



Published in final edited form as:

*Int J Drug Policy*. 2021 June ; 92: 103052. doi:10.1016/j.drugpo.2020.103052.

## Assisted injection provider practices and motivations in Los Angeles and San Francisco California 2016–18.

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### Abstract

**Background:** Assisted injection is a high-risk and common practice among people who inject drugs (PWID) and occurs for diverse reasons according to qualitative research. To develop interventions for reducing assisted injection risks, it is important to understand the practices of PWID who provide injection assistance, including their motivations for providing assistance.

**Methods:** Using follow-up data from an efficacy trial among PWID recruited in Los Angeles and San Francisco, CA (n=601), we present descriptive statistics on motivations for providing injection assistance and use multivariable logistic regression modelling to examine factors associated with these motivations.

**Results:** PWID provided injection assistance most commonly to friends and acquaintances. A quarter provided assistance on a daily basis. The most common motivations for providing assistance were skill and injury prevention. PWID also provided assistance to stop pestering and for compensation in money or drugs. In separate models examining factors associated with the five main motivations, we found injury prevention to be associated with skill injecting others, neck injection, methamphetamine use, and recycling income. Pestering was associated with injury prevention, neck and hand injection, speedball use, and syringe selling. Skill was associated with injury prevention, neck and hand injection, being physically assaulted, and age. Providing assistance for money was associated with providing assistance for food or drugs, armpit injections, being female, and providing assistance more frequently. Providing assistance for drugs was associated with compensation in food or money, goofball injection, selling drugs, and panhandling.

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Declarations of interest:  
None.

**Conclusion:** Providing injection assistance is associated with injection needs of recipients and drug scene participation. We urgently need new interventions for reducing assisted injection risks. Since injection providers report being motivated by skill and to prevent injury, interventions such as training in safer injection techniques are likely to be met with enthusiasm.

### Keywords

injection drug use; assisted injection; harm reduction; PWID

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### Introduction

Injection drug use is a significant global public health issue. Worldwide, an estimated 15.6 million people inject drugs (Degenhardt et al., 2017). In the United States, approximately 1.3 to 1.8 million people inject drugs (Brady et al., 2008; Mathers et al., 2008; Templaski et al., 2013). Further, research suggests injection drug use is increasing (Jones, 2018; Jones et al., 2017; Klevens et al., 2016; Ko et al., 2019). People who inject drugs (PWID) are at high risk for overdose, HIV, hepatitis C (HCV), skin and soft tissue infections (SSTIs), and other harms (Aceijas & Rhodes, 2007; Aceijas et al., 2004; Degenhardt et al., 2017; Ebright & Pieper, 2002; Khan et al., 2013; Kral et al., 1998; Larney et al., 2017; Mackesy-Amiti et al., 2012; Nelson et al., 2011; Mathers et al., 2013). Injection-related risks for PWID are affected by multiple intersecting and interactive factors within the macro and micro-levels of the risk environment (Rhodes, 2002). For example, factors within the macro-level risk environment, which include policy and economic contexts such as poverty, limited funding, stigma, and criminalization, influence and are influenced by factors in the micro-level risk environment, which include social and physical contexts such as norms, networks, the space in which injections occur, the availability of sanitary equipment, and injection-related interactions.

One common and high-risk injection-related interaction is assisted injection, in which one person provides injection assistance to another (Kral et al., 1999; Rhodes, 2009; Moore, 2004). In studies of PWID, from 19% to 54% report either providing or receiving injection assistance in the past 6 months (Kral et al., 1999; Fairbairn et al., 2006; Lamb et al., 2018; Pedersen et al., 2016; Cheng et al., 2016; Lee et al., 2013; Evans et al., 2003; Spittal et al., 2002). Research specifically on injection providers is limited but studies document that 19–37% of PWID have provided injection assistance in the past 6 months (Lee et al., 2013; Kral et al., 1999; Fairbairn et al., 2006; Lamb et al., 2018).

The majority of the literature on assisted injection has examined recipients (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 et al., 2003). PWID receive injection assistance for numerous reasons including lack of injection skill or confidence, venous problems, disability, withdrawal (Epele, 2001; Fairbairn et al., 2010; Lee et al., 2013; McElrath & Harris, 2013; McNeil et al., 2014; Carlson, 2000; Wood et al., 2003), and a preference (or, in cases of severe venous damage, a need) for injections into less accessible and more high-risk locations, such as the jugular (Hoda et al., 2008; Hope et al., 2017). Assisted injection recipients report higher rates of syringe sharing, abscesses, bacterial infections, venous

damage, theft, robbery, rape, physical violence, and economic exploitation than the overall PWID population (Fairbairn et al., 2010; Kral et al., 1999; Lee et al., 2013; Marshall et al., 2008; McElrath & Harris, 2013; Carruthers, 2003). Compared to other PWID, they are twice as likely to experience a nonfatal overdose and to be infected with HIV and HCV (Hunter et al., 2018; Kerr et al., 2007; O'Connell et al., 2005; Lappalainen et al., 2015; Spittal et al., 2002).

A small number of studies have examined the risk profiles of assisted injection providers (Carlson, 2000; Fairbairn et al., 2006; Friedman et al., 2002; Kral et al., 1999). Compared to non-providers, providers are at increased risk of syringe sharing (Kral et al., 1999; Fairbairn et al., 2006), injecting more frequently (Lamb et al., 2018), initiating others into injection drug use (Bluthenthal et al., 2014; Navarro et al., 2019), and HCV infection (Hagan et al., 2001; Fairbairn et al., 2006).

The few studies that have focused on why PWID provide injection assistance find that there are multiple reasons. Some work, particularly qualitative studies, shows that PWID provide assistance because they are experienced and skilled (Brothers, 2019; Murphy & Waldorf, 1991), since providing assistance may require considerable experience self-injecting (Friedman et al., 2002; Carlson, 2000). Additional studies find that PWID provide assistance out of empathy. They aim to help recipients who have difficulties injecting, since they themselves have struggled with the same problem (Carlson, 2000; Murphy & Waldorf, 1991). Other work, however, finds that PWID often provide assistance for payment in money or drugs (Khan et al., 2009; Friedman et al., 2002; Friedman et al., 1998; Parkin & Coomber, 2009; Epele, 2001; Fairbairn et al., 2006; Fairbairn et al., 2010).

