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Impact of cumulative incarceration and the post-release period on syringe sharing among people who inject drugs in Tijuana, Mexico: A longitudinal analysis

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Abstract

Background and aims: Syringe sharing among people who inject drugs, which can occur during incarceration and post-release, has been linked with increased risk of blood borne infections. We aimed to investigate the cumulative effect of repeated incarceration and the post-release period on receptive syringe sharing.

Design: Ongoing community-based cohort, recruited through targeted sampling between 2011–2012 with 6-month follow-ups.

Setting: Tijuana, Mexico.

Participants: Sample of 185 participants (median age 35 years; 67% female) with no history of incarceration at study entry, followed to 2017.

Measurements: Cumulative incarceration and post-release period were constructed from incarceration events reported in the past 6 months for each study visit. Receptive syringe sharing in the past 6 months was assessed as a binary variable. We used logistic regression with generalized estimating equations to examine the association between cumulative incarceration events and the post-release period with receptive syringe sharing over time. Missing data were handled through multiple imputation.

Findings: At baseline, 65% of participants engaged in receptive syringe sharing in the prior 6 months. At follow-up, 150 (81%) participants experienced a total of 358 incarceration events (median 2; IQR 1–3). The risk of receptive syringe sharing increased with the number of repeated

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incarcerations. Compared with never incarcerated, those with one incarceration had 1.28 (95% CI 0.97–1.68) higher adjusted odds of syringe sharing; two to three incarcerations, 1.42 (95% CI 1.02–1.99); and more than three incarcerations, 2.10 (95% CI 1.15–3.85). Participants released within past 6 months had 1.53 (95% CI 1.14–2.05) higher odds of sharing syringes compared with those never incarcerated. This post-release risk continued up to 1.5 years post-incarceration (aOR 1.41 95% CI 1.04–1.91) but then waned.

Conclusions: A longitudinal community cohort study among people who inject drugs, suggested that the effects of incarceration on increased injecting risk, measured through syringe sharing, are cumulative and persist in the post-release period.

Keywords

Cumulative incarceration; Post-release; Reentry; Longitudinal; PWID; Tijuana; Multiple Imputation

Introduction

Growing evidence suggests that punitive drug policies have failed to reduce drug use, crime, and adverse health outcomes (1). Globally, people who inject drugs (PWID) face disproportionately higher rates of incarceration and higher prevalence of associated infections such as HIV, hepatitis C virus (HCV), and tuberculosis than persons who do not inject drugs (2, 3). Among PWID, having a drug related sentence and resuming injection drug use after release from prison have been associated with a twofold higher risk of reincarceration (4). A recent meta-analysis found a strong association between recent incarceration and increased risk of acquiring HIV (twofold increase) and HCV (1.5 increase) among PWID. Past incarceration was also associated with increased HIV and HCV risks (5). However, understanding the mechanisms driving the elevated risk of infection associated with incarceration, warrants further study. While the link between recent incarceration and syringe sharing has been previously established (6–8), to our knowledge, no studies have examined whether there is an association between the cumulative effect of repeated incarceration and receptive syringe sharing. As opposed to distributive syringe sharing, receptive syringe sharing is of more relevance as it is a proxy for direct exposure to study blood-borne infections.

While blood borne infections are prevalent among PWID (3), for those not infected, the risk may increase during incarceration and upon release (9, 10). Inside prisons, continued injection drug use, lack of harm reduction services, and increased frequency of syringe sharing have been associated with incident HIV/HCV infection (3, 11–13). During the post-release period, which is characterized by lack of treatment and harm reduction, and disruption of social networks, transitioning back to the community has been associated with increased risk of relapse, fatal overdose, and injection risk behaviors (10, 14–18).

The border city of Tijuana, Baja California, Mexico, is situated along a major drug trafficking route to the United Sates. Characterized by homelessness, public injecting, and lack of access to health services, an estimated 10,000 PWID are at increased risk of blood borne infections (BBI) (19, 20). In 2009, the Mexican government passed a public

health-oriented drug reform, decriminalizing small possession of illicit drugs for personal use and adopting a harm reduction strategy through diverting individuals to treatment instead of incarceration (21). Despite this, approximately 75% of PWID in Tijuana have a history of incarceration (22) and about a third had shared syringes inside prison (23). A study among PWID in Tijuana, found that recent incarceration (released in past 6 months) has been associated with increased odds of receptive syringe sharing at baseline (24). However, as the number of previous incarcerations was unaccounted, it is unknown if there was a cumulative effect of repeated incarcerations.

