitpitan et al., 2015), with methamphetamine and heroin (including co-injection) the most commonly injected drugs (Meacham et al., 2015; Rusch et al., 2009). Among PWID with a history of incarceration, over 60% report injecting while in prison (Pollini et al., 2009). Access to OST is limited in Tijuana, and available drug treatment consists primarily of 12-step approaches, which have limited effectiveness, and in this setting is often coercive, with reports of mistreatment common (Harvey-Vera et al., 2016; Rafful and Medina-Mora, 2016; Syvertsen et al., 2010).

Although studies conducted in Tijuana have found that many drug users express a desire to reduce or cease drug use (Bazzi et al., 2016) and report a high level of self-reported need for addiction treatment (Werb et al., 2015), little is known about IDU cessation in this setting. In the only study to-date that examined IDU cessation in Mexico, 19% of female sex workers who injected drugs and participated in a behavioral intervention to promote safer sex in the context of drug use ceased IDU for at least four months during 12 months of follow-up. This study found no significant associations between drug use variables (including participation in OST) and IDU cessation (West et al., 2015).

In response to this gap in the literature, this paper aimed to measure the rate of IDU cessation and identify predictors of IDU cessation among a cohort of people who inject drugs regularly in Tijuana.

2. Methods

2.1. Study methods

Data were drawn from *Proyecto El Cuete IV*, a prospective cohort of

PWID in Tijuana designed to examine the impact of recent Mexican drug policy reform on HIV risk among PWID. Study methods have previously been described in detail (Robertson et al., 2014a). In brief, eligibility criteria included being aged ≥ 18 years, reporting past-month IDU, speaking English or Spanish, residing in Tijuana with no plans to move for 30 months and not currently participating in any intervention studies. From 2011 to 2012, 734 PWID were recruited using targeted sampling and street-based outreach. Following provision of written informed consent, data were collected by trained bilingual interviewers. Study instruments comprised an interviewer-administered quantitative survey and rapid HIV testing using Advance Quality rapid HIV tests (InTec Products, Inc.). Reactive rapid tests were confirmed with a second test; a second reactive test result was considered positive. Participants are followed up biannually (with an interview window ± 1.5 months) and receive a \$20USD reimbursement per visit. Approval for the study was provided by Institutional Review Boards at the University of California San Diego and El Colegio de la Frontera Norte (Tijuana).

2.2. Measures

The outcome of interest was the first self-reported episode of IDU cessation (defined as not having injected drugs for at least six months, to enable comparisons with most existing literature). At each interview, participants reported the number of days since their last illicit drug injection, from which we calculated the date of the last injection. We then added 180 days to calculate the date on which a six-month period of IDU cessation was completed. Survival time was calculated by subtracting the baseline interview date from the date of first cessation completion for those who experienced a cessation event, or from the date of most recent interview, for those who did not cease injecting (i.e., were right censored).

Selection of predictor variables for inclusion in analysis was informed by available literature on IDU cessation (e.g. DeBeck et al., 2011; Evans et al., 2009; Kimber et al., 2010; Nambiar et al., 2015; Shah et al., 2006; West et al., 2015; Xia et al., 2015), with a focus on variables which we considered particularly relevant to our study setting (i.e., a middle-income country with low OST coverage). Four domains of variables were included:

1. *Socio-demographic variables*: Sex, age, educational attainment, marital status, and employment status. We also considered deportation history as Tijuana is a primary receiving community for U.S. deportees (Masferrer and Roberts, 2012) and emerging evidence suggests that deported migrants who inject drugs engage in different patterns of drug use and are less likely to receive treatment compared with other PWID (Brouwer et al., 2009). Deportation history was stratified by time since most recent deportation (never deported, last deported within the past four years, last deported longer than four years prior to baseline). These time periods were chosen to correspond roughly to the commencement of the Obama administration (i.e., January 20, 2009), during which deportations increased dramatically (Gonzalez-Barrera and Krogstad, 2014), as well as to capture recency of arrival in Mexico.
2. *Drug use variables*: Duration of injecting, frequency of injecting, heroin/methamphetamine co-injection, frequency of marijuana use, frequency of methamphetamine smoking, ever receiving any type of professional help for drug use other than methadone maintenance therapy (MMT) at baseline, enrolment in MMT (ever enrolled at baseline; past six months), need for help for drug use in the past six months, and experiencing an overdose in the past six months;
3. *Risk environment variables*: Residence in the Zona Norte (the region encompassing Tijuana's red light district, which borders the U.S. and has been subject to heightened policing (Gaines et al., 2015; Werb et al., 2016)), mostly living in unstable housing in the past six months, arrested in the past six months, time spent incarcerated in