Finally, another line of work has explored the relationship between providers and recipients of injection assistance. Studies find that PWID often receive assistance in the context of close relationships, such as from close friends (Lee et al., 2013) or romantic partners (Bryant et al., 2010). Other studies show that PWID also provide injection assistance to acquaintances, sex partners, and strangers (Parkin & Coomber, 2009; Des Jarlais et al., 1986; Small et al., 2012). One Vancouver study that documented the frequency of these relationships found that PWID provide assistance to casual and close friends more frequently than they assist acquaintances, sex partners, and strangers (Fairbairn et al., 2006).

Despite the risks and the prevalence of assisted injection, there is limited quantitative data on characteristics and practices of PWID who provide injection assistance. Studies have not examined the frequency of PWID motivations for providing assistance, or if these motivations overlap with each other or are held by PWID with different characteristics, nor do they provide much information on other motivations besides compensation. In addition, little is known about how common different assisted injection relationships are, or if people's motivations vary by their relationship to the injection recipient.

Some qualitative research reports that recipients have limited control over the injection interaction (Carlson, 2000; McNeil et al., 2014; Power, 1996), which may limit recipients' self-protective strategies against injection-related risks. In addition, PWID often receive assistance into sites that are high risk for complications including vein thrombosis,

pulmonary embolism, and pneumothorax (Hoda et al., 2008; Hope et al., 2017; Lewis et al., 1980). Thus, because of injection recipients' vulnerability to risk, it is critical to further examine the practices and motivations of assisted-injection providers.

In order to contribute to the ongoing characterization of PWID injection providers, this study describes injection provider characteristics and examines their practices, including how often they provide injection assistance, who they assist, the bodily sites where they inject others, their motivations for providing assistance, correlations between motivation and relationship with recipient, and factors associated with their motivations.

## Methods

For these analyses, we are using the 6-month follow-up sample from a larger randomized control trial on a behavioral intervention to reduce injection initiation. The intervention trial consisted of two-arms that tested the efficacy of a modified, single session, hour long active listening counseling session to reduce injection drug use initiation and behaviors that encourage injection initiation among non-injecting drug users, such as injecting in front of non-injectors, describing how to inject, and encouraging uptake of injection drug use (Bluthenthal et al., 2014; 2015). The intervention is based on the pilot conducted by Strike and colleagues in Toronto (Strike et al., 2014). An attention control condition was the comparator and was focused on improving water and protein intake. To be included in the study at baseline participants had to be at least 18 years of age and reported to have injected drugs within the past 30 days (confirmed by visual inspection of recent venipuncture tracks) (Cagle et al., 2002). Each participant provided written informed consent prior to enrollment. Eligible participants completed a 45-minute computer-based quantitative interview administered by trained research assistants using the Questionnaire Development System software (Nova Research, Bethesda, MD). The intervention was delivered after the quantitative interview, avoiding an intervention effect. Participants received USD \$20 for completing the survey. All study procedures were reviewed and approved by the Institutional Review Board at the University of Southern California.

### Key study variables

To determine who had provided injection assistance, we asked the following item: "In the last 6 months, did you inject another person?" Those responding yes, we asked about their reasons/motivations for doing so. These items included the following: "In the past 6 months have you injected someone: 1) to prevent them from injuring themselves?"; 2) "to stop them from bothering you?" referred to hereafter as pestered; 3) "because you are good at it?" referred to hereafter as skilled; 4) "for money?"; 5) "for drugs?"; 6) "for sex?"; 7) "for food?"; 8) "for shelter?"; and 9) "for transportation?"; and 10) "for something else or a favor not mentioned?" Response options for all questions were "Yes" or "No."

We were also interested in the frequency of providing injection assistance and the number of people assisted. To access frequency participants were asked, "In the last 6 months, how often did you inject another person?" with the following response options: "Less than once a month," "1 to 4 times a month," "2 to 6 times a week," "once a day," "2 or more times a day." To facilitate data analysis, we re-coded this variable into provided injection assistance

daily versus less than daily. To assess number of people, we used the following item: “How many people have you injected in the last 6 months?”

Additional details on providing injection assistance included questions on who was injected as well as where on their body they they injected the other person. For who, we used the following response categories: “stranger,” “acquaintance,” “friend,” “casual sex partner,” “spouse, steady sex partner, intimate partner,” “family member” and “other.” We used the following item to assess where on their body they injected the other person: “In the last 6 months, when you injected others, did you ever inject them in their “neck/clavicle,” “arm,” “hand,” “armpit,” “stomach/belly,” “groin/femoral,” “buttock,” “leg,” and “feet.”

Potential covariates included drug use pattern (drug use frequency, types), demographic (race, gender, and age), economic (income, income sources, and housing), mental health (any diagnosis for bipolar, depression, PTSD, anxiety, or schizophrenia), drug scene (operated or brought people to a location where people can inject drugs, purchased drugs or syringes for another person, and sold drugs or syringes), and violence (punched, attacked with weapon, raped, and had belongings stolen) variables. Due to combined use of some substances (e.g., cocaine with heroin or methamphetamine with heroin), we calculated several summed variables that account for total use of a substance. In these analyses, we looked at total use of cocaine (including crack cocaine and in combination with heroin) and total use of methamphetamine (including in combination with heroin). Income sources in the last 6 months included job, welfare/general relief, retirement/SSI, disability/SSDI, illegal or possibly illegal sources, panhandling, and recycling, among others. To assess drug scene involvement (Friedman et al., 1998), participants were asked about the following behaviors in the last 6 months: “Have you taken others to a location where they could inject drugs?” “Have you operated a shooting gallery or a place where people can inject drugs?” “Have you bought syringes or needles for another person?” “Have you sold needles or syringes?” “Have you bought drugs for other people?” and “Have you sold drugs to other people?” Response options were “Yes” or “No.”

### Statistical analysis

Descriptive statistics (e.g. frequencies, means, standard deviations) were examined for all study variables. We developed logistic regression models to examine factors associated with providing injection assistance with the whole sample (n=601) and separate models to examine the five most common motivations for providing injection assistance (to prevent injury, skilled, pestered, for money, for drugs) using the injection assistance sub-sample (n=336). We did not develop models on the other motivations due to the low number of endorsements of these motivations. Our approach to developing these logistic models proceeded as follows. First, we conducted bivariate analysis for each outcome using variables from the following domains: demographic, economic, drug use, drug scene, and violence. We used Pearson Chi-Square and Fisher’s exact test for these analyses. For the motivation models, we also considered assisted injection variables such as where the injection was administered and the relationship of the injection providers to the recipient. For all models, 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 outcome variable. Associations were assessed using multivariable logistic regression models. Variables found to be significant at  $p < 0.05$  were considered to be independently associated with the outcome variable and were retained in the final models.

