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Peer-to-peer injection: Demographic, drug use, and injection-related risk factors

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Abstract

Background: Peer-to-peer injection (either providing or receiving an injection to/from a person who injects drugs [PWID]) is common (19%–50%) among PWID. Most studies of peer-to-peer injection have focused on receiving injection assistance, with fewer examining providing injection assistance and none considering characteristics of PWID who do both. We examined characteristics of PWID by peer-to-peer injection categories (receiving, providing, both, and neither) and determined if these behaviors were associated with receptive and distributive syringe sharing.

Methods: Los Angeles and San Francisco PWID (N = 777) were recruited using targeted sampling methods and interviewed during 2011–2013. Multinomial logistic regression was used to determine characteristics associated with peer-to-peer injection categories and logistic regression was used to examine if peer-to-peer categories were independently associated with distributive and receptive syringe sharing.

Results: Recent peer-to-peer injection was reported by 42% of PWID (18% provider; 14% recipient; 10% both). In multinomial regression analysis, PWID reporting any peer-to-peer injection were more likely to inject with others than those who did neither. Injection providers and those who did both were associated with more frequent injection, illegal income source, and methamphetamine injection while injection recipients were associated with fewer years of injection. Injection providers were younger, had more years of injecting, and were more likely to inject heroin than PWID who did neither. In multivariate analyses, we found that providers and

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Contributors

Ricky Bluthenthal and Alex H. Kral designed the study. Ricky Bluthenthal conducted the statistical analysis. Shona Lamb wrote the initial draft of the paper. Other authors provided assistance with interpretation of final results and approved the final version of the paper.

Conflict of interest

The authors have no financial relationships that are related to the topic of this manuscript and no conflicts of interest.

PWID who did both were significantly more likely to report receptive and distributive syringe sharing than PWID who did neither.

Conclusion: Peer-to-peer injection is associated with HIV/HCV risk. Current prevention strategies may not sufficiently address these behaviors. Modification of existing interventions and development of new interventions to better respond to peer-to-peer injection is urgently needed.

Keywords

HIV/HCV injection risk; Injecting others; Receiving injections; PWID

Introduction

Injection drug use is a significant global public health issue (Degenhardt et al., 2017; Mathers et al., 2008; Nelson et al., 2011). People who inject drugs (PWID) face elevated risk for a variety of health problems including HIV, HCV, skin and soft tissue infections (SSTIs), overdose, sexually transmitted infections, and mental health disorders (Aceijas & Rhodes, 2007; Aceijas, Stimson, Hickman, & Rhodes, 2004; Degenhardt et al., 2017; Ebright & Pieper, 2002; Khan et al., 2013; Kral, Bluthenthal, Booth, & Watters, 1998; Mackesy-Amity, Donenberg, & Ouellet, 2012; Nelson et al., 2011). As a consequence, premature mortality among PWID is elevated throughout the world (Mathers et al., 2013). A significant portion of the risks associated with drug injection arise from unsanitary injection and shared use of injection equipment.

Theory, ethnographic research, and observational epidemiology suggest that multi-level factors contribute to unsanitary injection by PWID including setting (Rhodes et al., 2006), time pressures (Ti et al., 2015), law enforcement contact (Booth et al., 2013), and interactions with other PWID to name a few (Harris & Rhodes, 2013). Among PWID interactions, peer-to-peer injection or the practice of giving (provider) or receiving injection assistance (recipient) from another PWID, is an important contributor to health outcomes in this population. Both forms of peer-to-peer injection have been associated with infectious disease risk and other harms related to drug injection including syringe sharing (Carlson, 2000; Fairbairn et al., 2006; Friedman et al., 2002; Kral, Bluthenthal, Erringer, Lorrivick, & Edlin, 1999; Lee et al., 2013; Pedersen et al., 2016; Wood et al., 2001), abscesses and soft tissue infections (Lee et al., 2013; Lloyd-Smith et al., 2008), drug overdose (Fairbairn, Small, Van Borek, Wood, & Kerr, 2010), and HIV incidence (Lappalainen, Kerr, Hayashi, Dong, & Wood, 2015; O'Connell et al., 2005; Spittal et al., 2002).