the past six months, and level of concern for personal safety in the past six months (this variable, measured on a 5-point Likert Scale ranging from not at all to always, reflects exposure to the everyday violence which is prevalent in the lives of PWID in many contexts, including Tijuana (Bourgois, 1998; Pinedo et al., 2015; Syvertsen et al., 2017)); and

4. *Health-related variables*: HIV status (confirmatory test result).

2.3. Analytic sample

We included data from up to nine study visits. Of the total 734 participants, 113 (15%) were excluded from analysis (105 participants who completed two or fewer interviews due to the use of predictors lagged by two interviews, and eight whose last drug injection occurred prior to baseline). Excluded participants did not differ significantly from included participants on baseline socio-demographic, drug use or risk environment characteristics, but HIV prevalence was significantly higher among excluded participants compared with those included (7% vs. 3%, $p < 0.05$). A sensitivity analysis excluding participants who had more than one consecutive missing follow-up interview ($n = 79$) was conducted as we hypothesised that such events may not be random (i.e., participants not interviewed for one year or longer may not have returned for the interview because they ceased injecting), violating censoring assumptions for survival analysis (Ranganathan and Pramesh, 2012). As results were largely unchanged, these participants were included in the analysis.

The final analytic sample comprised 621 participants (4503 interviews; median duration of follow-up: 45.6 months [range: 10.8–56.0 months]). The median time between interviews was 167 days (Interquartile Range [IQR]: 153–196 days).

2.4. Data analysis

Descriptive statistics were used to characterize the sample at baseline, and to assess the number of cessation events and median time to first cessation.

An extended Cox model was used to identify predictors of time to first cessation. We lagged covariates by two interviews, to capture the interview period prior to the start of a participant's six-month cessation period, except for time-invariant characteristics and variables which were not collected consistently over time, for which baseline measures were used (all socio-demographic variables; duration of injecting; drug treatment history; neighbourhood of residence; housing status). Due to a low incidence of HIV, HIV status was considered at baseline rather than as a time-varying covariate.

Bivariate regressions were conducted, and predictors with $p \leq 0.10$ were selected for inclusion in a multivariable model. After assessing for multicollinearity using variance inflation factors, a final multivariable model was constructed, for which significance was set at $p < 0.05$. All variables were retained in the final multivariable model regardless of significance. We also examined whether there was an interaction effect between deportation history and any of the variables selected for inclusion in the multivariable model since the literature indicates differing drug use patterns among deportees (Brouwer et al., 2009; Pinedo et al., 2014b; Strathdee et al., 2008). All analyses were conducted using Stata 13.1 (StataCorp LP, College Station, TX).

3. Results

3.1. Sample characteristics

Participants ($N = 621$) were predominantly male (61%), with a median age of 37 years (IQR: 31–43) at baseline (Table 1). Participants had injected drugs for a median of 16 years (IQR: 9–22) and almost all (95%) injected daily in the six months preceding baseline interview. At baseline, 51% reported currently being in great or urgent need of help

Table 1

Baseline socio-demographic, drug use, risk environment and health characteristics of El Cuete IV participants.