## Results

### Study sample

Providing injection assistance in the past 6 months was reported by 56% (336/601) of participants in the entire sample ( $n=601$ ) (Table 1). Providing assistance was associated with wide variety of variables across our domains (demographic, socioeconomic, drug use, drug scene involvement, and violence) in bivariate analysis (see Tables 2a and 2b for a full summary of bivariate results).

In multivariate analysis we found the following factors to be significantly associated with increased odds of assisting others: Injection frequency in the last 30 days between 1 to 29 times (adjusted odds ratio [AOR]=2.66; 95% confidence interval [CI]=1.22, 5.80), 30 to 89 times (AOR=3.12; 95% CI=1.41, 6.91), and 90 or more times (AOR=3.88; 95% CI=1.80, 8.38) as compared to those who did not inject in the last 30 days; Age, 30 to 39 years old (AOR=3.32; 95% CI=1.72, 6.41), 40 to 49 years old (AOR=3.09; 95% CI=1.77, 5.39) as compared to those who were 18 to 29 years old; any lifetime depression diagnosis (AOR=2.56; 95% CI=1.68, 3.89); taking someone to a place to inject (AOR=4.06; 95% CI=2.70, 6.12) and having belongings stolen in the last 6 months (AOR=2.50; 95% CI=1.61, 3.89) (data not shown).

### Assisted injection: who, where, and why

In the past 6 months, 83% of injection providers had assisted more than one person, and 33% had assisted 10 or more people. Participants in this study reported that they had assisted a total of 4,511 people in the last six months. The 33% of providers who had assisted 10 or more people accounted for 85% of the unique injection recipients in this study (3837/4511). The mean number of people assisted in the past 6 months was 14.2, while the mean number for this latter group, those who provided injection assistance to 10 or more recipients, was 36.

Respondents provided injection assistance to friends (79%) and acquaintances (69%) more frequently than strangers (34%), steady sex partners (24%), or casual sex partners (18%) in the past 6 months (Table 2a). The most common site where PWID provided injection assistance was the arm (88%). However, many providers reported providing injections in high-risk areas such as the neck and clavicle region (64%), the hand (38%), leg (24%), and armpit (16%).

On average, participants endorsed 3.14 reasons for providing injection assistance (median=3;  $sd=1.78$ , IQR 2, 4). The most common motivation for providing assistance was skill (81%) followed by injury prevention (70%), drugs (49%), being pestered (46%), and money (37%). Assisting for food (10%), shelter (6%), sex (5%) and transportation or a ride (4%) was reported by 10% or fewer of participants.

Of those who provided assistance, 26% (86/336) reported providing assistance at least daily. Daily or more frequent providers were more likely to inject strangers (48% vs 31%) and acquaintances (78% vs 65%) than those who provided assistance on a less than daily basis. They were also more likely to provide injections in high-risk locations including the neck (82% vs 57%) hand (57% vs 31%), leg (37% vs 20%), armpit (33% vs 10%), femoral vein (17% vs 5%), and stomach (10% vs 3%). Moreover, they were more likely to be motivated by skill (92% vs 77%), injury prevention (82% vs 66%), being pestered (62% vs 41%), money (60% vs 29%), and for drugs (62% vs 45%) than less than daily providers (data not shown).

We looked at motivations for providing injection assistance by the provider's relationship with the recipient (Table 2a and 2b). The most common relationship between provider and recipient was friend (range: 78% to 85%), acquaintance (range: 73% to 83%), followed by casual sex partner (range: 40% to 50%), steady sex partner (range: 43% to 47%) and stranger (range: 36% to 52%). The injection location was consistent across motivation with arm (range: 87% to 90%) the most common followed by neck (range: 70% to 76%), hand (range: 42% to 47%), and leg (range: 27% to 34%).

### Factors associated with motivation categories

We examined factors associated with each motivation. Factors found to be significant in bivariate analysis are presented in Tables 2a and 2b. In these exploratory analyses, a wide range of demographic, economic, drug use patterns, drug scene involvements, and violence were associated with motivations to provide injection assistance. However, only a few variables were associated across motivations. These include providing assistance to acquaintances and providing assistance to prevent injury, because of skill, and for money or drugs.

In multivariable logistic regression models for each motivation, we found some motivations tended to be independently associated with other motivations while controlling for intervention assignment condition. For instance, we found that PWID who were motivated to provide injection assistance to prevent injury had higher odds of providing assistance because of skill (adjusted odd ratio [AOR]=3.42; 95% confidence interval [CI]=1.87, 6.22) (Table 3). PWID who provided assistance to stop pestering had higher odds of providing assistance due to skill (AOR=2.23; 95% CI=1.30, 3.80) (Table 4). PWID who were skilled at injection assistance had higher odds of also being motivated by injury prevention (AOR=3.18; 95% CI=1.71, 5.93) (Table 5). PWID who were motivated by money had higher odds of providing assistance for drugs (AOR=7.08; 95% CI=3.95, 12.69) and for food (AOR= 6.33; 95% CI=1.92, 20.83) (Table 6). Similarly, those who provided injection assistance for drugs had higher odds of being motivated by money (AOR=6.57; 95% CI=3.66, 11.79) and food (AOR=8.75; 95% CI=1.81, 42.28) (Table 7).

We found certain motivations to be associated with providing injection assistance into high-risk locations. For instance, providing neck injection assistance was significantly associated with motivations to prevent injury (AOR=1.98; 95% CI=1.17, 3.34), being pestered (AOR=1.98; 95% CI=1.20, 3.26), and being skilled (AOR=2.84; 95% CI=1.52, 5.30) (Tables 3 through 5). Similarly, providing injection assistance into the hand was associated with

being pestered (AOR=1.70; 95% CI=1.05, 2.75) and being skilled (AOR=2.19; 95% CI=1.06, 4.50) (Tables 4 and 5). Lastly, PWID who were motivated by money had higher odds of providing injections in the armpit (AOR= 2.88; 95% CI=1.31, 6.35) (Table 6).

