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Correlates of Seeking Injection Assistance among Injection Drug Users in Tijuana, Mexico

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Abstract

Assisted injection among injection drug users (IDUs) remains understudied. We recruited 1056 injecting drug users (IDUs) using respondent driven sampling in Tijuana, Mexico. Participants underwent HIV and syphilis testing and structured interviews. One quarter (25%) sought injection assistance in the past 6 months. Seeking injection assistance was independently associated with being female [Adjusted Odds Ratio (AOR)=2.59; 95% Confidence Interval (CI)=1.73–3.90], being born outside Baja California (AOR=1.75; CI=1.26–2.42), having recent abscesses (AOR=2.59; CI=1.93–3.47), using syringes previously used by others in the past six months (AOR=1.99; CI=1.45–2.71), and ever being arrested for carrying sterile syringes (AOR=1.55; CI=1.15–2.09).

INTRODUCTION

There is a substantial scientific literature on injection practices that place injection drug users (IDUs) at heightened risk for transmission of HIV and other blood borne infections.¹ These practices include sharing syringes and other injection equipment and dividing or loading drugs with a common syringe.²⁻⁴ Syringe sharing is particularly common in certain settings. Injecting in public areas has been associated with a higher likelihood of syringe sharing, which is attributed to the need to hurry injection to avoid police detection.⁵ Shooting galleries have also been identified as a place where high-risk injection is common, as IDUs often visit these establishments for the purpose of renting or borrowing injection equipment.^{6,7} Understanding the environment in which high risk injection behaviors occur is instrumental in developing relevant HIV prevention interventions for IDUs.⁸

Studies in North America have identified injection assistance as a risk factor for HIV infection.⁹⁻¹¹ In a prospective study of IDUs in Vancouver, Canada, 41% reported requiring help injecting, which was independently associated with an elevated risk of HIV seroconversion.¹⁰ Participants requiring help injecting were more likely to be female,

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younger, and have fewer years of injection experience.¹⁰ Other studies in Vancouver have found that injection assistance is independently associated with injecting in public,¹² engaging in receptive syringe sharing (i.e., using syringes previously used by others) and distributive syringe sharing (i.e., allowing others to use syringes previously used by oneself), having IDU sex partners, being female,¹¹ and acquiring cutaneous injection-related infections, such as abscesses.¹³ In the San Francisco Bay Area, IDUs who received help injecting were four times more likely to have shared syringes than other IDUs.⁹ Few studies have described reasons for seeking help injecting, which may include difficulty injecting due to collapsed or inaccessible veins, lacking personal injection equipment, inexperience with injecting oneself, anxiety or withdrawal symptoms, and preferring to inject subcutaneously or in the jugular vein.¹¹

In some settings, IDUs who need help injecting seek the services of ‘hit doctors’ who ‘hit’ (inject) them in exchange for a small fee or a share of their drug supply.^{9,14,15} Hit doctors may operate casually in an IDU network without a defined role, or may act in a semi-professional role, often at a shooting gallery, where they are sought out specifically for their injection skills.^{16,17} In Ho Chi Minh City, Vietnam, IDUs at shooting galleries reported injections by a professional *chu*, who typically provides injections from behind a curtain, drawing the drug supply from a common pot.¹⁶ In Vancouver, IDUs who provided injection assistance were more likely to engage in distributive syringe sharing, frequently inject heroin and cocaine, and binge drug use; typically, these IDUs provided help injecting to casual or close friends.¹⁴

Since the correlates of receiving help injecting from others, including hit doctors, remain understudied among IDUs in resource-constrained settings, we investigated this practice among IDUs in Tijuana, a U.S.-Mexico border city adjacent to San Diego, California. Based on literature from other settings, we hypothesized that IDUs who sought help injecting would be more likely to engage in receptive syringe sharing than those who did not seek help injecting. We also sought to identify social and structural correlates of this behavior that might inform HIV prevention efforts in the U.S.-Mexico border region.