This study aims to fill this gap by investigating the longitudinal association between cumulative incarceration events and receptive syringe sharing among a sample of PWID in Tijuana, with no history of incarceration. Given the risk of receptive syringe sharing post-incarceration, we also assessed the post-release period on the odds of receptive syringe sharing.

Methods

Study Sample

We used data from an ongoing community-based cohort study of PWID in Tijuana, Mexico (El Cuete-IV) (25). Between 2011 and 2012 baseline data were collected with follow-up surveys every 6 months. Targeted sampling consisting of street outreach in 10 neighborhoods across Tijuana was used to recruit participants who were 18 years of age or older, had injected drugs in the past month, and were currently living in Tijuana. At baseline and semiannually thereafter, trained interviewers using computer-assisted personal interviews administered questionnaires collected data on socio-demographics, drug use behaviors, drug treatment experiences, justice involvement, migration history, and drug related harms and health outcomes (25). For the present analysis we included PWID recruited between April 2011 and June 2012 and followed for approximately 54 months (visits 1 through 10). We included only those participants who reported never being incarcerated at baseline to exclude participants who may already have been at increased risk of reincarceration and/or syringe sharing associated with previous incarceration (Supplemental Table S1 shows characteristics of participants included compared to those excluded from this analysis). This study was approved by the Ethics Board at the University of California San Diego and Xochicalco University in Tijuana. All participants provided written informed consent.

Measures

Outcome: The outcome of this study was self-reported receptive syringe sharing in the past 6 months, which was defined as the frequency of using a syringe that had been, or suspected to have been, used by others (with categories ranging from 1–5; “never” to “always”). We dichotomized to “never” versus “ever,” because we considered that injecting with a used syringe (regardless if it is always or a few times) already puts individuals at significantly increased risk of acquiring blood borne infections compared to always using clean syringes.

Exposure: Our study had two main exposures, cumulative incarceration events and post-release period.

We defined cumulative incarceration as the number of incarceration events reported by participants over the follow-up period. To construct this variable, we first defined recent incarceration (past 6 months) as any jail or detention event reported in the previous 6 months in any of the study visits after baseline. In Mexico, detention implies remaining in custody between 48 to 144 hours until formally charged or released (usually within 72 hours). Individuals are jailed if convicted of a crime for periods longer than 3 months (26). Under specific circumstances, detention can be extended for weeks and individuals jailed for shorter periods. Access to medical services and harm reduction in jails is limited (27). From the first follow-up (visit 2) to visit 10, we ascertained an incarceration event by inquiring "During the last 6 months, have you spent time in jail?" After visit 6, a separate question was introduced for detention: "In the last 6 months, how many times have you been in a detention center?" Therefore, after visit 6, both variables, "been in detention" and "spent time in jail," could potentially be reported in the same visit. If participants answered yes to either measure, we considered it to be an incarceration event, which was dichotomized to "never" versus "ever." Then, we used recent incarceration to construct the cumulative incarceration variable by aggregating the number of recent incarceration events reported by each participant over the study follow-up period. This variable was analyzed both continuously and categorically, by dividing it into four groups (never incarcerated, one incarceration, 2 to 3 incarcerations, and more than 3).

We defined the post-release period variable as the time elapsed (i.e., number of visits) after a participant had reported being incarcerated. This variable was grouped into five categories: never incarcerated, released within the past six months, released in the past 6 months to 1.5 years, released in the past 1.5 to 2.5 years, and released more than 2.5 years ago (Supplemental Figure S6).