We observed significant differences in characteristics and motivations associated with income-generating strategies. Females had higher odds of providing injection assistance for money (AOR=2.38; 95% CI=1.28, 4.41) as compared to males (Table 6). PWID who were motivated by money had higher odds of providing assistance at least daily (AOR= 2.65; 95% CI=1.40, 4.99) (Table 6). PWID who provided assistance to stop being pestered had higher odds of selling syringes (AOR=2.05; 95% CI=1.28, 3.30) (Table 4). PWID who provided assistance for drugs had higher odds of earning income from panhandling (AOR= 2.31; 95% CI=1.27, 4.23) or drug selling (AOR= 2.31; 95% CI=1.31, 4.09) (Table 7).

Several demographic, experiential, and drug use characteristics were associated with motivations to provide injection assistance. We found that PWID who were motivated to provide injection assistance because of skill had higher odds of being between the ages of 30–39 (AOR=4.18; 95% CI=1.37, 12.79) as compared to being less than 30 years old, and of being victims of physical violence in the past 6 months (AOR= 2.57; 95% CI=1.28, 5.17) (Table 5). PWID who provided assistance to prevent injury had higher odds of non-injection methamphetamine use (AOR=2.16; 95% CI=1.27, 3.67) (Table 3), while those who provided assistance to stop peustering had higher odds of non-injection speedball use (AOR=4.85; 95% CI=1.62, 14.52) (Table 4) and those who provided injection assistance for drugs had higher odds of goofball injection (AOR=2.46; 95% CI=1.44, 4.21) (Table 7).

## Discussion

To our knowledge, this is the first study to describe multiple aspects of assisted injection provider practices and motivations. Many providers assisted multiple people and provided injection assistance frequently. A quarter of providers assisted others at least once a day, and one third of providers had assisted at least ten people in the past 6 months. Providers, particularly those who assist others frequently, reported providing injections into sites, including the jugular vein, that are known to be high risk (Hoda et al., 2008; Hope et al., 2017; Lewis et al., 1980). This finding is in line with other work on assisted injection recipients which shows that preference for neck injection is correlated with seeking injection assistance (Rafful et al., 2015).

While many studies have focused on the risk for assisted injection recipients in heterosexual romantic partnerships (Bourgois et al., 2004; Bryant & Treloar, 2007; Hartel, 1994; Tompkins et al., 2006; Wright et al., 2007), this study shows that those relationships comprise a small part of assisted injection practices. Consistent with other studies (Fairbairn et al., 2006), we find that injection assistance among friends is the most common, and assistance of acquaintances is more common than assistance within heterosexual relationships.

Recipients may rely on friends for injections due to multiple factors in the risk environment (Rhodes, 2002). On the macro level these include the criminalization of assisted injection



and limited legal protections against potential violence from providers, on the micro level these include limited mechanisms for establishing whether a provider is trustworthy or skilled (Brothers, 2019). Some assisted injection risks arise because of the risk of exposure to HCV infected blood through physical contact between the provider and recipient (Carruthers, 2003). Since physical contact, and thus risk of infection through blood exposure, is high in assisted injection interactions between friends (Carruthers, 2003), the dynamics of assisted injection interactions between friends needs further research.

We found that many PWID were motivated by compensation in money or drugs, as past work has shown (Fairbairn et al., 2006; Friedman et al., 1998). In addition, we found that PWID who were motivated by money were most likely to provide injection assistance on at least a daily basis and more likely to be women. Women may be more likely to provide assistance for money because recipients may prefer physical contact from a female provider and may believe women assisted injection providers are less likely to sexually assault them (Sarah Brothers, personal communication, September 23, 2020).

However, compensation is a less frequently mentioned motivation than skill or altruism, which we find are the primary reasons PWID provide assistance, as suggested by qualitative research (Murphy & Waldorf, 1991). The frequency of providers citing injury prevention and being pestered as motivations suggests that many providers are not actively seeking to provide assistance. Instead, they may do so because they perceive it to be necessary and they are trying to help others.

The findings of the present study have practical implications. Factors on the micro and macro-levels of the risk environment could benefit from interventions and services. On the micro level, risk reduction interventions might address the social context in which assisted injection occurs (Rhodes, 2002) by providing trainings for providers and recipients. PWID who provide injection assistance, particularly those who assist others frequently, should also be targeted for extensive safer injection training, in line with other research that has called for such interventions (Small et al., 2012). Moreover, interventions should be developed specifically for women who provide injection assistance, keeping in mind that providing assistance may be an important income generating strategy for women. Injection-training initiatives for providers as well as recipients should include information, materials, and methods to protect against assisted-injection risks (Hunter et al., 2018), including information on vein care and vein selection, cautions against the sharing of paraphernalia in assisted injection interactions (Needle et al., 1998), information and materials for site sterilization and post-injection stanching (Grau et al., 2009), naloxone training to reverse overdoses, and training in injection techniques. In addition, assisted injection providers should be encouraged to convey health messages and materials to recipients (Friedman et al., 1998). Furthermore, since the power imbalances in assisted injection interactions can increase risk for recipients (Hunter et al., 2018; Rhodes, 2002), recipients should be given targeted training to protect themselves from assisted-injection risks, including encouragement to prepare their own dose, supply their own syringe, and sterilize their injection site (Needle et al., 1998).

One intervention has already shown that, congruent with our findings, PWID who provide injection assistance are often motivated by their skill and their investment in helping others. PWID injection providers led a safer assisted injection intervention which showed promise for reducing risk (Small et al., 2012). Such interventions should be expanded and shaped to acknowledge that many providers are motivated by skill and altruism. Furthermore, interventions may be appealing to people who provide assistance for compensation and would like to improve their skills in order to increase their income.

Our findings accord well with a body of work on how PWID provide vital public health services to their communities, disseminating information on safer practices and distributing resources (Dechman, 2015), reversing overdoses (Faulkner-Gurstein, 2017), assisting research (Marshall et al., 2015; Damon et al., 2017), and leading unsanctioned supervised injection facilities (SIFs) (Davidson et al., 2018). This study suggests that injection providers are performing a necessary practice in PWID communities with limited to no support or training. Interventions that build on extant practices by PWID such as secondary syringe exchange, SIFs, and peer overdose reversal interventions have successfully reduced injection and drug use-related risks (Valente et al., 2001; Marshall et al., 2011; Wheeler et al., 2015). Similarly, treating PWID who provide injection assistance as informal public health providers and developing interventions accordingly should be considered.