Peer-to-peer injection is common among PWID. Studies from a variety of settings have reported recent (i.e., last 6 months) peer-to-peer injection ranging from 19% to 50% (Cheng et al., 2016; Kral et al., 1999; Lee et al., 2013). Peer-to-peer injection arises from diverse circumstances and motivations. For injection recipients, lack of knowledge on how to inject has been reported, along with shorter length of injection career (Epele, 2001; Fairbairn et al., 2010; Lee et al., 2013; O'Connell et al., 2005). For women, poor vein availability, as well as wanting to reducing scarring and damage have been documented as reasons for needing injection assistance (Epele, 2001; Wood, Spittal et al., 2003). PWID wanting jugular injection and those in the midst of withdrawal have also report needing assistance injecting

(Hoda, Kerr, Li, Montaner, & Wood, 2008; Wood, Spittal et al., 2003). Providing injection assistance can be associated with exchanges of money or drugs (Epele, 2001; Fairbairn et al., 2010; Parkin & Coomber, 2009), although qualitative research has found that some providers take pride in assisting others and do so because they have had their own troubles self-injecting (Carlson, 2000; Murphy & Waldorf, 1991).

To date, much of the published research on peer-to-peer injection has focused on people who receive injection assistance (Cheng et al., 2016; Fairbairn et al., 2010; Lee et al., 2013; McElrath & Harris, 2013; O'Connell et al., 2005; Robertson et al., 2010; Wood, Spittal et al., 2003), although a few have also examined the risk profiles of those who provide injections (Carlson, 2000; Fairbairn et al., 2006; Friedman et al., 2002; Kral et al., 1999). It is important to note that some proportion of PWID engage in both behaviors (Kral et al., 1999), yet no published studies have examined this group in relationship to PWID who do not engage in peer-to-peer injection. Nor have studies examined if engaging in both are associated with distributive and receptive syringe sharing. Therefore, in the following, we present three multivariate models: 1) drug use and demographic factors associated with injection receiving, providing, both, or neither; 2) factors associated with distributive syringe sharing; and 3) factors associated with receptive syringe sharing among PWID in California.

Methods

Study sampling and recruitment

Targeted sampling and community outreach methods were used to recruit a cross-sectional sample of PWID in Los Angeles and San Francisco, California between April 2011 and April 2013 (Bluthenthal & Watters, 1995; Kral et al., 2010; Lopez et al., 2013; Watters & Biernacki, 1989). Eligible participants were 18 years of age or older and self-reported injection drug use in the last 30 days, which was verified by visual inspection for signs of recent venipuncture or track marks (Cagle, Fisher, Senter, Thurmond, & Kastar, 2002). Following an informed consent process prior to enrollment, trained interviewers administered a computer-assisted personal interview (Questionnaire Development System, NOVA Research, Bethesda, MD). Participants were compensated \$20 for completing the survey. This analysis includes data from 777 PWID, of which 397 participants were recruited in Los Angeles and 380 in San Francisco. All study procedures were approved by the Institutional Review Boards at RTI International and the University of Southern California.

Study measures

For these analyses, we classified participants into one of four categories based on their response to the following two questions: "In the last 30 days, did you inject another person?" (referred to as an "injection provider" from here on). And, "In the last 30 days, were you injected by another person?" (referred to as an "injection recipient"). Response options for both were yes or no. Comparing responses to these two items resulted in 4 classifications: recipient, provider, both or neither.

We also considered variables related to peer-to-peer injection as indicated by prior research. These items included injection frequency, types of drugs used, years of injection, public injection, and any injecting with other PWID (as opposed to always injecting alone). These variables were created by using the following items. Injection frequency was the sum of self-reported injection episodes with the following drugs: cocaine, crack cocaine, methamphetamine, heroin, speedball (admixture of cocaine and heroin), goofball (admixture of heroin and methamphetamine), prescription opiates, stimulants, sedatives, tranquilizers, methadone, and buprenorphine in the last 30 days. Injection frequency in last 30 days was considered as a continuous variable and as a categorical variable with the following classifications: less than daily use (< 30 injections), once or twice a day (30–89 injections), and three or more times a day (≥ 90). Any injection and non-injection use of the drugs listed above was also considered, along with reported multi-route drug use (injection and non-injection use of any drugs), and polysubstance use (reported 2 or more drugs used in the last 30 days). Years of injection was calculated by subtracting current age from age at first injection. Public injection was assessed using the following item: “How often do you inject in public places (e.g. a park, alley, parking lot)?” (Response options: “Always,” “Often,” “Sometimes,” “Rarely,” and “Never”). To facilitate interpretation, this variable was recoded to any public injection (Always to Rarely) versus never injecting in public. Injecting with others was assessed by asking, “How often do you inject with other people?” Response options (“Always,” “Often,” “Sometimes,” “Rarely,” and “Never”) were recoded to never injection with others versus rarely to always injection with others.

We also examined if peer-to-peer classification was associated with distributive and receptive syringe sharing. Data for distributive and receptive syringe sharing were collected in the following manner: “In the last 30 days, how many times did you give or loan syringes/needles that you had used to someone else (including a close friend or lover) who then used them?” and “In the last 30 days, how many times did you inject using a syringe/needle that you know had been used by someone else (including a close friend or lover)?” For the syringe sharing items, the number of sharing episodes was re-coded as 0 equals ‘no’ and 1 or more equals ‘yes.’