Covariates: We selected covariates for this study based on factors associated with syringe sharing among previously incarcerated PWID, mainly from studies in Tijuana (19, 23, 28–30). Sociodemographic characteristics included variables assessed at baseline such as age, gender, time spent daily on the street, years of education, and receiving income from a formal source. Drug use characteristics included time-varying covariates such as using heroin, methamphetamine, cocaine (including crack), injecting heroin and injected methamphetamine, all reported within the past 6 months. We also constructed a polysubstance use variable from the most prevalent drugs reported in El Cuete cohort at baseline (heroin, methamphetamine, crack/ cocaine, and tranquilizers) considering all routes of administration (31). Individuals consuming more than one drug in the previous 6 months, were counted in the polysubstance group. Injection drug use characteristics included time-varying variables such as getting syringes from a shooting gallery or a syringe exchange program in the past 6 months, and also included age at first injection. We considered injection frequency variables as important covariates in this context; however, these were not included because frequency was inconsistently reported across study visits. We also controlled for: 1) Environmental factors, e.g., living whole life in Tijuana and sex work, both assessed at baseline; 2) access to drug treatment, e.g., getting professional help for alcohol

and drug use, time-varying, and; 3) encounters with law enforcement, e.g., being stopped and arrested, time-varying.

Data analysis

We summarized baseline data using frequency and proportions or median and interquartile range (IQR). Participants' characteristics for those who reported receptive syringe sharing at baseline were compared to those who did not, using the Wilcoxon rank sum test for continuous variables and Chi-square test, or Fisher's exact, for categorical variables.

In order to investigate the longitudinal association between cumulative incarceration and receptive syringe sharing, we used logistic regression with generalized estimating equations (GEE). We specified an exchangeable correlation structure to account for the correlated nature of the repeated measurements among study participants. We assessed the unadjusted association between receptive syringe sharing and each of our *a priori* selected factors. We then fitted a multivariable adjusted model, where we first included all of our *a priori* selected factors and retained a final set after backward elimination using a cut-off p-value of 0.20 (32). This process was repeated for each outcome variable. Cumulative incarceration events were assessed continuously and categorically. Additionally, we tested for a dose-response relationship between cumulative incarceration categories and receptive syringe sharing using the Cochran-Armitage trend test. This test examines if there is a monotonic trend between an ordered categorical exposure and a dichotomous outcome (33).

We developed a separate multivariable GEE model to assess the post-release period.

Treatment of missing data

We assessed the proportion and patterns of missing data across study visits. We initially performed analyses on those with complete data. To account for the potential selection bias derived from this approach, participants with missing observations were incorporated to the analysis using multiple imputation by chained equations (MICE package, R) (34). This method can handle missing data assuming data are missing at random, i.e., missingness can be accounted for by observed covariates (35). We imputed all covariates measured at each visit after baseline using our full set of covariates as predictors. We imputed 15 data sets that were used to conduct our analyses. The estimates obtained from each imputed dataset were pooled based on Rubin's criteria (34). A detailed account of this process is provided in the supplement.

Results

From the 734 participants in El Cuete-IV study, this analysis included 185 who met the criteria of never being incarcerated at baseline.

Missing data over follow-up

Across study visits, we identified both monotonic (permanent loss to follow-up) and intermittent (missing a visit but subsequently participating again) missing data patterns (supplemental Figures S1–S2). After baseline, starting at the first follow-up (visit 2) the

proportion of missing observations (both monotonic and intermittent) was 21% which increased to 42% by visit 10. Monotonic missing data accounted for 3.5% of the total missing data at visit 2 and progressed to 4.9% in visit 10.

Baseline characteristics

Baseline characteristics are presented in Table 1. Participants were predominantly female (67%). Median age was 35 years (inter quartile range [IQR] 29–42). Participants had injected drugs for a median of 13 years (IQR 5–20) and heroin injection was the main drug and administration route of choice (96%). At baseline, 65% participants reported engaging in receptive syringe sharing in the past 6 months, 81% reported ever having received professional help for drugs or alcohol use, and 21% reported getting syringes from a syringe exchange program in the past 6 months. Less than half of participants (38%) reported having been stopped and arrested in the 6 months prior to the baseline interview.

Incarceration events over follow-up

Among the complete cases, 113 (61%) participants experienced a total of 245 incarceration events over the follow-up period (9 visits after baseline). After multiple imputation, 150 (81%) participants experienced a total of 358 incarceration events over the same follow-up period (median 2; IQR 2–3; min 0, max 8, per person).

Overall, 85 (75%) participants reported remaining in custody between one and three days (median=2, IQR: 1–3, min=1, max=180), with only 9% reporting over 1 month in custody. Also, 75% of participants experienced up to three short-term incarcerations with 9 (5%) reaching 6–8 in a 5-year period.