On the macro-level of the risk environment, an important tool for reducing harms for PWID who receive or provide injection assistance is low-threshold access to medication assisted treatment (MAT) such as methadone and buprenorphine. Improved access to MAT may reduce assisted-injection rates and associated risks because MAT treatment has been shown to reduce opioid and non-opioid illicit drug use, injection-related HIV and HCV infection risk, overdose risk, and overall mortality, especially when provided in combination with syringe access programs (Carter et al. 2019, Roy and Stein 2019, Millson et al. 2007, Fullerton et al. 2014, Ma et al. 2018, Platt et al. 2018).

Macro-level interventions that target economic support, housing, and mental health services could reduce assisted injection providers' vulnerability as well as assisted injection risks. We found that injection providers were more likely to be homeless, victims of physical violence, victims of theft, and to have been diagnosed with depression. In addition, many were motivated to provide assistance because of pestering or for compensation. Since many providers lack housing, the physical risk environment may increase the risk providers are pestered into providing public rushed injections, which increases the chance of injury for participants. Interventions should address and ameliorate providers' vulnerability by targeting them for housing and mental health services. In addition, improved economic support could reduce providers' need to provide assistance for compensation.

Given the prevalence of assisted injection, more research on injection providers is necessary, including research on injection-related risks and how these may vary based on gender, housing status, motivation, and social ties with recipients. In general, more research is needed on the dynamics of assisted injection interactions to examine where the risks for providers and recipients arise and how they can be ameliorated.

## Limitations

Our study has several limitations. These data were derived from a questionnaire that relied on self-reported information, thus recall bias may have influenced the accuracy of the data. Since social desirability bias may have influenced participants' accounts of their motivations for providing assistance, reports of providing injection for non-altruistic reasons may be artificially low. However, studies have shown that PWID self-reports of risk behaviors are reliable (Latkin et al. 1993). In addition, the cross-sectional nature of this analysis does not permit causal inference. PWID may engage in these practices for limited periods, and their motivations for engaging in these practices may change over time. Future work might further examine whether the observed associations and motivations persist longitudinally. Additionally, due to the quantitative nature of our questions, it is possible that PWID may provide assistance for other motivations that were not assessed in the survey, or hold different motivations depending on the circumstances or their relationship with the recipient. Thus, unmeasured or mis-measured motivations and other factors may have biased our results. Also, since this study took place in two large California cities, we are not able to generalize our findings to all PWID in California or elsewhere, including PWID in small to mid-size towns or rural areas. Lastly, because this study was the first to examine sociodemographic characteristics related to individual-level motivations for providing injection assistance, more research is needed to substantiate these potential associations.

## Conclusions

This study shows that many PWID provide injection assistance frequently and they often do so into high-risk locations, indicating a need to provide safer assisted injection training and literature to PWID. In addition, PWID injection providers should be targeted for interventions because providing assisted injection is strongly associated with initiating others (Navarro et al., 2019), and because recipients may have limited negotiating power in the interaction (Power, 1996).

This study can help amend existing Safer Injection Facility (SIF) policies and inform policies for new SIFs. SIFs are a growing intervention to reduce injection-related risks. Although one unsanctioned SIF in the United States is allowing assisted injection (Davidson et al., 2018), the majority of SIFs do not allow injection assistance on site (McNeil & Small, 2014; McNeil et al., 2014), so people who need assistance must inject outside the facilities (Small et al., 2012). Allowing assisted injection in SIFs could reduce many of the auxiliary risks and should be considered (Lee et al., 2013). In addition, many SIFs have supervisory personnel, including nurses, who can help individuals improve their skills at injecting themselves and others.

Finally, there are recent reports that prescription opioid use is leading to increased drug injection as well as increased injection frequency (Broz et al., 2018; Mateu-Gelabert & Guarino, 2018; Lambdin et al., 2019). Injecting more frequently may increase venous damage, which may lead to assisted injection practices becoming more prevalent. Thus, information and interventions on how to protect against assisted injection-related risk is growing in importance.

## Acknowledgements

We would like to thank study participants for their time and effort in this project. We would also like to thank the following individuals who meaningfully contributed to the study: Amin Afsahrezvani, Debra Allen, Letizia Alvarez, Julia Balboni, Joseph Becerra, Kacie Blackman, Giuseppe Cavaleri, Janae Chatmon, Fitsum Dejene, Karina Dominguez Gonzalez, Mohammed El-Farro, Brian Erwin, Sernah Essien, Allison Few, Hrant Gevorgian, Alessandra Gianino, Johnathan Hakakha, Jennifer Hernandez, Monika Howe, Alexander Ildaradashty, Cora Jenkins, Sasha Lasky, Joshua McKeever, Askia Mohammad, Rebecca Penn, Tasha Perdue, Jennifer Plumber, T' yana Taylor, Adam Viera, Olivia Uhley, Jeffery Williams, David Wiss, Thomas Won, Senem Yilmaz, and Johnathan Zhao. This work was funded by the National Institute on Drug Abuse (NIDA) [grant numbers R01DA038965, Project Official Richard Jenkins, Ph.D. and R01 DA 046049, Project Official Heather Kimmel, Ph.D.].

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**Table 1:**

Bivariate factors associated with providing assisted injection in the last 6 months (N=601)