Questions in the following domains were treated as potential covariates in all analyses: socio-demographic (e.g. age, gender, race/ethnicity, sexual partner types, sexual orientation), socioeconomic characteristics (e.g. housing status, monthly income, income sources [options were: job, unemployment and veterans benefits, welfare, disability, supplemental security income (SSI), spouse, family, friends, recycling, panhandling, and illegal or possibly illegal sources]), and contact with police, including arrest, legal status (on probation or parole), and concern with arrest for drug paraphernalia.

Statistical analyses

Descriptive statistics (e.g. frequencies, means, standard deviations, among others) were examined for all study variables. Bivariate analysis was conducted to determine factors correlated with peer-to-peer injection behaviors. Statistical significance of bivariate comparisons was set at $p < 0.05$ and was tested using chi-square test for categorical variables and t -test for continuous variables. Variables significant ($p < 0.05$) in bivariate analysis were

assessed for collinearity. Collinear variables were removed from the final analysis based on strength of association with the dependent variable. Correlations were assessed using multinomial logistic regression with peer-to-peer injection category as the dependent variable. Variables found to be significant at the $p < 0.05$ were considered to be independently associated with peer-to-peer injection group. Variables that were not collinear but found to be non-significant in regression analyses were dropped from the final model. We implemented a similar procedure for constructing separate logistic regression models for distributive and receptive syringe sharing for purposes of determining if peer-to-peer injection was associated independently with these important injection-related HIV and HCV risk behaviors

Results

Sample characteristics were as follows: 26% female, 50% 50 years old, 34% white, 30% African American, 25% Latino, 15% gay, lesbian, or bisexual, 7% HIV positive. Study participants had low income with 81% reporting a total monthly income of less than \$1350, and 62% considered themselves homeless.

Factors associated with peer-to-peer injection categories

Any peer-to-peer injection was reported by 41% of participants with 18% being injection providers, 14% being injection recipients, and 10% reporting both behaviors in the last 30 days. In bivariate analysis of factors associated with peer-to-peer injection (Table 1), a wide range of variables were found to correlate with these categories including race, age, sexual orientation, sexual partner type, homelessness, income, injection behaviors, recent drugs used, drug use frequency, years of use, and law enforcement contact.

In multinomial logistic regression modelling (Table 2) with “neither” type of peer-to-peer injection as the referent category, we found that being an injection provider was independently associated with any injecting with other PWID (Adjusted odds ratio [AOR] = 5.71; 95% Confidence Interval [CI] = 2.66, 12.20) as opposed to injecting alone, any methamphetamine injection in the last 30 days (AOR = 2.75; 95% CI = 1.64, 4.61), any heroin injection (AOR = 2.14; 95% CI = 1.14, 4.02), illegal or possibly illegal income source (AOR = 1.55; 95% CI = 1.03, 2.35), injection frequency (AOR = 1.00; 95% CI = 1.00, 1.01), years of injection (AOR = 1.03; 95% CI = 1.00, 1.06), and age (AOR = 0.94; 95% CI = 0.91, 0.97). Engaging in both peer-to-peer behaviors was associated with injecting with other PWID (AOR = 12.35; 95% CI = 2.92, 52.63), any methamphetamine injection (AOR = 5.38; 95% CI = 2.83, 10.20), illegal income source (AOR = 2.38; 95% CI = 1.40, 4.03) and injection frequency (AOR = 1.01; 95% CI = 1.00, 1.01). For injection recipients, only injecting with other PWID (AOR = 3.95; 95% CI = 1.92, 8.13) and years of injection (AOR = 0.98; 95% CI = 0.95, 1.00) were significantly associated with this peer-to-peer injection behavior. It is worth noting that the overlapping confidence intervals amongst the peer-to-peer injection categories indicates that there are no significant differences amongst them with regard to these demographic and drug use behaviors.