METHODS

Study Setting

With an estimated population of 1.4 million persons in 2005, Tijuana is the largest city on the U.S.-Mexico border.¹⁸ The border crossing between Tijuana and San Diego, California is the busiest land crossing in the world, with >43 million northbound crossings between Tijuana and San Diego County in 2008.¹⁹ Geographic proximity to the U.S. and the promise of local economic opportunities have resulted in Tijuana being the fastest-growing city on the U.S.-Mexico border, with more than half of its residents born outside the state of Baja California.¹⁸ Tijuana is also situated on major drug trafficking routes that carry heroin, cocaine and methamphetamine into the U.S.²⁰ Tijuana's IDU population has been approximated at 10,000.⁵ The increasing HIV prevalence among IDUs in Tijuana²¹ has prompted expansion of needle exchange programs in Tijuana and other Mexican states.²²

Recruitment

Between April 2006 and April 2007, IDUs in Tijuana were recruited into a prospective study of behavioral and contextual risk factors for HIV and syphilis, as previously described.²³ Briefly, eligibility criteria included being age ≥ 18 years, injecting drugs during the past month, speaking Spanish or English, providing informed consent, and planning to reside in Tijuana for the next 18 months. Respondent driven sampling (RDS) was used to recruit participants.²⁴ A group of “seeds” selected for heterogeneity with respect to age, gender, and

geographic location were given uniquely coded coupons to recruit members of their social networks into the study. Recruitment waves continued as subjects returning with coupons were trained to recruit their peers using the same process. Local outreach workers screened and interviewed participants using a modified recreational vehicle and storefront office. The Human Research Protections Program of the University of California, San Diego and the Ethics Board of the Tijuana General Hospital approved all study protocols.

Study Instrument

IDUs completed an interviewer-administered baseline survey eliciting information on socio-demographic, behavioral and contextual factors, including income, living arrangements, mobility, lifetime and current drug use (i.e., during the past 6 months), drug treatment experiences, sexual behaviors, and history of testing and diagnosis of HIV and other health conditions. To assess injection assistance, participants were asked, "In the past 6 months, have you sought the help of someone, like a hit doctor, to help you inject?"

Laboratory Testing

The "Determine"[®] rapid test identified HIV antibodies (Abbott Pharmaceuticals, Boston, MA), and HIV-1 enzyme immunoassay and immunofluorescence assay confirmed all reactive samples. The *Treponema pallidum* particle agglutination assay (Fujirebio, Wilmington, DE, U.S.) confirmed positive syphilis results from the rapid plasma reagin test (Macro-Vue, Becton Dickinson, Cockeysville, MD, U.S.). San Diego County Health Department staff conducted specimen testing. Local outreach workers referred participants with positive test results to the Tijuana municipal health clinic for free care.

Statistical Analysis

Statistical analyses compared IDUs who did and did not seek injection assistance in the past 6 months. Wilcoxon rank sum tests and Fisher's exact tests examined distributional differences between groups for continuous and binary outcomes, respectively. To control for multiple testing, the raw *P* values associated with outcomes within each area of interest (i.e., sociodemographics, social influence, individual behaviors, and structural/environmental factors) were adjusted for false discovery rate (FDR) by using the Hochberg and Benjamini method.²⁵ *P* values noted in Table 1 are FDR adjusted, and the corresponding statistical inferences are based on FDR adjusted *P* values. Univariate and multivariate logistic regression identified factors associated with seeking injection assistance. We considered all variables attaining a significance level <10% in univariate models for inclusion in a final multivariate model. To identify variables independently associated with seeking injection assistance in the past 6 months, we entered these variables into a multiple logistic regression model in a manual stepwise fashion, proceeding from the lowest to highest p-value. To determine which variables were retained in multivariable model, we compared nested models using the likelihood ratio test at a significance level <5%. Lack of multicollinearity between the predictor variables in the final model was confirmed by appropriate values of the largest condition index and of the variance inflation factors.