| Characteristic                     | Total N=601 (100%) | Injection provider N=336 (56%) | Non-provider N=265 (44%) |
|------------------------------------|--------------------|--------------------------------|--------------------------|
| <b>Socio-demographics</b>          |                    |                                |                          |
| Gender                             |                    |                                |                          |
| Female                             | 150 (25%)          | 90 (27%)                       | 60 (23%)                 |
| Male                               | 440 (75%)          | 240 (73%)                      | 200 (77%)                |
| Race/ethnicity *                   |                    |                                |                          |
| White                              | 239 (40%)          | 160 (48%)                      | 79 (32%)                 |
| Latinx                             | 142 (24%)          | 60 (18%)                       | 73 (28%)                 |
| African American                   | 133 (22%)          | 63 (19%)                       | 79 (30%)                 |
| Native American                    | 42 (7%)            | 28 (8%)                        | 14 (5%)                  |
| Asian/Pacific Islander             | 6 (1%)             | 4 (1%)                         | 2 (1%)                   |
| Mixed                              | 37 (6%)            | 20 (6%)                        | 17 (6%)                  |
| Age *                              |                    |                                |                          |
| Less than 30                       | 93 (16%)           | 71 (21%)                       | 22 (8%)                  |
| 30–39                              | 136 (24%)          | 99 (30%)                       | 37 (14%)                 |
| 40–49                              | 160 (27%)          | 83 (25%)                       | 77 (29%)                 |
| 50 or more                         | 210 (33%)          | 82 (25%)                       | 128 (49%)                |
| Gay, lesbian or bisexual *         | 115 (19%)          | 83 (25%)                       | 33 (13%)                 |
| Heterosexual                       | 479 (80%)          | 253 (75%)                      | 232 (87%)                |
| Homeless *Yes                      | 451 (75%)          | 272 (81%)                      | 179 (68%)                |
| No                                 | 150 (25%)          | 62 (19%)                       | 86 (32%)                 |
| Income source                      |                    |                                |                          |
| General Relief *                   | 349 (58%)          | 214 (64%)                      | 135 (51%)                |
| Panhandling *                      | 142 (24%)          | 96 (29%)                       | 46 (17%)                 |
| Retirement/SSI                     | 117 (20%)          | 51 (15%)                       | 66 (25%)                 |
| Illegal or possibly illegal income | 263 (44%)          | 191 (57%)                      | 72 (27%)                 |
| Monthly income *                   |                    |                                |                          |
| <\$1400                            | 473 (79%)          | 252 (75%)                      | 221 (83%)                |
| Years of injection use *           |                    |                                |                          |
| <10                                | 174 (29%)          | 108 (32%)                      | 66 (25%)                 |
| 10–19                              | 125 (21%)          | 83 (25%)                       | 42 (16%)                 |
| 20 or more                         | 298 (50%)          | 142 (43%)                      | 156 (59%)                |
| Injection frequency *              |                    |                                |                          |
| None                               | 67 (11%)           | 15 (5%)                        | 52 (20%)                 |
| Less than daily                    | 160 (27%)          | 75 (22%)                       | 85 (32%)                 |
| Once or twice a day                | 142 (24%)          | 82 (24%)                       | 60 (23%)                 |

| Characteristic                   | Total N=601 (100%) | Injection provider N=336 (56%) | Non-provider N=265 (44%) |
|----------------------------------|--------------------|--------------------------------|--------------------------|
| Three or more times a day        | 232 (39%)          | 164 (49%)                      | 68 (26%)                 |
| Drug Scene Involvement           |                    |                                |                          |
| Took others to place to inject * | 274 (47%)          | 215 (65%)                      | 59 (23%)                 |
| Operated shooting gallery *      | 62 (11%)           | 44 (13%)                       | 18 (7%)                  |
| Purchased syringes *             | 230 (39%)          | 168 (51%)                      | 62 (24%)                 |
| Sold syringes *                  | 218 (37%)          | 158 (48%)                      | 60 (23%)                 |
| Bought drugs for others *        | 333 (56%)          | 227 (68%)                      | 106 (41%)                |
| Sold drugs *                     | 310 (53%)          | 219 (67%)                      | 91 (35%)                 |
| Violence in the last 6 months    |                    |                                |                          |
| Punched *                        | 210 (35%)          | 148 (45%)                      | 62 (24%)                 |
| Attacked with weapon *           | 115 (19%)          | 85 (26%)                       | 30 (11%)                 |
| Stolen belongings *              | 423 (72%)          | 277 (84%)                      | 146 (56%)                |

\* P<0.05

**Table 2a:**

Selected bivariate factors associated with motivations for assisted injection (n=336).

|                          | Prevent injury |           |            | Pestered  |             |
|--------------------------|----------------|-----------|------------|-----------|-------------|
|                          | Total          | Yes       | No         | Yes       | No          |
|                          | N=336          | N=235     | N=101      | N=154     | N=182       |
|                          | % (n)          | % (n)     | % (n)      | % (n)     | % (n)       |
| <b>Who injected</b>      |                |           |            |           |             |
| Stranger                 | 34% (115)      | 37% (88)  | 27% (27)   | 42% (64)  | 28% (81) *  |
| Acquaintance             | 69% (231)      | 73% (171) | 59% (61) * | 77% (118) | 62% (113) * |
| Friend                   | 79% (264)      | 81% (191) | 72% (73)   | 78% (120) | 79% (144)   |
| Casual sex Partner       | 18% (59)       | 21% (50)  | 9% (9) *   | 21% (32)  | 15% (27)    |
| Steady sex partner       | 24% (80)       | 26% (61)  | 19% (19)   | 24% (37)  | 24% (43)    |
| <b>Where injected</b>    |                |           |            |           |             |
| Neck/Clavicle            | 64% (215)      | 70% (164) | 51% (51) * | 75% (116) | 54% (91) *  |
| Arm                      | 88% (296)      | 89% (209) | 86% (87)   | 87% (134) | 89% (162)   |
| Hand                     | 38% (127)      | 42% (98)  | 29% (29) * | 47% (73)  | 30% (54) *  |
| Armpit                   | 16% (52)       | 18% (42)  | 10% (10)   | 22% (34)  | 10% (18) *  |
| Stomach                  | 4% (14)        | 5% (11)   | 3% (3)     | 5% (7)    | 4% (7)      |
| Groin                    | 8% (27)        | 10% (23)  | 4% (4)     | 12% (18)  | 5% (9) *    |
| Buttocks                 | 5% (17)        | 5% (12)   | 5% (5)     | 3% (5)    | 7% (12)     |
| Leg                      | 24% (81)       | 27% (63)  | 18% (18)   | 29% (44)  | 20% (37)    |
| Feet                     | 11% (37)       | 12% (29)  | 8% (8)     | 14% (22)  | 8% (15)     |
| <b>Frequency</b>         |                |           |            |           |             |
| Daily or more            | 26% (86)       | 29% (69)  | 17% (17) * | 34% (52)  | 19% (34) *  |
| <b>Motivations</b>       |                |           |            |           |             |
| Prevent injury           | 70% (235)      | —         |            | 80% (123) | 62% (112) * |
| Pestered                 | 46% (154)      | 52% (123) | 31% (31) * | —         |             |
| Skilled                  | 81% (272)      | 88% (207) | 64% (65) * | 83% (128) | 79% (144)   |
| For Money                | 37% (124)      | 40% (90)  | 29% (29) * | 44% (68)  | 31% (56) *  |
| For Drugs                | 49% (164)      | 54% (126) | 38% (38) * | 58% (89)  | 41% (75) *  |
| For Sex                  | 5% (16)        | 6% (15)   | 1% (1) *   | 7% (11)   | 3% (5)      |
| For Shelter              | 6% (19)        | 7% (17)   | 2% (2)     | 8% (13)   | 3% (6) *    |
| For Food                 | 10% (32)       | 11% (26)  | 6% (6)     | 12% (18)  | 8% (14)     |
| For Ride                 | 4% (12)        | 5% (11)   | 1% (1)     | 5% (8)    | 2% (4)      |
| <b>Sociodemographics</b> |                |           |            |           |             |
| Female                   | 27% (90)       | 28% (69)  | 26% (26)   | 32% (47)  | 24% (43)    |
| Race/ethnicity           |                |           |            |           |             |