Univariable analysis

From multiply imputed (MI) data, compared to those who were never incarcerated, participants who experienced 2 to 3 incarcerations had higher odds of reporting receptive syringe sharing over the past 6 months (odds ratio [OR] 1.45, 95% confidence interval [CI] 1.05–2.00) and those with more than 3 incarcerations had an almost twofold increase in the odds of engaging in receptive syringe sharing (OR 1.98, 95% CI 1.11–3.52) (Table 2). Injecting methamphetamine (OR 1.63, 95% CI 1.14–2.33), using cocaine (including crack cocaine) (OR 2.15, 95% CI 1.30–3.55), getting syringes from a shooting gallery (OR 2.02, 95% CI 1.29–3.17), and being arrested (OR 1.51, 95% CI 1.38–1.65) were positively associated with receptive syringe sharing. Polysubstance use was negatively associated with receptive syringe sharing (OR 0.70, 95% CI 0.56–0.87).

Cumulative incarceration and receptive syringe sharing

In multivariable analyses from imputed data, we found that compared to those never incarcerated, the odds of receptive syringe sharing increased for participants reporting one incarceration (adjusted odds ratio [aOR] 1.28, 95% CI 0.97–1.68), 2 to 3 incarcerations (aOR 1.42, 95%CI 1.02–1.99), and those with three or more incarcerations had double the odds of engaging in receptive syringe sharing over follow-up (aOR 2.10, 95% CI 1.15–3.85) (Table 3). The Cochran-Armitage test showed evidence of a trend between increasing number of incarceration events and receptive syringe sharing (p=0.003). When

cumulative incarceration was treated as a continuous variable, each additional incarceration event increased the odds of syringe sharing by 18% (aOR 1.17, 95% CI 1.05–1.29).

Injecting methamphetamine (aOR 1.58, 95% CI 1.06–2.36), using cocaine (aOR 2.06, 95% CI 1.19–3.58), and receiving syringes from shooting gallery (aOR 1.88, 95% CI 1.17–3.04) were independently associated with receptive syringe sharing. Polysubstance use resulted in a decreased risk of receptive syringe sharing (aOR 0.70, 95% CI 0.55–0.89).

Post-release period and receptive syringe sharing

Compared to participants never incarcerated during follow-up, those released within the past 6 months had 1.53 (95% CI 1.14–2.05) higher odds of sharing syringes and those released in the previous 6 months to 1.5 years had 1.41 (95% CI 1.04–1.91) higher odds of sharing syringes (Table 4). There was limited evidence of increased syringe sharing for those reporting being released in the previous 1.5 to 2.5 years (aOR 1.15, 95% CI 0.74–1.78), as well as for those reporting release 2.5 years ago or longer (aOR 1.21, 95% CI 0.67–2.19).

We report results for incarceration as a dichotomous variable (Table S7) and from complete case analyses in the supplement (Tables S3 to S7).

Discussion

In this longitudinal study of PWID in Tijuana, Mexico, we included participants with no history of incarceration at study entry, to examine the association between cumulative incarceration events and the post-release period, with receptive syringe sharing over time. We found that individuals with more cumulative incarceration experiences had increased odds of receptive syringe sharing compared to individuals who had never been incarcerated, with every additional incarceration episode increasing the odds of syringe sharing by 17% (aOR 1.17, 95% CI 1.05–1.29). Furthermore, the post-release period was associated with increased odds of receptive syringe sharing, which persisted up to 1.5 years post-incarceration but then waned. These findings suggest that the effects of incarceration on injecting risk are cumulative and persist in the post-release period.

These results contribute to identifying a risk profile of PWID in Tijuana who, in the context of *de facto* criminalization, are more likely to engage in injecting risks. Indeed, we previously identified some of the disruptive effects of criminalization on PWID in Tijuana (21, 30, 36–38). For example, being arrested for carrying unused/sterile syringes, even when syringe purchase and possession is legal in Mexico, was independently associated with a twofold higher odds of receptive syringe sharing (30). However, we still knew little about the long-term effects of punitive policing in this setting.