To correct for differential recruitment bias by seeking injection assistant status, we calculated inverse probability weights based on individualized recruitment weights. The weights include a factor to control for respondent's heterogeneity of degree (i.e., multiplicity) and were derived via RDS Analytical Tool.²⁶ The variable containing the weights was used as a covariate in the logistic regression models. Interactions between this covariate and the predictors were also explored. To account for correlation between recruiter and recruit, we created a variable indicating who the recruiter of each subject was, and used this variable as a cluster variable in the GEE algorithm. An exchangeable correlation

structure within each cluster was assumed (i.e., correlation between any two subjects recruited by the same recruiter was assumed to be the same).

RESULTS

Characteristics of IDUs Seeking Injection Assistance

Of 1,056 IDUs, 85% were male, median age was 37 years (IQR: 31-42) and median duration of injection was 14 years (IQR: 9-22). Almost all participants (99%) were Hispanic/Latino and reported using black tar heroin. RDS-adjusted HIV prevalence was estimated at 2.4% among males and 5.5% among females.²¹ One-quarter (25%) reported seeking injection assistance within the past six months (Table 1). Compared to other IDUs, those who sought help injecting were more likely to be female (24% vs. 12%, $P_{\text{FDR-adj}}=0.006$) and born outside Baja California (75% vs. 64%, $P_{\text{FDR-adj}}=0.006$). They were also more likely to report having an abscess in the past six months [Unadjusted Odds Ratio (OR) = 2.90; 95% Confidence Interval (CI): 2.17–3.89], engaging in receptive syringe sharing (OR=1.90; CI: 1.41–2.56) or distributive syringe sharing (OR=2.21; CI: 1.62–3.03) in the past six months, and ever trading sex for money, goods, or shelter (OR=1.75; CI: 1.28–2.41). IDUs who sought help injecting had larger numbers of IDUs within their social networks (median 9 network members vs. 7, per 10 people, $P_{\text{FDR-adj}}=0.002$) and were more likely to have ever been arrested for carrying sterile syringes (OR=1.43; CI: 1.06–1.92), even though purchasing and carrying syringes without a prescription is legal in Mexico.²⁷ Groups did not differ significantly in age, education, country of birth (U.S. vs. Mexico), years lived in Baja California, HIV serostatus, or syphilis titers consistent with active infection.

Factors Independently Associated with Seeking Injection Assistance among IDUs

Five factors were independently associated with seeking injection assistance during the past six months (Table 2). Seeking help injecting was independently associated with being female [Adjusted Odds Ratio (AOR) = 2.59; CI: 1.73–3.90], being born outside Baja California (AOR=1.75; CI: 1.26–2.42), having an abscess within the past six months (AOR: 2.59; CI: 1.93–3.47), engaging in receptive syringe sharing during the past six months (AOR=1.99; CI: 1.45–2.71), and having ever been arrested for carrying sterile syringes (AOR=1.55; CI: 1.15–2.09). No significant confounding interactions were found.

DISCUSSION

Our study of injection assistance among IDUs in Tijuana yielded several findings with important implications for HIV prevention programs in the U.S.-Mexico border region. Overall, this practice was common, with one quarter of our study population seeking help injecting during the past six months. IDUs who sought help injecting had greater odds of being female, migrating to Tijuana from outside of Baja California, having recently had an abscess and engaging in receptive syringe sharing, and ever having been arrested for carrying sterile syringes.