	N = 621 n (%)
Socio-demographic variables	
Sex	
Male	379 (61)
Female	239 (39)
Median age, IQR	37, 31–43
Education	
Did not complete primary school	114 (18)
Did not complete secondary school	269 (43)
Completed secondary school or higher	238 (38)
Marital status	
Single/never married	332 (53)
Married/common law spouse	289 (47)
Worked in the formal economy (past year)	
No	536 (86)
Yes	85 (14)
History of deportation from U.S.	
Never deported	334 (57)
Last deported ≤ 4 years ago	73 (12)
Last deported > 4 years ago	180 (31)
Drug use variables	
Median duration of injecting, IQR	16, 9–22
Injected \geq daily on average (past 6m)	
No	30 (5)
Yes	589 (95)
Heroin/Methamphetamine co-injection (past 6m)	
No	382 (62)
Yes	239 (38)
Marijuana use (past 6m)	
Never	426 (69)
Less than daily	144 (23)
\geq daily	51 (8)
Methamphetamine smoking (past 6m)	
Never	364 (59)
Less than daily	176 (28)
\geq daily	81 (13)
Currently need help for drug use	
No need	82 (13)
Some need	225 (36)
Great or urgent need	314 (51)
Ever received professional help for drug use (excl. MMT)	
No	444 (72)
Yes	176 (28)
Ever enrolled in MMT	
No	444 (72)
Yes	176 (28)
Enrolled in MMT (past 6m)	
No	560 (90)
Yes	60 (10)
Experienced a drug overdose (past 6m)	
No	562 (91)
Yes	59 (9)
Risk environment variables	
Reside in Zona Norte ¹	
No	427 (69)
Yes	194 (31)
Mostly lived in unstable housing (past 6m)	
No	385 (62)
Yes	236 (38)
Arrested by law enforcement (past 6m)	
No	266 (43)
Yes	354 (57)
Time spent incarcerated (past 6m)	
Never incarcerated	368 (62)
\leq One week	151 (25)
$> One week$	78 (13)
Concerned for personal safety (past 6m)	
Not at all	146 (23)
Rarely	56 (9)
Sometimes	99 (16)
Often	106 (17)
Always	214 (34)
Health variables	
Tested HIV positive	

(continued on next page)

Table 1 (continued)

	N = 621 n (%)
No	603 (97)
Yes	18 (3)

Missing data excluded.

¹ Tijuana's red light district.

for their drug use, 28% had ever been enrolled in MMT, and 10% had been enrolled in the past six months.

3.2. Patterns of IDU cessation

Of the 621 participants, 141 participants (23%) experienced a total of 293 cessation events throughout the follow-up period (median number of cessations per person: 1, IQR: 1–3). A total of 1921.3PY of time at risk were observed, corresponding to a crude IDU cessation rate of 7.3 per 100PY (95% Confidence Interval [CI]: 6.2–8.7). Among those who ceased injecting, the median time to having achieved a six-month period of cessation was 15.1 months (IQR: 5.8–29.1 months).

3.3. Predictors of IDU cessation

In bivariate regression (Table 2), variables significantly ($p < 0.05$) associated with a lower hazard rate of IDU cessation were injecting at least daily in the past six months and heroin/methamphetamine co-injection in the past six months. Testing HIV positive at baseline and being enrolled in MMT in the past six months were associated with a significantly higher hazard of IDU cessation. Compared with participants who were not at all concerned for their safety, those who were rarely concerned had a lower hazard of IDU cessation and those reporting always being concerned had a higher hazard of IDU cessation.

In the final multivariable model (Table 2), the hazard of IDU cessation was significantly lower among PWID who injected at least daily (AHR: 0.57, 95% CI: 0.34–0.97), reported recent heroin/methamphetamine co-injection (AHR: 0.51, 95% CI: 0.34–0.76) and those who were rarely concerned for their own personal safety (AHR: 0.50, 95% CI: 0.26–0.94). Testing HIV positive at baseline (AHR: 8.05, 95% CI: 3.59–18.03), enrolment in MMT (AHR: 2.04, 95% CI: 1.02–2.57), recent arrest (AHR: 1.66, 95% CI: 1.07–2.57) and reporting always being concerned for one's personal safety (AHR: 3.54, 95% CI: 1.98–6.35) were associated with a significantly higher hazard of IDU cessation. Deportation history was not a significant effect modifier of any of these associations.