Factors associated with distributive and receptive syringe sharing

To determine if peer-to-peer behaviors were independently associated with critical injection-related HIV and HCV risk, we constructed multivariate models of distributive and receptive syringe sharing. Bivariate factors associated with distributive and receptive syringe sharing are presented in Table 3. In the multivariate distributive syringe sharing model (Table 4), being an injection provider (AOR = 1.88; 95% CI = 1.02, 3.45) and doing both (AOR = 3.71; 95% CI = 1.87, 7.36) were associated with this type of sharing, but not being an injection recipient. This model included African American race, public injection, unauthorized syringe source, paying sex partner in the last 6 months, steady sex partner is a PWID, concern about arrest for drug paraphernalia, and being HIV positive. In the multivariate receptive syringe sharing model (Table 4), being an injection provider (AOR = 1.84; 95% CI = 1.01, 3.35) and doing both (AOR = 2.29; 95% CI = 1.14, 4.59) were associated with this type of sharing, but not being an injection recipient. This model included income over \$1351 per month, public injection, injects with others, syringe coverage of 100% or more, paying sex partner is a PWID, any police contact in the last 6 months, and being concerned with being arrested for possessing drug paraphernalia. Overlapping confidence intervals on the peer-to-peer behaviors indicate that differences between the categories are not significant.

Discussion

Peer-to-peer injection remains common among PWID and is associated with important injection-related HIV/HCV risk behaviors. Specifically, PWID who are injection providers and those who engage in both behaviors were associated with both distributive and receptive syringe sharing as compared to those who reported no peer-to-peer injection. This poses a challenge for existing syringe-related prevention strategies. For instance, operational policies of many safer injection facilities (SIFs) do not permit assisted injection despite this being a persistent need for a significant proportion of PWID (Gagnon, 2017; Kerr, Mitra, Kennedy, & McNeil, 2017). One potential response to this need was the development of injection support teams - teams where peer outreach workers would provide advice, education, and injection assistance for PWID who used in public settings (Callon, Charles, Alexander, Small, & Kerr, 2013; Small et al., 2012). The injection support teams were developed by the Vancouver Area Network of Drug Users (VANDU) organization and represented a logical extension of the unsanctioned, nighttime syringe access program and the unsanctioned SIF that VANDU had initiated several years prior (Kerr, Oleson, Tyndall, Montaner, & Wood, 2005; Wood, Kerr et al., 2003). The VANDU unsanctioned SIF did permit assisted injection but was closed down by government officials after 6 months of operation (Kerr et al., 2005). An unsanctioned SIF in the United States is also allowing assisted injection (Davidson, Lopez, & Kral, 2017). According to one report, assisted injection has been permitted at a few SIFs, typically when a participant has a severe disability (Kimber, Dolan, & Wodak, 2005). Data from this study underscore the need to permit assisted injection in SIFs (Fast, Small, Wood, & Kerr, 2008; Wood et al., 2008).

Nonetheless, other intervention strategies are needed to address assisted injection. The literature suggests at least two promising approaches. One is the deployment of combined,

multi-level interventions such as expanded medication-assisted treatment, syringe exchange programs, and HIV and HCV treatment enrollment and adherence support. Combined approaches have been found to reduce HIV incidence among PWID (Des Jarlais, Arasteh, & Friedman, 2011; Van Den Berg, Smit, Van Brussel, Coutinho, & Prins, 2007) as well as maintain low HIV seroprevalence in areas where this approach has been taken (Des Jarlais et al., 1995). While this approach may not directly impact peer-to-peer injection practices, by reducing HIV and HCV seroprevalence in PWID populations, they reduce an important harm of this practice. Another approach is to consider engaging directly with PWID involved in peer-to-peer injection to support behavior changes that reduce potential harms associated with this practice. Peer interventions among PWID have been successful in the area of overdose reversals (Wheeler et al., 2015), reducing syringe sharing (Roux et al., 2016), and navigation of services including entering medication assisted treatment and HIV care (Des Jarlais et al., 2016). Consideration on how to engage injection providers and recipients in risk reduction related to peer-to-peer injection is needed.

We also found that receiving injection assistance alone was not significantly associated with either distributive or receptive syringe sharing. This finding differs significantly from prior studies where receiving injection assistance was associated with syringe sharing (Cheng et al., 2016; Lee et al., 2013; Pedersen et al., 2016; Robertson et al., 2010; Wood, Spittal et al., 2003), HIV infection, and HCV and HIV incidence (Lappalainen et al., 2015; Miller et al., 2002; Spittal et al., 2002). The lack of an association between receiving injection assistance and syringe sharing behaviors could be the result of three things. First, in most prior studies on risk behaviors, injection recipients were regarded as the dependent variable. This approach reverses the causal direction of this association since the interpretation is typically that receiving injection assistance leads to syringe sharing. In our study, we treat injection receipt as the independent variable in relationship to syringe sharing. Second, other studies have classified injection recipients as a dichotomous variable. This has the consequence of including PWID who are not engaged in peer-to-peer injection with those who provided injections. This seems inappropriate since multiple studies have found that providing injections is also associated with syringe sharing (Fairbairn et al., 2006; Kral et al., 1999). And third, acknowledging that peer-to-peer injection behaviors might be distinct, we constructed models that classified PWID based on their involvement in all three types of peer-to-peer injection involvement (provider, recipient, or both). We believe this leads to a more accurate assessment of the risk of each behavior as compared to those who do not engage in either behavior.