Our study supports previous findings that IDUs who seek injection assistance are more likely to engage in risk behaviors for acquiring HIV and other blood-borne pathogens, including receptive syringe sharing.^{9,11,12} Studies have shown that sharing injection equipment and drugs among IDUs takes place in the context of social relationships,^{28,29} and that hit doctors and other IDUs often provide injection assistance to casual or close friends.¹⁴ We did not find injecting in public places or shooting galleries to be independently associated with seeking injection assistance, although these settings have been associated with receptive syringe sharing in Tijuana and Ciudad Juarez, Mexico,²⁷ and have been correlated with injection assistance in Vancouver.¹² Although we did not explore the

specific relationships in which injection assistance takes place, our results suggest that efforts to reduce high risk injection behaviors among IDUs must look beyond injection settings to focus on relationship factors, including the positive social and economic functions that result from syringe sharing.²⁸

Our finding that female IDUs were more likely to seek injection assistance supports previous studies of the role of gender and relationship dynamics in differences in HIV-related risk behaviors between male and female IDUs.^{9,11,12,30,31} Gender effects may be strongest during the early stages of female IDUs' injection trajectories, as men often initiate women into injection³¹ and often dominate the procurement and administration of drugs within drug injecting couples.^{9,28,32-34} Qualitative research in Tijuana and Ciudad Juarez, another US-Mexico border city with a large IDU population, has suggested that female IDUs inject drugs with people they know and trust.³² We also found that our study population injects black tar heroin almost exclusively, which is known to induce scarred and collapsed veins.³⁵ Women have smaller veins than men, which may collapse more rapidly, quickly causing difficulty injecting and leading women to seek help injecting.^{13,36} From our data, we cannot determine whether female IDUs were more likely to seek help injecting due to gender dynamics, collapsed veins, a combination of these factors, or other influential factors that we did not measure. However, given the prevalence of black tar heroin injection among our sample, vein-care and safer injection interventions in Tijuana should make special efforts to reach female IDUs.

Our finding that injection assistance is independently associated with abscesses may also be related to the predominance of black tar heroin in the U.S.-Mexico border region.³⁵ Difficulty injecting intravenously is associated with increased frequency of intramuscular and subcutaneous injecting (“skin-popping”),³⁷ which increases the risk of abscesses and other bacterial infections of the skin and soft tissue, particularly black tar heroin injectors.^{13,36,38,39} Difficulty injecting due to scarred or collapsed veins was an important reason why IDUs in Vancouver sought injection assistance.¹¹ Although our study did not explore reasons for seeking injection assistance, the long duration of drug injection and the ubiquitous nature of black tar heroin suggest that collapsed veins may be an important reason for seeking injection assistance, and could explain the close association with abscesses. Based on our results, interventions with IDUs in the U.S.-Mexico border region should incorporate education and training on vein care and safer injection practices, including skin disinfection and using a new, sterile syringe for every single injection.

We also found that being arrested for carrying sterile syringes was positively associated with seeking injection assistance. The practice of seeking injection assistance may require IDUs to spend more time on the street and injecting in public places, rendering them more visible to police. Arrest for carrying sterile syringes may also encourage IDUs to inject in shooting galleries where they may find improved access to syringes, other injection equipment, and injection assistance. We previously reported that IDUs who have experienced arrest for carrying sterile syringes in Tijuana, despite the legality of doing so, were more likely to inject in shooting galleries and engage in receptive syringe sharing.²⁷ Similarly, in the San Francisco Bay Area, IDUs who feared arrest or police harassment were less likely to carry syringes and more likely to report sharing drugs, syringes, and other injection paraphernalia.^{40,41} Other recent studies and a review of international evidence have concluded that law enforcement practices, including arrest for syringe possession and injection stigmata, are associated with heightened HIV risk behaviors among IDUs.^{11,27,42-45} Our study confirms the need to address law enforcement practices toward IDUs as part of public health efforts to prevent HIV transmission in Tijuana and elsewhere.