4. Discussion

This study detected a low rate of IDU cessation (7.3/100PY) among a cohort of PWID in Tijuana, Mexico who were followed for an average of almost four years. This estimate is lower than cessation rates recorded among PWID in high-income countries (Evans et al., 2009; Genberg et al., 2011a; Langendam et al., 2000; Nambiar et al., 2015; Shah et al., 2006; Steensma et al., 2005), likely reflecting the high proportion of in-treatment participants in those cohorts. Only two other studies have examined IDU cessation in LMIC; the cessation rate detected in our study is on par with that detected among female sex workers who inject drugs in Mexico (West et al., 2015), but considerably lower than the 117/100PY detected among PWID in Chennai, India over a comparable follow-up period (Mehta et al., 2012). This finding may reflect that our cohort was comprised primarily of PWID who injected drugs daily at baseline, compared with only 15% reporting daily injecting at baseline among the Indian cohort.

This study provides unique insight into the predictors of IDU cessation and has important implications for harm reduction interventions in LMIC settings. Consistent with studies in high income settings

(DeBeck et al., 2011; Evans et al., 2009; Langendam et al., 2000; Shah et al., 2006; Werb et al., 2013; Xia et al., 2015), participants in our study who were engaged in MMT had a significantly higher hazard of ceasing IDU. This finding is somewhat surprising given the limited availability of MMT, which has resulted in low uptake and retention in treatment (consistently fewer than 10% of participants at each study wave were engaged in MMT, and among participants who accessed MMT at any point in time, fewer than half reported doing so at more than one time-point). It is possible that participants who have participated in MMT may have experienced pressure from or have been required by treatment providers to abstain from drug use and, given the low retention in treatment, it may be this, rather than the effectiveness of MMT, which explains this finding.

Around half our participants reported great/urgent need for help at baseline but few accessed treatment, which is concerning as it suggests that PWID are unable to access the support needed to help manage drug use. Our findings re-emphasize the urgent need for OST scale-up to help reduce drug use and facilitate IDU cessation for those who wish to do so. As research has identified a number of barriers to retention in MMT among drug users in Tijuana, including cost, inconvenience of clinic attendance, and experiencing withdrawal (Bazzi et al., 2016; Werb et al., 2015), exploration of options to abate these, such as government subsidisation of treatment costs and flexible attendance policies (Strike et al., 2013), are warranted. To do so, persistent institutional-level barriers to treatment scale-up, such as a lack of adequate treatment facilities, insufficient scientific and technical expertise and underfunding (Werb et al., 2017), must first be addressed. Moreover, efforts to scale-up OST must be underpinned by a harm reduction, non-punitive and non-stigmatising approach which facilitates respectful relationships between providers and consumers (Mora-Ríos et al., 2016; O'Keefe et al., 2017). Identifying interventions to mitigate the impacts of stigma will play an important role in improving treatment access and retention for PWID in Tijuana, particularly since stigma is a general barrier to care across Latin America (Sapag et al., 2017).

Our analysis identified two other drug use variables which were significantly associated with IDU cessation. First, consistent with previous research (Bruneau et al., 2004; Huo et al., 2006; Luchenski et al., 2015; Mehta et al., 2012; Shah et al., 2006), participants who reported higher IDU frequency had a reduced hazard of cessation. This finding is unsurprising and likely reflective of greater drug dependence. Second, participants reporting recent heroin/methamphetamine co-injection were almost 50% less likely to report cessation. Heroin/methamphetamine co-injection is common in Tijuana, and use is associated with engagement in injecting risk behaviors and being in greater need of help for drug use (Case et al., 2008; Meacham et al., 2016). These findings suggest that future efforts to increase access to MMT should focus on high-frequency injectors and heroin/methamphetamine co-injectors as they may be most in need.