Our findings expand upon the above as increased exposure to punitive policing, in the form of repeated incarceration, likely due to possession of drugs or drug paraphernalia related infractions (36), inhibits PWID from safe injecting practices (39). Similarly, the post-release period has been characterized by high injecting risks, which might disrupt engagement in safe injecting practices due to the lasting effects of punitive policing such as fear of carrying

clean syringes or injecting hurriedly in the street, both previously associated with syringe sharing (40, 41).

Understanding the iatrogenic effect of incarceration in the PWID cohort has a number of policy implications. First, it highlights the imperative to reduce the number of encounters with the criminal legal system, even among those with a history of such encounters. Effective implementation of deflection and diversion programs can help operationalize this. When encounters do occur, public health prevention dictates that the harm from these encounters must be anticipated and addressed. This includes improving harm reduction programming inside detention settings (42). In Tijuana, this includes syringe service programs and opioid agonist treatment (OAT) (43). Such a policy shift becomes particularly relevant among PWID communities in Tijuana and other border cities in Mexico, where injection drug use is more common than in the rest of the country (44).

Previously, Mexico adopted a public health-oriented drug policy reform (2009–2012) that favored treatment and harm reduction instead of incarceration but failed to materialize (21, 36, 45, 46). Relying on incarceration has likely worsened health outcomes among PWID. This article underscores the impact of detention experience on BBI risk, but that is only one area of health harms emanating from carceral systems to PWID, their partners, and broader community. Effective implementation of these policies and shift towards evidence-based drug treatment during incarceration and after incarceration (e.g., OAT), would decrease the risk of BBI (47, 48). This is especially urgent during the COVID-19 pandemic, when detention settings are an important driver of infection spread.

About polysubstance use's protective effect on receptive syringe sharing. We think this effect is driven by the inclusion of different routes of drug administration in this variable which may not directly impact injecting risks. For example, approximately 41% of participants reported smoking methamphetamine compared to 28% injecting. Also, around 20% of participants ingested tranquilizers (no alternative route was reported). These, in contrast with participants in the non-polysubstance group mostly constituted by individuals injecting heroin (95%).

Limitations

Our study is not without limitations. The El Cuete survey was not specifically developed to explore pre-, during-, and post-incarceration behaviors and risks. As we did not collect data on the specific dates of incarceration and release, our precision on behavior change is limited. Another limitation may stem from the heterogeneity in incarceration exposures. While most of our participants (75%) were in custody for only 1–3 days, a minority remained in custody for more than a month and up to 6 months. The impact of time spent in custody, not assessed in our analysis due to lack of precise data, may be critical in terms of the changes in risk behaviors around the incarceration continuum and warrants further exploration.

We also recognize the high proportion of missing data as a limitation. We believe that our assumption of missing at random (MAR) is plausible as it was assessed through observable variables included in our imputation model (35, 49–51). Complete case analyses under MAR

could be biased (i.e., missing observations are related to patients' characteristics), and the multiple imputation combined with the GEE have been shown to be suitable for addressing this selection bias (35).

Additional limitations may include the following. As is common in research with PWID, data collected through self-report may be subject to imprecision due to recall and social desirability (52). Generalizing our results to other contexts should be taken with caution. For example, border cities like Tijuana have drug use patterns that differ from other cities in Mexico. Also, our subsample consisted of a higher proportion of female (67%) than male (33%) participants, which is not commonly observed among PWID populations. This was due to most men (72%) reporting previous incarceration at baseline who were excluded from the study, while only 28% of women had been previously incarcerated (Supplemental Table S7). However, we also consider this a strength as women have been underrepresented in studies among PWID (53). We did not examine HIV incidence because it is low and could not detect a difference between exposure groups in our already narrowed subsample. We did not conduct HCV testing however previous evidence indicates that most PWID in Tijuana have already been exposed (54). All-cause mortality has already been assessed in West, Abramovitz (20). This analysis was not pre-registered, results should be considered exploratory.

