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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 ≥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

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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 Interests

No conflict declared.

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.

Keywords

Injecting Drug Use; Cessation; Mexico

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; Mathers et al., 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, 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 coinjection) 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 2011–2012, 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 (In Tec 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:

2.2.1. 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.

2.2.2. 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.

2.2.3. 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

2.2.4. 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 the first cessation.

An extended Cox model was used to identify predictors of time to the 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 $p\leq0.10$ 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 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 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 consider 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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References

Bazzi AR, Syvertsen JL, Rolon ML, Martinez G, Rangel G, Vera A, Amaro H, Ulibarri MD, Hernandez DO, Strathdee SA. Social and structural challenges to drug cessation among couples in Northern Mexico: Implications for drug treatment in underserved communities. J Subst Abuse Treat. 2016; 61:26–33. [PubMed: 26470596]

Boeri MW, Harbry L, Gibson D. A qualitative exploration of trajectories Among suburban users of methamphetamine. J Ethnogr Qual Res. 2009; 3:139–151. [PubMed: 21552386]

Bourgois P. The moral economies of homeless heroin addicts: Confronting ethnography, HIV risk, and everyday violence in San Francisco shooting encampments. Subst Use Misuse. 1998; 33:2323–2351. [PubMed: 9758016]

Boyd J, Fast D, Hobbins M, McNeil R, Small W. Social-structural factors influencing periods of injection cessation among marginalized youth who inject drugs in Vancouver, Canada: An ethno-epidemiological study. Harm Reduct J. 2017; 14:31. [PubMed: 28583136]

Brouwer KC, Case P, Ramos R, Magis-Rodriguez C, Bucardo J, Patterson TL, Strathdee SA. Trends in the production and trafficking and consumption of methamphetamine and cocaine in Mexico. Subst Use Misuse. 2006; 41:707–727. [PubMed: 16603456]

Brouwer KC, Lozada R, Cornelius W, Firestone Cruz M, Magis-Rodriguez C, Zuniga de Nuncio ML, Strathdee SA. Deportation along the U.S.–Mexico Border: Its relation to drug use patterns and accessing care. J Immigr Minor Health. 2009; 11:1–6. [PubMed: 18247117]

Bruneau J, Brogly SB, Tyndall MW, Lamothe F, Franco EL. Intensity of drug injection as a determinant of sustained injection cessation among chronic drug users: The interface with social factors and service utilization. Addiction. 2004; 99:727–737. [PubMed: 15139871]

Bucardo J, Brouwer KC, Magis-Rodriguez C, Ramos R, Fraga M, Perez SG, Patterson TL, Strathdee SA. Historical trends in the production and consumption of illicit drugs in Mexico: Implications for the prevention of blood borne infections. Drug Alcohol Depend. 2005; 79:281–293. [PubMed: 16102372]

Case P, Ramos R, Brouwer KC, Firestone-Cruz M, Pollini RA, Fraga MA, Patterson TL, Strathdee SA. At the borders, on the edge: Use of injected methamphetamine in Tijuana and Ciudad Juarez, Mexico. J Immigr Minor Health. 2008; 10:23–33. [PubMed: 17516170]

Cepeda JA, Strathdee SA, Arredondo J, Mittal ML, Rocha T, Morales M, Clairgue E, Bustamante E, Abramovitz D, Artamonova I, Banuelos A, Kerr T, Magis-Rodriguez CL, Beletsky L. Assessing police officers' attitudes and legal knowledge on behaviors that impact HIV transmission among people who inject drugs. Int J Drug Policy. 2017; 50:56–63. [PubMed: 29028564]

Davidson PJ, McLean RL, Kral AH, Gleghorn AA, Edlin BR, Moss AR. Fatal heroin-related overdose in San Francisco, 1997–2000: A case for targeted intervention. J Urban Health. 2003; 80:261–273. [PubMed: 12791802]