Within the health domain, HIV status at baseline was associated with a significantly higher hazard of IDU cessation, as has been shown previously among PWID in Baltimore, USA (Shah et al., 2006). This finding could reflect engagement with the healthcare system and access to professional support, which have been found to promote IDU cessation (Luchenski et al., 2015). Although this finding should be interpreted with caution due to the low prevalence of HIV and wide confidence interval, this finding re-emphasizes the importance of linkage to and retention in HIV care as a means of reducing morbidity among PWID. Importantly, a recent review of integration of OST and HIV care shows that this approach has been welcomed by clients and providers alike (Guise et al., 2017). Although there has been little examination of integrated OST and HIV care in LMIC, given that funding and resource constraints have been identified as barriers to both OST and HIV service provision in Mexico (Pineirua et al., 2015; Werb et al., 2017), service integration could provide a practical means of improving service delivery and access to care.

Finally, within the risk environment domain, two variables

Table 2
Bivariate and multivariable Cox regression model of injecting cessation.

Variable	Unadjusted Hazard Ratio (95% CI)	p-value	Adjusted Hazard Ratio (95% CI)	p-value
Fixed covariates¹				
Socio-demographic variables				
Female sex (ref: male)	0.79 (0.56–1.13)	0.204		
Age (per 1-year increase)	1.00 (0.98–1.02)	0.872		
Education (ref: did not complete primary school)				
Did not complete secondary school	0.93 (0.59–1.49)	0.769		
Completed secondary school or higher	1.20 (0.75–1.90)	0.449		
Married/common law spouse (ref: single/never married)	0.98 (0.70–1.37)	0.910		
Worked in the formal economy (past year) ²	0.86 (0.53–1.40)	0.554		
History of deportation from U.S. (ref: never deported)				
Last deported ≤ 4 years ago	1.02 (0.61–1.69)	0.951	0.99 (0.55–1.78)	0.977
Last deported > 4 years ago	0.70 (0.47–1.06)	0.092*	0.63 (0.39–1.03)	0.064
Drug use variables				
Duration of injecting (per 1-year increase)	1.00 (0.98–1.02)	0.887		
Ever received professional help for drug use (excluding MMT) ²	1.03 (0.72–1.48)	0.856		
Ever enrolled in MMT ²	0.99 (0.69–1.43)	0.959		
Risk environment variables				
Reside in the Zona Norte ²	0.83 (0.57–1.21)	0.341		
Mostly lived in unstable housing (past 6m) ²	0.97 (0.69–1.37)	0.878		
Health-related variables				
Tested HIV positive at baseline	5.85 (3.29–10.40)	< 0.001*	8.05 (3.59–18.03)	< 0.001
Time-varying covariates³				
Drug use variables				
Injected ≥ daily on average (past 6m) ²	0.47 (0.30–0.75)	0.001*	0.57 (0.34–0.97)	0.039
Heroin/Methamphetamine co-injection (past 6m) ²	0.48 (0.33–0.71)	< 0.001*	0.51 (0.34–0.76)	0.001
Marijuana use (past 6m; ref: never)				
Less than daily	0.89 (0.54–1.48)	0.659		
≥ daily	1.49 (0.87–2.56)	0.144		
Methamphetamine smoking (past 6m; ref: never)				
Less than daily	0.96 (0.59–1.57)	0.855		
≥ daily	1.06 (0.64–1.76)	0.828		
Currently need help for drug use (ref: no need)				
Some need	0.79 (0.45–1.39)	0.415		
Great or urgent need	1.19 (0.70–2.02)	0.530		
On MMT (past 6m) ²	2.24 (1.16–4.34)	0.017*	2.04 (1.02–4.08)	0.045
Experienced a drug overdose (past 6m) ²	1.36 (0.69–2.71)	0.378		
Risk environment variables				
Arrested by law enforcement (past 6m) ²	1.44 (0.98–2.10)	0.062*	1.66 (1.07–2.57)	0.023
Time spent incarcerated (past 6m; ref: never)				
≤ one week	1.54 (0.93–2.52)	0.091*	1.65 (0.95–2.86)	0.077
> one week	1.04 (0.52–2.08)	0.911*	1.24 (0.61–2.54)	0.548
Concerned for personal safety (past 6m; ref: not at all)				
Rarely	0.47 (0.26–0.86)	0.015*	0.50 (0.26–0.94)	0.033
Sometimes	0.64 (0.37–1.11)	0.110	0.58 (0.33–1.03)	0.061
Often	1.32 (0.73–2.37)	0.359	1.16 (0.63–2.15)	0.634
Always	4.35 (2.53–7.50)	< 0.001*	3.54 (1.98–6.35)	< 0.001

Variables considered in multivariable model ($p \leq 0.10$) denoted by an asterisk. Significant results in multivariable model ($p < 0.05$) bolded.