Overall, recent incarceration was associated with increased risk of receptive syringe sharing. The association was stronger for individuals reporting repeated incarceration events and persisted in the post-release period. Our results underpin the need to reduce incarceration and strengthen the link to harm reduction services in the community. This linkage is particularly germane to Tijuana and similar settings, where incarceration and reincarceration for low-level offenders is high and access to health services is poor.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Baseline characteristics of people who inject drugs enrolled in El Cuete-IV cohort in Tijuana, Mexico, who reported never being incarcerated, stratified by receptive syringe sharing in the past 6 months

Variables *(1)(2)(3)*)	Overall	Receptive Syringe Sharing		p-value *(4)*
		No	Yes	
n	**185**	**64**	**121**	
Age (median [IQR])*(5)*	35.0 [29.0, 42.0]	37.0 [30.75, 43.0]	35.0 [29.0, 42.0]	0.242
Gender (%)				
Male	62 (33.5)	22 (34.4)	40 (33.1)	0.987
Female	123 (66.5)	42 (65.6)	81 (66.9)	
Hours spent on Street (median [IQR])	10.0 [6.0, 13.0]	8.50 [4.75, 12.00]	11.0 [8.0, 15.0]	**0.013**
Years of Education (median [IQR])	9.0 [6.0, 11.0]	9.0 [6.0, 10.3]	9.0 [7.0, 11.0]	0.075
Income from Formal Source (%)				
No	161 (87.0)	56 (87.5)	105 (86.8)	>0.99
Yes	24 (13.0)	8 (12.5)	16 (13.2)	
Time Injecting (median [IQR])	13.0 [5.0, 20.0]	16.0 [9.0, 20.3]	12.0 [4.0, 20.0]	0.067
Whole Life in Tijuana (%)				
No	118 (63.8)	34 (53.1)	84 (69.4)	**0.042**
Yes	67 (36.2)	30 (46.9)	37 (30.6)	
Used Heroin (%)				
No	8 (4.4)	2 (3.2)	6 (5.1)	0.716
Yes	173 (95.6)	61 (96.8)	112 (94.9)	
Used Methamphetamine (%)				
No	91 (49.2)	34 (53.1)	57 (47.1)	0.533
Yes	94 (50.8)	30 (46.9)	64 (52.9)	
Used Cocaine/Crack (%)				
No	161 (87.0)	57 (89.1)	104 (86.0)	0.712
Yes	24 (13.0)	7 (10.9)	17 (14.0)	
Injected Heroin (%)				
No	8 (4.4)	2 (3.2)	6 (5.1)	0.716
Yes	173 (95.6)	61 (96.8)	112 (94.9)	
Injected Methamphetamine (%)				
No	135 (73.0)	49 (76.6)	86 (71.1)	0.532
Yes	50 (27.0)	15 (23.4)	35 (28.9)	
Polysubstance use				
No	69 (38.3)	29 (45.3)	40 (34.5)	0.204
Yes	111 (61.7)	35 (54.7)	76 (65.5)	
Got syringes from shooting gallery (%)				
No	169 (91.4)	62 (96.9)	107 (88.4)	0.058
Yes	16 (8.6)	2 (3.1)	14 (11.6)	
Got syringes from exchange program (%)				
No	164 (88.6)	57 (89.1)	107 (88.4)	>0.99

Variables (1)(2)(3))	Overall	Receptive Syringe Sharing		p-value (4)
		No	Yes	
Yes	21 (11.4)	7 (10.9)	14 (11.6)	
Professional Help for Drugs/Alcohol (%)				
No	104 (56.2)	38 (59.4)	66 (54.5)	0.635
Yes	81 (43.8)	26 (40.6)	55 (45.5)	
Stopped and Arrested (%)				
No	114 (61.6)	42 (65.6)	72 (59.5)	0.512
Yes	71 (38.4)	22 (34.4)	49 (40.5)	
Income from Sex Work				
No	124 (67)	43 (67.2)	81 (66.9)	>0.99
Yes	61 (33)	21 (32.8)	40 (33.1)	

(1) All variables are reported for the past 6 months except for age, gender, years of education, and sex work (past year).

(2) Median [IQR] reported for continuous variables and proportions otherwise.

(3) A small percentage of missing values was reported for years of education (2.2%) and for Heroin Use and Heroin Injecting (6.5%).

(4) Chi-square test with continuity correction for categorical variables (except for used heroin, heroin injection, and got syringes from shooting gallery, which display cell counts <5 observations, in which case the Fisher's exact test was used) and Wilcoxon rank sum (Mann-Whitney U) test for continuous variables.

(5) Full range for age [min, max]: overall [18, 60], receptive syringe sharing (yes) [18, 59], receptive sharing syringes (no) [19, 60].