Drug use and demographic differences were also found. Specifically, being a recipient was associated only with years of injecting, where more years was protective against this behavior, and injecting with other PWID, a necessary prerequisite for receiving injections. Meanwhile, doing both and providing injections was associated with income from illegal sources and likely reflects greater involvement in the drug economy as observed elsewhere (Carlson, 2000; Friedman et al., 2002; Parkin & Coomber, 2009). PWID who did both and provided injections were also found to inject more frequently and to have used methamphetamine in the last 30 days. More frequent injection has been associated with injection providers in other studies (Fairbairn et al., 2006; Friedman et al., 2002), although our finding that methamphetamine use predicts this behavior is novel. This likely reflects the

relatively high portion of PWID who inject methamphetamine in Los Angeles and San Francisco (Corsi et al., 2012; Gonzales, Mooney, & Rawson, 2010). Lastly, injection providers were associated with more years of injection and younger age as compared to those who had no peer-to-peer injection behaviors. We suspect the positive association with longer injection career reflects injection skill, while the inverse association with age is surprising since age can also be an indicator of injecting skill. However, looking at the bivariate proportions (Table 2), PWID under the age of 40 were significantly more likely to report providing injection assistance. Injection assistance may be a behavior that PWID “age out” of. More research on age differences among PWID engaged in peer-to-peer injection is necessary to understand this phenomenon.

Limitations

Study results should be interpreted with the following limitations in mind. Given our cross-sectional study design, causality cannot be inferred. Study data are derived from participant self-reports and are subject to recall and social desirability biases. However, the reliability and validity of items used in this study have been established in prior studies (Dowling-Guyer et al., 1994; Needle et al., 1995; Weatherby et al., 1994). Different time frames were used to measure variables. For example, a thirty-day time frame was used for peer-to-peer injection but sex-related variables were assessed over 6 months. Lastly, data were collected in 2011 to 2013. It is possible that temporal changes have made these data obsolete. In the United States, there have been two significant drug use transitions since 2013. First, is the growing use of heroin by former prescription opioid users. The second, is the contamination of the heroin supply with fentanyl and other synthetic opioids. Neither of these changes are likely to change the prevalence of peer-to-peer injection in our minds. In fact, California for the most part appears to have missed the second trend as measured by overdose deaths, which have remained stable for the last 5 years. As a consequence, we believe this data from 2011/13 is still relevant.

Conclusions

Future research on peer-to-peer injection should use longitudinal cohort study designs and consistent time frames for data collection. Also, we have little quantitative data on motivations for providing or receiving injection assistance including frequency of such behaviors. Obtaining information on frequency of peer-to-peer injection will help prioritize the need to amend existing SIF policies and inform the operational policies for new SIFs. Further, we know little about the relative importance of different motivations to receive injection assistance. That is, whether it is related mostly to withdrawal symptoms, vein loss, or desire to inject in difficult-to-reach locations. On this latter point, at least three studies have found that PWID who engage in neck or jugular injection were more likely to receive injection assistance (Hoda et al., 2008; Pedersen et al., 2016; Rafful et al., 2015). Establishing frequency, motivations, demographic, and drug use characteristics of PWID who receive injection assistance is essential for ensuring that prevention activities reach high-need subgroups among PWID.

There is also a need for more qualitative research on peer-to-peer injection. This could uncover other intervention approaches that address enduring infectious disease risk related to this behavior. In addition, geographic differences in recent peer-to-peer injection have been found but the causes of these differences are not well understood. More qualitative and ethnographic research is needed to explore and describe peer-to-peer behaviors in varied settings and by different drug use patterns and preferences.

The risk profiles of PWID who engage in peer-to-peer injection suggest that these individuals are at the intersection of syndemics related to blood borne infectious diseases and chronic ailments common to those who inject drugs (Mizuno et al., 2015; Singer & Clair, 2003). Interventions that engage PWID involved in peer-to-peer injection behaviors are few (e.g. injection teams, assisted injection within SIFs), but preliminary results suggest promise (Callon et al., 2013; Small et al., 2012). Implementation of these existing strategies and development of new approaches are needed in the face of what appears to be increases in diseases associated with drug injection in the US and elsewhere (Bruneau, Roy, Arruda, Zang, & Justras-Aswad, 2012; Global Commission on Drug Policy, 2017; Zibbell et al., 2015, 2017).

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Table 1

Bivariate analysis of peer to peer injection by selected characteristics (N = 777).