DeBeck K, Kerr T, Bird L, Zhang R, Marsh D, Tyndall M, Montaner J, Wood E. Injection drug use cessation and use of North America's first medically supervised safer injecting facility. Drug Alcohol Depend. 2011; 113:172–176. [PubMed: 20800976]

Degenhardt L, Bucello C, Mathers B, Briegleb C, Ali H, Hickman M, McLaren J. Mortality among regular or dependent users of heroin and other opioids: A systematic review and meta-analysis of cohort studies. Addiction. 2011; 106:32–51. [PubMed: 21054613]

Des Jarlais DC, Feelemyer JP, Modi SN, Abdul-Quader A, Hagan H. High coverage needle/syringe programs for people who inject drugs in low and middle income countries: A systematic review. BMC Public Health. 2013; 13:1–13. [PubMed: 23280303]

Dutta A, Wirtz AL, Baral S, Beyrer C, Cleghorn FR. Key harm reduction interventions and their impact on the reduction of risky behavior and HIV incidence among people who inject drugs in low-income and middle-income countries. Curr Opin HIV AIDS. 2012; 7:362–368. [PubMed: 22647588]

Evans JL, Hahn JA, Lum PJ, Stein ES, Page K. Predictors of injection drug use cessation and relapse in a prospective cohort of young injection drug users in San Francisco, CA (UFO Study). Drug Alcohol Depend. 2009; 101:152–157. [PubMed: 19181458]

Gaines TL, Beletsky L, Arredondo J, Werb D, Rangel G, Vera A, Brouwer K. Examining the spatial distribution of law enforcement encounters among people who inject drugs after implementation of Mexico's drug policy reform. J Urban Health. 2015; 92:338–351. [PubMed: 25300503]

Galai N, Safaeian M, Vlahov D, Bolotin A, Celentano DD. Longitudinal patterns of drug injection behavior in the ALIVE study cohort,1988-2000: Description and determinants. Am J Epidemiol. 2003; 158:695–704. [PubMed: 14507606]

Genberg BL, Gange SJ, Go VF, Celentano DD, Kirk GD, Latkin CA, Mehta SH. The effect of neighborhood deprivation and residential relocation on long-term injection cessation among injection drug users (IDUs) in Baltimore, Maryland. Addiction. 2011a; 106:1966–1974. [PubMed: 21592251]

Genberg BL, Gange SJ, Go VF, Celentano DD, Kirk GD, Mehta SH. Trajectories of injection drug use over 20 years (1988–2008) in Baltimore, Maryland. Am J Epidemiol. 2011b; 173:829–836. [PubMed: 21320867]

Gonzalez-Barrera A, Krogstad JM. U.S. deportations of immigrants reach record high in 2013. 2014

Guise A, Seguin M, Mburu G, McLean S, Grenfell P, Islam Z, Filippovych S, Assan H, Low A, Vickerman P, Rhodes T. Integrated opioid substitution therapy and HIV care: A qualitative systematic review and synthesis of client and provider experiences. AIDS Care. 2017; 29:1119–1128. [PubMed: 28281354]

Hadland SE, Wood E, Nosova E, Kerr T, DeBeck K. Cessation of injecting and preceding drug use patterns among a prospective cohort of street-involved youth. J Adolesc Health. 2017; 61:612–618. [PubMed: 28867353]

Harvey-Vera AY, González-Zúñiga P, Vargas-Ojeda AC, Medina-Mora ME, Magis-Rodríguez CL, Wagner K, Strathdee SA, Werb D. Risk of violence in drug rehabilitation centers: Perceptions of people who inject drugs in Tijuana, Mexico. Subst Abuse Treat Prev Policy. 2016; 11:1–9. [PubMed: 26733043]

Huo D, Bailey SL, Ouellet LJ. Cessation of injection drug use and change in injection frequency: The Chicago needle exchange evaluation study. Addiction. 2006; 101:1606–1613. [PubMed: 17034440]