Finally, we found that IDUs who were born outside of Baja California and subsequently migrated to Tijuana had significantly higher odds of seeking help injecting than other IDUs. In Mexico, international and internal migration has been associated with changes in HIV risk and protective behaviors, and increased HIV transmission throughout the country.^{46,47} Among IDUs in Tijuana, migrants deported from the U.S. had higher HIV prevalence and riskier injection profiles,⁴⁸ including more frequent receptive syringe sharing than IDUs without deportation history.^{23,49} Although our data do not allow for a complete explanation of the relationships between migration, acculturation, changes in risk environments, and injection assistance, our findings reinforce the conclusions of earlier studies that special efforts are needed to reach IDUs who are migrants to Tijuana.^{21,48}

Our study was limited by the fact that it was cross-sectional, precluding causal inferences. We did not find an independent association between injection assistance and HIV serostatus. This may be due to low power, since HIV prevalence was relatively low in our sample. Additionally, due to our cross-sectional study design, it is possible that some behaviors we measured, including injection assistance, occurred after HIV seroconversion, rather than before; however, the majority of IDUs in our study were unaware of their HIV serostatus at baseline. Prospective studies are needed to further explore the associations between injection assistance, other risk factors, and HIV infection.

It is important to note that we could not disentangle professional hit doctors from others who might offer help injecting within the context of a relationship. Although our sample included a low proportion of female participants, IDUs were recruited through RDS, and tests of its assumptions showed results to be robust. We are therefore confident that the associations we observed reflect the experience of the target population. The six month recall period may have caused recall problems for some participants; however, this time frame has been used in numerous other studies with IDUs and is ideal for outcomes that are relatively infrequent, such as seeking injection assistance. Furthermore, recall problems would tend to attenuate any of our associations towards the null. A final limitation of our study is the lack of information on the context and process of seeking injection assistance in Tijuana.

Despite these limitations, our study found that seeking help injecting is common among IDUs in Tijuana, and that this practice is associated with risky injection behaviors and adverse health outcomes. Our findings indicate a need for HIV prevention interventions to reduce IDUs' need for injection assistance by emphasizing improved vein care and safer injection practices. For IDUs who continue to seek help injecting due to personal preference, difficulty injecting, or other factors beyond their immediate control, community outreach and syringe exchange programs should ensure that IDUs have access to sterile injection equipment for every single injection, and provide individuals who give and receive help injecting with information on safer injection techniques and the risks involved with injection assistance. In addition to improving sterile syringe access, consideration should be given to the training of hit doctors and other individuals who provide injection assistance as 'promotores' for disseminating HIV prevention messages and linkages to syringe exchange services within their social networks.^{15,50-52} Lastly, interventions should seek to address the structural constraints on accessing and using sterile syringes, including fear of arrest or police harassment, and migrant or "newcomer" status.

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Table 1

Factors associated with seeking injection assistance* among IDUs in Tijuana, Mexico