Characteristic	Total N = 777 100%	Neither N = 455 59%	Injection provider N = 140 18%	Both N = 76 10%	Injection recipient N = 107 14%
Socio-demographics					
Gender					
Female	203 (26%)	117 (26%)	30 (22%)	24 (32%)	32 (30%)
Male	572 (74%)	338 (74%)	108 (78%)	51 (68%)	75 (70%)
Race*					
White	265 (34%)	129 (29%)	70 (50%)	29 (39%)	37 (35%)
African American	233 (30%)	146 (32%)	28 (20%)	24 (32%)	35 (33%)
Latino	192 (25%)	131 (29%)	23 (17%)	16 (21%)	22 (21%)
Other	82 (11%)	46 (10%)	18 (13%)	6 (8%)	12 (11%)
Study site*					
Los Angeles	397 (51%)	257 (56%)	54 (39%)	37 (49%)	49 (46%)
San Francisco	380 (49%)	198 (44%)	86 (61%)	38 (51%)	58 (54%)
Age*					
Less than 30	80 (10%)	32 (7%)	24 (17%)	8 (11%)	16 (15%)
30–39	86 (11%)	35 (8%)	29 (21%)	10 (13%)	12 (11%)
40–49	223 (29%)	129 (28%)	33 (24%)	25 (33%)	36 (34%)
50 or more	388 (50%)	259 (57%)	54 (38%)	32 (43%)	43 (40%)
Gay, lesbian or bisexual*					
Yes	118 (15%)	52 (11%)	29 (21%)	19 (25%)	18 (17%)
Casual sex partner in the last 6 months*					
Yes	236 (30%)	117 (26%)	47 (34%)	37 (49%)	35 (33%)
Paying sex partner in the last 6 months*					
Yes	90 (12%)	40 (9%)	17 (12%)	19 (25%)	14 (13%)
Steady sex partner is an PWID*					
Yes	212 (27%)	96 (21%)	50 (36%)	33 (44%)	33 (31%)
Casual sex partner is an PWID*					

Characteristic	Total N = 777 100%	Neither N = 455 59%	Injection provider N = 140 18%	Both N = 76 10%	Injection recipient N = 107 14%
Yes	139 (18%)	60 (13%)	28 (20%)	26 (35%)	25 (23%)
Paying sex partner is an PWID *					
Yes	56 (7%)	27 (6%)	13 (9%)	11 (15%)	5 (5%)
Homeless *					
Yes	484 (62%)	264 (58%)	94 (67%)	57 (76%)	69 (65%)
Any mental health diagnosis *					
Yes	363 (47%)	188 (42%)	81 (58%)	38 (51%)	56 (53%)
Income source					
Government assistance *	273 (35%)	141 (31%)	65 (46%)	28 (37%)	39 (36%)
Other family/friends *	122 (16%)	54 (12%)	29 (21 %)	19 (25%)	20 (19%)
Spouse *	60 (8%)	26 (6%)	15 (11%)	12 (16%)	7 (7%)
Panhandling *	203 (26%)	102 (22%)	52 (37%)	22 (29%)	27 (25%)
Illegal or possibly illegal income *	286 (37%)	142 (31%)	68 (49%)	42 (56%)	34 (32%)
Monthly income *					
< \$1350	627 (81%)	381 (84%)	103 (74%)	54 (72%)	89 (83%)
\$1,350 or more	150 (19%)	74 (16%)	37 (26%)	21 (28%)	18 (17%)
Injection behaviors					
Any public injection, last 30 days *					
Yes	392 (51%)	192 (42%)	93 (66%)	55 (73%)	52 (49%)
Inject with others *					
Yes	628 (81%)	325 (71%)	132 (94%)	73 (97%)	98 (92%)
Drug use items					
Non-injection drug use, last 30 days					
Methamphetamine *	192 (25%)	76 (17%)	41 (29%)	29 (39%)	46 (43%)
Marijuana *	416 (54%)	220 (48%)	94 (67%)	41 (55%)	61 (57%)
Prescription					
Opiates *	189 (24%)	90 (20%)	46 (33%)	23 (31%)	30 (28%)
Tranquilizer *	192 (25%)	94 (21%)	46 (33%)	25 (33%)	27 (25%)