Instituto Nacional de Salud Pública. Encuesta Nacional de Consumo de Drogas, Alcohol y Tabaco, 2016–2017: Consumo de drogas: prevalencias globales, tendencias y variaciones estatales [National survey on drug consumption, alcohol and tobacco, 2016–2017: Drug consumption: Global prevalences, trends and state variations]. 2017. https://www.gob.mx/cms/uploads/attachment/file/234856/CONSUMO_DE_DROGAS.pdf. (accessed 05/12/2017)

Kimber J, Copeland L, Hickman M, Macleod J, McKenzie J, De Angelis D, Robertson JR. Survival and cessation in injecting drug users: Prospective observational study of outcomes and effect of opiate substitution treatment. BMJ. 2010; 341:c3172. [PubMed: 20595255]

Knight R, Fast D, DeBeck K, Shoveller J, Small W. "Getting out of downtown": A longitudinal study of how street-entrenched youth attempt to exit an inner city drug scene. BMC Public Health. 2017; 17:376. [PubMed: 28464942]

Langendam MW, van Brussel GH, Coutinho RA, van Ameijden EJ. Methadone maintenance and cessation of injecting drug use: Results from the Amsterdam Cohort Study. Addiction. 2000; 95:591–600. [PubMed: 10829334]

Luchenski S, Ti L, Hayashi K, Dong H, Wood E, Kerr T. Protective factors associated with short-term cessation of injection drug use among a Canadian cohort of people who inject drugs. Drug Alcohol Rev. 2015; 35:620–627. [PubMed: 26661408]

Masferrer C, Roberts BR. Going back home? Changing demography and geography of Mexican return migration. Popul Res Policy Rev. 2012; 31:465–496.

Mathers B, Degenhardt D, Bucello C, Lemon J, Wiessing L, Hickman M. Mortality among people who inject drugs: A systematic review and meta-analysis. Bull World Health Organ. 2013; 91:102–123. [PubMed: 23554523]

Mathers BM, Degenhardt L, Ali H, Wiessing L, Hickman M, Mattick RP, Myers B, Ambekar A, Strathdee SA. HIV prevention, treatment, and care services for people who inject drugs: A systematic review of global, regional, and national coverage. Lancet. 2010; 375:1014–1028. [PubMed: 20189638]

Mathers BM, Degenhardt L, Phillips B, Wiessing L, Hickman M, Strathdee SA, Wodak A, Panda S, Tyndall M, Toufik A, Mattick RP. Global epidemiology of injecting drug use and HIV among people who inject drugs: A systematic review. Lancet. 2008; 372:1733–1745. [PubMed: 18817968]

McNeil R, Shannon K, Shaver L, Kerr T, Small W. Negotiating place and gendered violence in Canada's largest open drug scene. Int J Drug Policy. 2014; 25:608–615. [PubMed: 24332972]

Meacham MC, Rudolph AE, Strathdee SA, Rusch ML, Brouwer KC, Patterson TL, Vera A, Rangel G, Roesch SC. Polydrug use and HIV risk among people who inject heroin in Tijuana, Mexico: A latent class analysis. Subst Use Misuse. 2015; 50:1351–1359. [PubMed: 26444185]

Meacham MC, Strathdee SA, Rangel G, Armenta RF, Gaines TL, Garfein RS. Prevalence and correlates of heroin-methamphetamine co-injection among persons who inject drugs in San Diego, California, and Tijuana, Baja California, Mexico. J Stud Alcohol Drugs. 2016; 77:774–781. [PubMed: 27588536]

Mehta SH, Sudarshi D, Srikrishnan AK, Celentano DD, Vasudevan CK, Anand S, Kumar MS, Latkin C, Solomon S, Solomon SS. Factors associated with injection cessation, relapse and initiation in a community-based cohort of injection drug users in Chennai, India. Addiction. 2012; 107:349–358. [PubMed: 21815960]

Mora-Ríos J, Ortega-Ortega M, Medina-Mora ME. Addiction-related stigma and discrimination: A qualitative study in treatment centers in Mexico City. Subst Use Misuse. 2016:1–10.