<i>Baseline Characteristics</i>	Sought Injection Assistance* N=260	Did Not Seek Injection Assistance* N=796	Univariate Odds Ratio	95% Confidence Interval
<i>Sociodemographics</i>				
Median (IQR) and mean (SD) age (per year)	35 (30-42) 36.6 (8.9)	37 (31-42) 37.3 (8.2)	0.99	0.97-1.01
Female **	62 (24%)	96 (12%)	2.28	1.60-3.26
Median (IQR) years of education completed	7 (6-9)	8 (6-9)	0.99	0.95-1.03
Hispanic/Latino *	252 (97%)	788 (99%)	0.27	0.09-0.82
Speaks some English	118 (45%)	392 (49%)	0.86	0.65-1.13
Average monthly income ≥3000 pesos	172 (68%)	540 (69%)	0.94	0.69-1.27
Married/common-law	83 (32%)	247 (31%)	1.04	0.77-1.41
<i>Social Influence</i>				
Sex partner is an IDU <i>a b</i> **	12 (6%)	13 (2%)	3.22	1.44-7.18
Median (IQR) IDUs in social network (per 10 people) **	9 (4.8-20)	7 (4-12)	1.01	1.00-1.01
High perceived risk of HIV infection compared to others	109 (43%)	352 (45%)	0.94	0.71-1.25
Median (IQR) HIV positive people known personally **	1 (0-3)	0 (0-2)	1.02	0.99-1.04
<i>Individual Behaviors</i>				
Median (IQR) injection duration (per year)	14 (8-21)	15 (9-22)	0.99	0.98-1.01
Injects black-tar heroin (vs. powder)	252 (98.8%)	780 (99.7%)	0.22	0.04-1.30
Receptive syringe sharing <i>a</i> **	182 (70%)	439 (55%)	1.90	1.41-2.56
Distributive syringe sharing <i>a</i> **	194 (75%)	454 (57%)	2.21	1.62-3.03
Shared injection paraphernalia half the time or more <i>a</i>	22 (9%)	68 (9%)	0.99	0.60-1.64
Used new/sterile needle half the time or more <i>a</i>	116 (45%)	355 (45%)	1.00	0.76-1.33
Median (IQR) # injections before changing needle <i>a</i> **	4 (3-8)	6 (3-10)	0.98	0.97-1.00
Had an abscess <i>a</i> **	123 (47%)	188 (24%)	2.90	2.17-3.89
Ever traded sex for money, drugs, goods or shelter **	80 (31%)	161 (20%)	1.75	1.28-2.41
Ever tested for HIV	116 (45%)	314 (39%)	1.24	0.93-1.64
Tested HIV-Positive	13 (5%)	34 (4%)	1.18	0.61-2.28
Positive for syphilis antibodies	46 (18%)	117 (15%)	1.25	0.86-1.82
Syphilis titers ≥ 1:8	21 (8%)	58 (7%)	1.15	0.68-1.93
<i>Structural/Environmental Factors</i>				

<i>Baseline Characteristics</i>	Sought Injection Assistance* N=260	Did Not Seek Injection Assistance* N=796	Univariate Odds Ratio	95% Confidence Interval
Born in the US vs. Mexico	9 (4%)	12 (2%)	2.35	0.98-5.63
Born outside of Baja California **	196 (75%)	512 (64%)	1.70	1.24-2.33
Median (IQR) and mean (SD) years lived in Tijuana	15 (6-28) 17.9 (14.5)	14 (5-30) 18.0 (14.8)	1.00	1.00-1.00
Ever traveled to U.S.	205 (79%)	616 (77%)	1.09	0.77-1.53
Deported from the US	94 (36%)	319 (40%)	0.85	0.63-1.13
Homeless ^a	44 (17%)	96 (12%)	1.49	1.01-2.20
Normally injected drugs outside ^a	54 (21%)	203 (26%)	0.77	0.55-1.08
Normally injected drugs at shooting gallery ^a	65 (25%)	173 (22%)	1.20	0.87-1.67
Ever arrested for carrying unused needles/syringes ^{c *}	109 (46%)	252 (37%)	1.43	1.06-1.92
Ever arrested for having track marks ^{c *}	168 (70%)	423 (62%)	1.42	1.03-1.95
Ever arrested for carrying drugs ^{c **}	112 (48%)	238 (36%)	1.67	1.23-2.25

^a Last 6 months;

^b among those with a sex partner (N=824);

^c among those ever arrested (N=917).

* P ≤0.10;

** P<0.05.

Table 2Factors independently associated with seeking injection assistance among IDUs in Tijuana, Mexico^{*a}

Variable	Adjusted Odds Ratio	95% Confidence Interval
Female	2.59	1.73-3.90
Born outside of Baja California	1.75	1.26-2.42
Had an abscess ^a	2.59	1.93-3.47
Receptive syringe sharing ^a	1.99	1.45-2.71
Ever arrested for carrying unused needles/syringes	1.55	1.15-2.09

^aLast 6 months.

* Models are adjusted for the RDS recruitment method; p<0.05 for all values.