Characteristic	Total N = 777 100%	Neither N = 455 59%	Injection provider N = 140 18%	Both N = 76 10%	Injection recipient N = 107 14%
Methadone *	162 (21%)	85 (19%)	34 (24%)	26 (35%)	17 (16%)
Injected drug use, last 30 days					
Crack Cocaine *	70 (9%)	31 (7%)	21 (15%)	13 (17%)	5 (5%)
Powder cocaine *	83 (11%)	38 (8%)	24 (17%)	14 (19%)	7 (7%)
Heroin *	613 (79%)	369 (81%)	114 (81%)	60 (80%)	70 (65%)
Methamphetamine *	290 (37%)	124 (27%)	69 (49%)	44 (59%)	53 (50%)
Speedball *	128 (17%)	57 (13%)	35 (25%)	21 (28%)	15 (14%)
Goofball *	93 (12%)	27 (6%)	34 (24%)	23 (31%)	9 (8%)
Prescription drugs					
Opiates *	93 (12%)	28 (6%)	38 (27%)	15 (20%)	12 (11%)
Injection frequency, last 30 days *					
< 30	362 (47%)	227 (50%)	47 (34%)	25 (33%)	63 (59%)
30–89	214 (27%)	121 (27%)	47 (34%)	25 (33%)	32 (20%)
90 or more	201 (26%)	107 (23%)	46 (33%)	25 (33%)	29 (21%)
Poly injection drug use, last 30 days *					
Yes	290 (37%)	121 (27%)	88 (63%)	43 (57%)	38 (36%)
Multi-route drug use *					
Yes	552 (71%)	293 (64%)	110 (79%)	58 (77%)	91 (85%)
Years of injection use *					
< 10	126 (16%)	61 (13%)	27 (19%)	13 (17%)	25 (23%)
10–19	128 (17%)	56 (12%)	37 (26%)	11 (15%)	24 (22%)
20 or more	523 (67%)	338 (74%)	76 (54%)	51 (68%)	58 (54%)
Law enforcement					
Any contact					
Police *	399 (52%)	193 (43%)	91 (65%)	55 (74%)	60 (56%)
Arrest *	206 (27%)	98 (22%)	41 (29%)	35 (47%)	32 (30%)
Security guard *	167 (22%)	61 (13%)	51 (36%)	26 (35%)	29 (27%)

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Characteristic	Total N = 777 100%	Neither N = 455 59%	Injection provider N = 140 18%	Both N = 76 10%	Injection recipient N = 107 14%
Probation *	172 (22%)	83 (18%)	39 (28%)	26 (35%)	24 (23%)

* Chi-square $p < 0.05$.

Table 2

Multinomial logistic regression of peer to peer injection.

	No Peer Injection	Injection provider	Both	Injection recipient
		β 95% Confidence Interval	β 95% Confidence Interval	β 95% Confidence Interval
Injection frequency, 30 days	referent	1.00 (1.00, 1.01) *	1.01 (1.00, 1.01) *	1.00 (1.00, 1.01)
Age	referent	0.94 (0.91, 0.97) *	1.00 (0.96, 1.04)	1.00 (0.97, 1.03)
Years of injecting	referent	1.03 (1.00, 1.06) *	1.00 (0.97, 1.03)	0.98 (0.95, 1.00) *
Any illegal income, last 30d	referent	1.55 (1.03, 2.35) *	2.38 (1.40, 4.03) *	0.89 (0.56, 1.44)
Any meth injection, last 30d	referent	2.75 (1.64, 4.61) *	5.38 (2.83, 10.20) *	1.77 (0.95, 3.29)
Any heroin injection, last 30d	referent	2.14 (1.14, 4.02) *	2.12 (0.99, 4.52)	0.78 (0.40, 1.52)
Inject with others, last 30 days	referent	5.71 (2.66, 12.20) *	12.35 (2.92, 52.63) *	3.95 (1.92, 8.13) *

 β =point estimate.* $p < 0.05$.

Table 3

Bivariate analysis of distributive and receptive syringe sharing by selected characteristics (N = 777).

Characteristics	Distributive syringe sharing N (%)	Receptive syringe sharing N (%)
Socio-demographics		
Gender		
Female (n = 203)	38 (19%)	28 (14%)
Male (n = 572)	76 (13%)	78 (14%)
Race	*	*
White (n = 265)	53 (20%)	43 (16%)
African American (n = 233)	18 (8%)	17 (7%)
Latino (n = 192)	33 (17%)	35 (18%)
Other (n = 82)	10 (12%)	11 (13%)
Study site	*	*
Los Angeles (n = 397)	74(19%)	66 (17%) *
San Francisco (n = 380)	40 (11%)	40 (11%)
Age	*	*
Less than 30 (n = 80)	21 (26%)	16 (20%)
30–39 (n = 86)	11 (13%)	10 (12%)
40–49 (n = 223)	36 (16%)	39 (18%)
50 or more (n = 388)	46 (12%)	41 (11%)
Paying sex partner in the last 6 months	*	*
Yes (n = 90)	25 (22%)	24 (27%)
Steady sex partner is an PWID	*	*
Yes (n = 212)	49 (23%)	42 (20%)
Casual sex partner is an PWID		
Yes (n = 139)	27 (19%)	25 (18%)
Paying sex partner is an PWID	*	*
Yes (n = 56)	16 (29%)	18 (32%)
Homeless		
Yes (n = 484)	86 (18%) *	84 (17%) *
Income source		
Government assistance (n = 273)	52 (19%) *	46 (17%)
Family (n = 122)	24 (20%)	23 (19%)
Spouse (n = 60)	15 (25%) *	13 (22%)
Panhandling (n = 203)	48 (24%) *	46 (23%) *
Recycling (n = 202)	33 (16%)	37 (18%) *
Illegal or possibly illegal (n = 286)	47 (16%)	48 (17%) *
SSI benefits (n = 267)	30 (11%)	29 (11%)
Income in the last 30 days	*	*
< \$1350 (n = 627)	90 (14%)	97 (16%)