Nambiar D, Agius PA, Stoove M, Hickman M, Dietze P. Cessation of injecting drug use: The effects of health service utilisation, drug use and demographic factors. Drug Alcohol Depend. 2015; 154:208–213. [PubMed: 26154480]

Nelson PK, Mathers BM, Cowie B, Hagan H, Des Jarlais D, Horyniak D, Degenhardt L. Global epidemiology of hepatitis B and hepatitis C in people who inject drugs: Results of systematic reviews. Lancet. 2011; 378:571–583. [PubMed: 21802134]

O'Keefe D, Stoové M, Doyle J, Dietze P, Hellard M. Injecting drug use in low and middle-income countries: Opportunities to improve care and prevent harm. J Viral Hepat. 2017; 24:714–724. [PubMed: 28632952]

Pinedo M, Burgos JL, Ojeda AV, FitzGerald D, Ojeda VD. The role of visual markers in police victimization among structurally vulnerable persons in Tijuana, Mexico. Int J Drug Policy. 2014a; 26:501–508. [PubMed: 25281235]

Pinedo M, Burgos JL, Ojeda VD. A critical review of social and structural conditions that influence HIV risk among Mexican deportees. Microbes Infect. 2014b; 16:379–390. [PubMed: 24583278]

Pinedo M, Burgos JL, Zuniga ML, Perez R, Macera CA, Ojeda VD. Police victimization among persons who inject drugs along the U.S.-Mexico border. J Stud Alcohol Drugs. 2015; 76:758–763. [PubMed: 26402356]

Pineirua A, Sierra-Madero J, Cahn P, Guevara Palmero RN, Martinez Buitrago E, Young B, Del Rio C. The HIV care continuum in Latin America: Challenges and opportunities. Lancet Infect Dis. 2015; 15:833–839. [PubMed: 26122456]

Pitpitan EV, Goodman-Meza D, Burgos JL, Abramovitz D, Chavarin CV, Torres K, Strathdee SA, Patterson TL. Prevalence and correlates of HIV among men who have sex with men in Tijuana, Mexico. J Int AIDS Soc. 2015; 18:19304. [PubMed: 25669423]

Pollini RA, Alvelais J, Gallardo M, Vera A, Lozada R, Magis-Rodriguez C, Strathdee S. The Harm Inside: Injection during incarceration among male injection drug users in Tijuana, Mexico. Drug Alcohol Depend. 2009; 103:52–58. [PubMed: 19386448]

Rafful, C., Medina-Mora, ME. Involuntary drug treatment narratives among people who inject drugs in Tijuana, Mexico; U.S. National Harm Reduction Conference; San Diego, USA. 2016. http://harmreduction.org/our-work/national-conference/ (accessed February 8, 2018)

Ranganathan P, Pramesh C. Censoring in survival analysis: Potential for bias. Perspect Clin Res. 2012; 3:40. [PubMed: 22347702]

Robertson A, Garfein RS, Wagner KD, Mehta SR, Magis-Rodriguez C, Cuevas-Mota J, Moreno-Zuniga PG, Strathdee SA. Evaluating the impact of Mexico's drug policy reforms on people who inject drugs in Tijuana, B.C., Mexico, and San Diego, CA, United States: A binational mixed methods research agenda. Harm Reduct J. 2014a; 11:4. [PubMed: 24520885]

Robertson A, Syvertsen J, Ulibarri M, Rangel G, Martinez G, Strathdee S. Prevalence and correlates of HIV and sexually transmitted infections among female sex workers and their non-commercial male partners in two Mexico-USA border cities. J Urban Health: Bulletin of the New York Academy of Medicine. 2014b; 91:752–767.