|                        | Prevent injury |           |           | Pestered  |            |
|------------------------|----------------|-----------|-----------|-----------|------------|
|                        | Total          | Yes       | No        | Yes       | No         |
|                        | N=336          | N=235     | N=101     | N=154     | N=182      |
|                        | % (n)          | % (n)     | % (n)     | % (n)     | % (n)      |
| White                  | 48% (160)      | 49% (114) | 46% (46)  | 47% (73)  | 48% (87)   |
| Latinx                 | 18% (60)       | 18% (42)  | 18% (18)  | 21% (32)  | 16% (28)   |
| Black                  | 19% (63)       | 13% (30)  | 23% (23)  | 17% (26)  | 20% (37)   |
| Native                 | 8% (28)        | 9% (21)   | 8% (7)    | 10% (15)  | 7% (13)    |
| A/PI                   | 1% (4)         | 1% (2)    | 2% (2)    | 1% (2)    | 1% (2)     |
| Mixed                  | 6% (20)        | 7% (16)   | 4% (4)    | 4% (6)    | 8% (14)    |
| Age                    |                |           |           |           |            |
| Less than 30           | 21% (71)       | 22% (51)  | 20% (20)  | 20% (31)  | 22% (40)   |
| 30–39                  | 30% (99)       | 32% (76)  | 23% (23)  | 36% (55)  | 24% (44)   |
| 40–49                  | 25% (83)       | 23% (54)  | 29% (29)  | 20% (31)  | 29% (52)   |
| 50 or more             | 24% (82)       | 23% (54)  | 28% (28)  | 24% (37)  | 25% (45)   |
| Sexual orientation     |                |           |           |           |            |
| Gay, lesbian, bisexual | 25% (83)       | 27% (64)  | 19% (19)  | 23% (35)  | 27% (48)   |
| Straight/Hetero        | 75% (252)      | 73% (171) | 81% (81)  | 77% (119) | 74% (133)  |
| High school or more    | 74% (247)      | 72% (170) | 77% (77)  | 71% (110) | 76% (137)  |
| Homeless               | 81% (272)      | 83% (195) | 77% (77)  | 85% (131) | 76% (141)  |
| Income source          |                |           |           |           |            |
| General relief         | 64% (214)      | 63% (148) | 65% (66)  | 61% (94)  | 66% (120)  |
| Retirement/SSI         | 15% (51)       | 15% (34)  | 17% (17)  | 12% (19)  | 18% (32)   |
| Recycling              | 22% (75)       | 19% (45)  | 30% (30)* | 21% (32)  | 24% (43)   |
| Panhandling            | 29% (96)       | 31% (73)  | 23% (23)  | 32% (49)  | 26% (47)   |
| Illegal                | 57% (191)      | 59% (139) | 52% (52)  | 62% (96)  | 52% (95)   |
| <b>Drug use</b>        |                |           |           |           |            |
| Injection frequency    |                |           |           |           |            |
| None                   | 5% (15)        | 4% (10)   | 5% (5)    | 3% (5)    | 6% (10)    |
| Less than daily        | 22% (75)       | 23% (54)  | 21% (21)  | 20% (30)  | 25% (45)   |
| 1–2 times a day        | 24% (82)       | 24% (56)  | 26% (26)  | 26% (40)  | 23% (42)   |
| 3 or more times        | 49% (164)      | 49% (115) | 49% (49)  | 51% (79)  | 47% (85)   |
| Injected drugs, 30 d   |                |           |           |           |            |
| Speedball              | 33% (111)      | 35% (83)  | 28% (28)  | 38% (58)  | 29% (53)   |
| Goofball               | 55% (186)      | 58% (137) | 49% (49)  | 65% (100) | 47% (86)*  |
| Cocaine                | 13% (44)       | 15% (34)  | 10% (10)  | 18% (27)  | 9% (17)*   |
| Methamphetamine        | 56% (188)      | 57% (134) | 54% (54)  | 55% (85)  | 57% (103)  |
| Heroin                 | 79% (265)      | 81% (190) | 74% (75)  | 84% (129) | 75% (136)* |
| Rx Opioid              | 10% (32)       | 11% (26)  | 6% (6)    | 12% (19)  | 7% (13)    |
| Non-injected, 30 d     |                |           |           |           |            |