Characteristics	Distributive syringe sharing N (%)	Receptive syringe sharing N (%)
\$1350 or more (n = 150)	24 (15%)	9 (6%)
HIV positive	*	
Yes (n = 53)	1 (2%)	5 (9%)
Injection behaviors		
Any public injection, last 30 days	*	*
Yes (n = 392)	90 (23%)	83 (21%)
Inject with others	*	*
Yes (n = 628)	107 (17%)	103 (16%)
Peer to peer injection	*	*
Neither (n = 455)	43 (10%)	43 (10%)
Injection provider (n = 140)	31 (22%)	28 (20%)
Both (n = 75)	25 (33%)	21 (28%)
Injection recipient (n = 107)	15 (14%)	14 (13%)
Syringe coverage of 100% or more		*
Yes (n = 472)	53 (11%)	48 (10%)
Pharmacy syringe access	*	*
Yes (n = 245)	51 (21%)	48 (20%)
Unauthorized syringe access	*	*
Yes (n = 270)	59 (22%)	57 (21%)
Shooting gallery use	*	*
Yes (n = 84)	20 (24%)	21 (25%)
Drug use items		
Non-injection drug use, last 30 days		
Methamphetamine (n = 192)	38 (20%) *	36 (19%) *
Prescription		
Opiates (n = 189)	36 (19%) *	37 (20%) *
Tranquilizer (n = 192)	48 (25%) *	37 (19%) *
Methadone (n = 162)	31 (19%)	30 (19%) *
Injected drug use, last 30 days		
Heroin (n = 613)	98 (16%) *	90 (15%)
Goofball (n = 93)	25 (27%) *	29 (31%) *
Prescription drugs		
Opiates (n = 93)	21 (22%) *	13 (14%)
Injection frequency, last 30 days	*	*
< 30 (n = 362)	33 (9%)	39 (11%)
30–89 (n = 214)	37 (17%)	29 (14%)
90 or more (n = 201)	44 (22%)	38 (19%)
Years of injection use	*	
< 10 (n = 126)	31 (25%)	21 (17%)
10–19 (n = 128)	15 (12%)	14 (11%)

Characteristics	Distributive syringe sharing N (%)	Receptive syringe sharing N (%)
20 or more (n = 523)	68 (13%)	71 (14%)
Law enforcement		
Any contact		
Police (n = 399)	76 (19%) [*]	79 (20%) [*]
Arrest (n = 206)	43 (21%) [*]	39 (19%) [*]
Security guard (n = 167)	37 (22%) [*]	29 (17%)
Concerned with arrest for paraphernalia (n = 344)	75 (22%) [*]	66 (19%) [*]
Probation (n = 172)	28 (16%) [*]	32 (19%) [*]

^{*} Chi-square $p < 0.05$.

Table 4

Logistic regression analysis of distributive and receptive syringe sharing.

Variables	Distributive syringe sharing (1)	Receptive syringe sharing (2)
	Adjusted Odds Ratio, (95% CI) ⁺	Adjusted Odds Ratio (95% CI) ⁺
Peer to Peer injecting		
Neither	Referent	Referent
Injection provider	1.88 (1.02, 3.45)	1.84 (1.01, 3.35)
Both	3.71 (1.87, 7.36)	2.29 (1.14, 4.59)
Injection recipient	1.53 (0.76, 3.10)	1.11 (0.54, 2.28)

⁺ Confidence interval.

(1) Controlling for African American race, public injection, unauthorized syringe source, paying sex partner in the last 6 months, steady sex partner is a PWID, concern about arrest for drug paraphernalia, and being HIV positive.

(2) Controlling for income, any public injection, injecting with others, syringe coverage, paying sex partner is a PWID, any police contact, and concern about arrest for drug paraphernalia.