Rusch ML, Lozada R, Pollini RA, Vera A, Patterson TL, Case P, Strathdee SA. Polydrug use among IDUs in Tijuana, Mexico: Correlates of methamphetamine use and route of administration by gender. J Urban Health. 2009; 86:760–775. [PubMed: 19521780]

Sapag JC, Sena BF, Bustamante IV, Bobbili SJ, Velasco PR, Mascayano F, Alvarado R, Khenti A. Stigma towards mental illness and substance use issues in primary health care: Challenges and opportunities for Latin America. Glob Public Health. 2017; :1–13.doi: 10.1080/17441692.2017.1356347

Shah NG, Galai N, Celentano DD, Vlahov D, Strathdee SA. Longitudinal predictors of injection cessation and subsequent relapse among a cohort of injection drug users in Baltimore, MD, 1988–2000. Drug Alcohol Depend. 2006; 83:147–156. [PubMed: 16364568]

Steensma C, Boivin JF, Blais L, Roy E. Cessation of injecting drug use among street-based youth. J Urban Health. 2005; 82:622–637. [PubMed: 16195471]

Strathdee SA, Arredondo J, Rocha T, Abramovitz D, Rolon ML, Patino Mandujano E, Rangel MG, Olivarria HO, Gaines T, Patterson TL, Beletsky L. A police education programme to integrate occupational safety and HIV prevention: Protocol for a modified stepped-wedge study design with parallel prospective cohorts to assess behavioural outcomes. BMJ Open. 2015; 5:e008958.

Strathdee SA, Lozada R, Ojeda VD, Pollini RA, Brouwer KC, Vera A, Cornelius W, Nguyen L, Magis-Rodriguez C, Patterson TL. Differential effects of migration and deportation on HIV infection among male and female injection drug users in Tijuana, Mexico. PLoS ONE. 2008; 3:e2690. [PubMed: 18665250]

Strathdee SA, Magis-Rodriguez C, Mays VM, Jimenez R, Patterson TL. The emerging HIV epidemic on the Mexico-U.S. border: An international case study characterizing the role of epidemiology in surveillance and response. Ann Epidemiol. 2012; 22:426–438. [PubMed: 22626001]

Strike C, Millson M, Hopkins S, Smith C. What is low threshold methadone maintenance treatment? Int J Drug Policy. 2013; 24:e51–56. [PubMed: 23743178]

Syvertsen J, Pollini RA, Lozada R, Vera A, Rangel G, Strathdee SA. Managing la malilla: Exploring drug treatment experiences among injection drug users in Tijuana, Mexico, and their implications for drug law reform. Int J Drug Policy. 2010; 21:459–465. [PubMed: 20800464]

Syvertsen JL, Bazzi AR, Mittal ML. Hope amidst horror: Documenting the effects of the “War On Drugs” among female sex workers and their intimate partners in Tijuana, Mexico. Med Anthropol. 2017; 36:566–583. [PubMed: 28414530]

Teesson M, Marel C, Darke S, Ross J, Slade T, Burns L, Lynskey M, Memedovic S, White J, Mills KL. Long-term mortality, remission, criminality and psychiatric comorbidity of heroin dependence: 11-year findings from the Australian Treatment Outcome Study. Addiction. 2015; 110:986–993. [PubMed: 25619110]

United Nations Office on Drugs and Crime. World Drug Report 2016. United Nations publication; 2016. Sales No. E.16.XI.7. https://www.unodc.org/doc/wdr2016/WORLD_DRUG_REPORT_2016_web.pdf (accessed February 8, 2018)

Weiss L, Gass J, Egan JE, Ompad DC, Trezza C, Vlahov D. Understanding prolonged cessation from heroin use: Findings from a community-based sample. J Psychoactive Drugs. 2014; 46:123–132. [PubMed: 25052788]

Werb D, Kerr T, Buxton J, Shoveller J, Richardson C, Montaner J, Wood E. Patterns of injection drug use cessation during an expansion of syringe exchange services in a Canadian setting. Drug Alcohol Depend. 2013; 132:535–540. [PubMed: 23642315]