Table 2.

Cumulative incarceration and other factors associated with receptive syringe sharing. Univariable GEE for multiply imputed data. *(1)*

Variable	Unadjusted odds ratio (OR)	95% CI *(2)*	
Cumulative incarceration (ref: no)			
One	1.23	0.95	1.61
2 to 3	**1.45**	**1.05**	**2.00**
>3	**1.98**	**1.11**	**3.52**
Age	0.99	0.97	1.00
Time injecting *(3)*	0.99	0.98	1.01
Gender (ref: male)	0.95	0.74	1.20
Always living in Tijuana (ref: no)	1.29	1.00	1.65
Hours spent on Street	1.02	1.00	1.04
Heroin injecting (ref: no)	1.17	0.92	1.49
Methamphetamine injecting (ref: no)	**1.63**	**1.14**	**2.33**
Cocaine Use (ref: no)	**2.15**	**1.30**	**3.55**
Polysubstance use (ref: no)	**0.70**	**0.56**	**0.87**
Getting professional help for alcohol and drug use (ref: no)	0.82	0.60	1.12
Syringe Exchange (ref: no)	1.28	0.96	1.69
Getting syringes from shooting gallery (ref: no)	**2.02**	**1.29**	**3.17**
Arrested	**1.51**	**1.38**	**1.65**
Income from Sex Work	0.83	0.67	1.07

(1) Multiple imputation using chained equations generating 15 imputed data sets. Imputed sets come from longitudinal data including 9 follow-ups after baseline (10 visits).

(2) Covariates in bold if significant at 5% in the univariable regression.

(3) Time injecting was not included in multivariable analyses due to high correlation with age.

Table 3.

Cumulative incarceration and other factors associated with receptive syringe sharing. Multivariable adjusted GEE for multiply imputed data.[1]

Variable [2]	Adjusted odds ratio (aOR)	95% CI [3]	
Cumulative Incarceration (ref: none) [4]			
One	1.28	0.97	1.68
2 to 3	**1.42**	**1.02**	**1.99**
>3	**2.10**	**1.15**	**3.85**
Age	0.98	0.97	1.00
Heroin injecting (ref: no)	1.27	0.97	1.66
Meth injecting (ref: no)	**1.58**	**1.06**	**2.36**
Cocaine use (ref: no)	**2.06**	**1.19**	**3.58**
Polysubstance use (ref: no)	**0.70**	**0.55**	**0.89**
Getting syringes from shooting gallery (ref: no)	**1.88**	**1.17**	**3.04**

[1] Multiple imputation using chained equations generating 15 imputed data sets. Imputed sets come from longitudinal data including baseline and 9 follow-ups.

[2] Covariates reported are the final set retained after backward elimination using a cut-off p-value of 0.20.

[3] Covariates in bold if significant at 5% in the multivariable regression.

[4] We also assessed cumulative incarceration as continuous variable, instead of categorical, same set of covariates were retained (aOR 1.17, 95% CI 1.05–1.29).

Table 4.

Post-Release Period and other factors associated with receptive syringe sharing. Multivariable adjusted GEE for multiply imputed data.([1])

Variable([2])	Adjusted odds ratio (aOR)	95% CI ([3])	
Post-Release Categories (ref: none)			
Recent (p6m)	**1.53**	**1.14**	**2.05**
Past (6m-1.5yrs	**1.41**	**1.04**	**1.91**
Past (1.5yrs-2.5yrs)	1.15	0.74	1.78
Past (> 2.5)	1.21	0.67	2.19
Age	0.98	0.97	1.00
Heroin injecting (ref: no)	1.23	0.95	1.61
Meth injecting (ref: no)	**1.52**	**1.03**	**2.25**
Cocaine use (ref: no)	**1.99**	**1.15**	**3.48**
Polysubstance use (ref: no)	**0.70**	**0.55**	**0.88**
Getting syringes from shooting gallery (ref: no)	**1.90**	**1.18**	**3.01**

[1]Multiple imputation using chained equations generating 15 imputed data sets. Imputed sets come from longitudinal data including baseline and 9 follow-ups.

[2]Covariates reported are the final set retained after backward elimination using a cut-off p-value of 0.20.

[3]Covariates in bold if significant at 5% in the multivariable regression.