¹ Collected at baseline.

² Yes vs. no.

³ Lagged by two interviews, to capture the interview period prior to the start of a six-month period of cessation.

predicted IDU cessation. Participants who were recently arrested had a higher hazard of IDU cessation. This finding possibly reflects PWID engaging in help-seeking behaviors, as previous analysis of El Cuete data has found that police encounters in Tijuana commonly occur in proximity to OST centers (Werb et al., 2016). Second, it is possible that participants who had negative encounters with police may be motivated to cease IDU to avoid future encounters. This theory fits with our second finding that participants who were always concerned for their safety had a significantly higher hazard of IDU cessation compared with those who were not at all concerned. A potential explanation is that fear for personal safety may lead PWID to avoid the ‘drug scene’ (McNeil et al., 2014; Wood et al., 2017), potentially limiting access to drug supply and thereby promoting cessation. We did not ask participants about the reasons for their concerns; however previous research has found drug users commonly report being both verbally and physically abused by police in Tijuana (Pinedo et al., 2014a; Wood et al., 2017). It is also important to consider unintended negative consequences arising from negative police encounters and withdrawal from the drug scene.

For example, PWID who use drugs at home alone may be at increased risk of an adverse outcome in the event of a drug overdose (Davidson et al., 2003). Taken together, our findings of an association between recent arrest, concern for personal safety and IDU cessation suggest that further examination of PWID’s interactions with police and potential impacts on public health outcomes is warranted. We highlight the importance of educating police about OST and other harm reduction services. Recent research by our group found that 86% of Tijuana police officers participating in a police education program agreed that drug addiction is a disease, and 56% agreed that it is the role of police to refer PWID to health and social services (Cepeda et al., 2017; Strathdee et al., 2015), suggesting that police are amenable to facilitating access to treatment for PWID.

Findings from this study must be considered in light of some limitations. A small percentage of our cohort (15%) was excluded from analysis due to missing data or loss to follow-up after baseline. Although there were few significant differences between retained and excluded participants, we cannot ignore the potential impact of

selection bias on our findings. Our estimates regarding the relationship between HIV testing and IDU cessation may be conservative given that excluded participants were more likely to test HIV positive at baseline. As with much research among PWID, data collected through self-report may also be subject to recall bias. Our study detected a low IDU cessation rate over a median follow-up period of 46 months resulting in a small sample size for examining predictors of IDU cessation. We were unable to fully explore differences in deportation history due to the low number of cessation events among this group; however, analyses indicate an association in the direction of lower cessation among deported migrants. Future studies should make concerted efforts to include larger numbers of deported migrants, particularly newly deported migrants, which could enable a detailed examination of the unique experiences and factors influencing IDU cessation among this group. Finally, our analysis only examined predictors of the first cessation event; given the relapsing nature of drug use, future analyses examining relapse to IDU and recurrent cessation events will be informative.

5. Conclusion

This study is one of the first to examine IDU cessation among a cohort of community-recruited PWID outside high-income country settings. A low rate of IDU cessation was recorded. Given that over half our sample reported needing help for their drug use, our findings underscore the importance of expansion of OST to help reduce drug use and facilitate IDU cessation for those who wish to do so. Interventions addressing individual-level economic barriers as well as broader social and structural barriers to OST are integral. Given high levels of engagement in the criminal justice system, providing harm reduction education to police may play an important role in improving public health outcomes for PWID.

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Contributors

DH and BSW conceptualized the manuscript. DH and TG conducted data analysis. DH drafted the manuscript. All authors commented, and contributed text, and approved the manuscript to be submitted.

Conflict of interest

No conflict declared.

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