Werb D, Strathdee SA, Meza E, Rangel Gomez MG, Palinkas L, Medina-Mora ME, Beletsky L. Institutional stakeholder perceptions of barriers to addiction treatment under Mexico’s drug policy reform. Glob Public Health. 2017; 12:519–530. [PubMed: 28278755]

Werb D, Strathdee SA, Vera A, Arredondo J, Beletsky L, Gonzalez-Zuniga P, Gaines T. Spatial patterns of arrests, police assault, and addiction treatment center locations in Tijuana, Mexico. Addiction. 2016; 111:1246–1256. [PubMed: 26879179]

Werb D, Wagner KD, Beletsky L, Gonzalez-Zuniga P, Rangel G, Strathdee SA. Police bribery and access to methadone maintenance therapy within the context of drug policy reform in Tijuana, Mexico. Drug Alcohol Depend. 2015; 148:221–225. [PubMed: 25655577]

West BS, Abramovitz D, Staines H, Vera A, Patterson TL, Strathdee SA. Predictors of injection cessation and relapse among female sex workers who inject drugs in two Mexican-US Border Cities. J Urban Health. 2015; 93:141–154.

Wood EF, Werb D, Beletsky L, Rangel G, Cuevas Mota J, Garfein RS, Strathdee SA, Wagner KD. Differential experiences of Mexican policing by people who inject drugs residing in Tijuana and San Diego. Int J Drug Policy. 2017; 41:132–139. [PubMed: 28111221]

Xia Y, Seaman S, Hickman M, Macleod J, Robertson R, Copeland L, McKenzie J, De Angelis D. Factors affecting repeated cessations of injecting drug use and relapses during the entire injecting career among the Edinburgh Addiction Cohort. Drug Alcohol Depend. 2015; 151:76–83. [PubMed: 25869544]

Highlights

- One of the first studies to examine injection drug use (IDU) cessation in a low/middle-income setting.
- A low rate of IDU cessation was recorded (7.3 per 100 person-years).
- Health, drug use and risk environment characteristics predicted IDU cessation.
- There is a pressing need for expansion of opioid substitution therapy in Tijuana.

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 low 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 ≥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)
≥daily	51 (8)
Methamphetamine smoking (past 6m)	
Never	364 (59)
Less than daily	176 (28)
≥daily	81 (13)
Currently need help for drug use	

	N=621 n (%)
No need	82 (13)
Some need	225 (36)
Great or urgent need	314 (51)
Ever received professional help for drug use (excl. MMT)	444 (72)
No	176 (28)
Yes	
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)
≤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	
No	603 (97)
Yes	18 (3)

Missing data excluded.

[1] Tijuana's red light district

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 covariates[1]				
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) Last deported >4 years ago	1.02 (0.61 – 1.69) 0.70 (0.47 – 1.06)	0.951 0.092*	0.99 (0.55 – 1.78) 0.63 (0.39 – 1.03)	0.977 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[1]	0 83 (0 57 – 1 21)	0 341		
Mostly lived in unstable housing (past 6m)[1]	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 covariates[3]				
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		

Variable	Unadjusted Hazard Ratio (95% CI)	p-value	Adjusted Hazard Ratio (95% CI)	p-value
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)	0.47 (0.26 – 0.86)	0.015*	**0.50 (0.26 – 0.94)**	**0.033**
Rarely	0.64 (0.37 – 1.11)	0.110	0.58 (0.33 – 1.03)	0.061
Sometimes	1.32 (0.73 – 2.37)	0.359	1.16 (0.63 – 2.15)	0.634
Often	4.35 (2.53 – 7.50)	<0.001*	**3.54 (1.98 – 6.35)**	**<0.001**
Always				

[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

Variables considered in multivariable model (p≤0.10) denoted by an asterisk

Significant results in multivariable model (p<0.05) bolded