|                                     | Prevent injury |           |           | Pestered  |            |
|-------------------------------------|----------------|-----------|-----------|-----------|------------|
|                                     | Total          | Yes       | No        | Yes       | No         |
|                                     | N=336          | N=235     | N=101     | N=154     | N=182      |
|                                     | % (n)          | % (n)     | % (n)     | % (n)     | % (n)      |
| Speedball                           | 6% (21)        | 7% (17)   | 4% (4)    | 10% (16)  | 3% (5)*    |
| Goofball                            | 6% (21)        | 7% (17)   | 4% (4)    | 9% (14)   | 4% (7)*    |
| Crack cocaine                       | 36% (122)      | 34% (80)  | 42% (42)  | 33% (51)  | 39% (71)   |
| Cocaine                             | 11% (37)       | 12% (27)  | 10% (10)  | 11% (17)  | 11% (20)   |
| Methamphetamine                     | 48% (162)      | 52% (122) | 40% (40)* | 46% (71)  | 50% (91)   |
| Heroin                              | 25% (83)       | 27% (63)  | 20% (20)  | 25% (38)  | 25% (45)   |
| Rx Opioid                           | 19% (63)       | 19% (45)  | 18% (18)  | 21% (32)  | 17% (31)   |
| Heroin use frequency, 30 days       |                |           |           |           |            |
| 0                                   | 13% (45)       | 12% (28)  | 17% (17)  | 9% (14)   | 17% (31)   |
| 1–29                                | 19% (65)       | 20% (47)  | 18% (18)  | 19% (30)  | 19% (35)   |
| 30–89                               | 23% (77)       | 23% (53)  | 24% (24)  | 23% (35)  | 23% (42)   |
| 90 or more                          | 44% (149)      | 45% (107) | 42% (42)  | 49% (75)  | 41% (74)   |
| Methamphetamine use frequency, 30 d |                |           |           |           |            |
| 0                                   | 21% (69)       | 18% (42)  | 27% (27)  | 17% (27)  | 23% (42)   |
| 1–29                                | 31% (104)      | 31% (73)  | 31% (31)  | 32% (49)  | 30% (55)   |
| 30–89                               | 29% (97)       | 28% (30)  | 30% (30)  | 27% (41)  | 31% (56)   |
| 90 or more                          | 19% (66)       | 23% (53)  | 13% (13)  | 24% (37)  | 16% (29)   |
| Cocaine use frequency, 30 d         |                |           |           |           |            |
| 0                                   | 43% (143)      | 42% (98)  | 44% (45)  | 41% (64)  | 43% (79)   |
| 1–29                                | 36% (123)      | 38% (89)  | 34% (34)  | 36% (55)  | 37% (68)   |
| 30–89                               | 11% (36)       | 11% (25)  | 11% (11)  | 13% (20)  | 9% (16)    |
| 90 or more                          | 10% (34)       | 10% (23)  | 11% (11)  | 10% (15)  | 10% (19)   |
| Drug Scene Involvement              |                |           |           |           |            |
| Took inject place                   | 65% (215)      | 66% (154) | 60% (61)  | 71% (108) | 59% (107)* |
| Shooting gallery                    | 13% (44)       | 13% (30)  | 14% (14)  | 16% (24)  | 11% (20)   |
| Purchased syringes                  | 51% (168)      | 52% (120) | 48% (48)  | 58% (87)  | 45% (81)*  |
| Sold syringes                       | 48% (158)      | 47% (108) | 50% (50)  | 57% (86)  | 40% (72)*  |
| Bought drugs                        | 68% (227)      | 68% (157) | 69% (70)  | 76% (114) | 62% (113)* |
| Sold drugs                          | 67% (219)      | 70% (160) | 60% (59)  | 72% (108) | 62% (111)  |
| <b>Other domains</b>                |                |           |           |           |            |
| Any PTSD diagnosis Yes              | 29% (97)       | 30% (71)  | 26% (26)  | 31% (48)  | 27% (49)   |
| Violence in the last 6 months       |                |           |           |           |            |
| Punched                             | 45% (148)      | 47% (109) | 39% (39)  | 47% (71)  | 43% (77)   |
| Weapon attack                       | 26% (85)       | 29% (66)  | 19% (19)  | 28% (42)  | 24% (43)   |
| Rape                                | 4% (14)        | 5% (11)   | 3% (3)    | 5% (7)    | 4% (7)     |

|                      | Prevent injury |              |              | Pestered     |              |
|----------------------|----------------|--------------|--------------|--------------|--------------|
|                      | Total          | Yes          | No           | Yes          | No           |
|                      | <b>N=336</b>   | <b>N=235</b> | <b>N=101</b> | <b>N=154</b> | <b>N=182</b> |
|                      | % (n)          | % (n)        | % (n)        | % (n)        | % (n)        |
| Stolen from          | 84% (277)      | 85% (197)    | 80% (80)     | 87% (130)    | 81% (147)    |
| Police contact       | 66% (217)      | 69% (160)    | 57% (57) *   | 72% (108)    | 61% (109) *  |
| Police arrest        | 38% (124)      | 39% (89)     | 36% (35)     | 43% (65)     | 33% (59) *   |
| Security contact     | 45% (148)      | 48% (110)    | 38% (38)     | 53% (80)     | 38% (68) *   |
| Assignment condition |                |              |              |              |              |
| Experimental         |                |              |              |              |              |
| Yes                  | 48% (161)      | 51% (119)    | 42% (42)     | 43% (66)     | 53% (95)     |

\*  
p<0.05

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**Table 2b:**

Selected bivariate factors associated with motivations for assisted injection (n=336)

|                          | Skilled            |                  | For Money          |                   | For Drugs          |                   |
|--------------------------|--------------------|------------------|--------------------|-------------------|--------------------|-------------------|
|                          | Yes N=272 %<br>(n) | No N=64 %<br>(n) | Yes N=124 %<br>(n) | No N=212 %<br>(n) | Yes N=164 %<br>(n) | No N=171 %<br>(n) |
| <b>Who injected</b>      |                    |                  |                    |                   |                    |                   |
| Stranger                 | 36% (99)           | 25% (16)         | 52% (64)           | 24% (51)*         | 47% (77)           | 22% (38)*         |
| Acquaintance             | 73% (199)          | 50% (32)*        | 83% (103)          | 60% (128)*        | 81% (132)          | 58% (99)*         |
| Friend                   | 81% (219)          | 70% (45)         | 83% (103)          | 76% (161)         | 85% (140)          | 72% (123)*        |
| Casual sex partner       | 18% (49)           | 16% (10)         | 25% (31)           | 13% (28)*         | 23% (38)           | 12% (21)          |
| Steady sex partner       | 26% (71)           | 14% (9)*         | 27% (33)           | 22% (47)          | 27% (44)           | 21% (36)          |
| <b>Where injected</b>    |                    |                  |                    |                   |                    |                   |
| Neck/Clavicle            | 70% (190)          | 39% (25)         | 76% (94)           | 57% (121)*        | 71% (116)          | 57% (98)*         |
| Arm                      | 89% (242)          | 84% (54)         | 90% (112)          | 87% (184)         | 90% (147)          | 87% (148)         |
| Hand                     | 42% (113)          | 22% (14)*        | 47% (58)           | 33% (69)          | 45% (74)           | 31% (53)*         |
| Armpit                   | 17% (47)           | 8% (5)           | 29% (36)           | 8% (16)*          | 23% (38)           | 8% (14)*          |
| Stomach                  | 5% (14)            | 0% (0)           | 9% (11)            | 1% (3)*           | 7% (11)            | 2% (3)*           |
| Groin                    | 10% (26)           | 2% (1)*          | 15% (19)           | 4% (8)*           | 10% (17)           | 6% (10)           |
| Buttocks                 | 6% (16)            | 2% (1)           | 9% (11)            | 3% (6)*           | 6% (10)            | 4% (7)            |
| Leg                      | 27% (73)           | 13% (8)*         | 34% (42)           | 18% (39)*         | 28% (46)           | 21% (35)          |
| Feet                     | 13% (15)           | 5% (3)           | 15% (19)           | 9% (18)           | 15% (24)           | 8% (13)*          |
| <b>Frequency</b>         |                    |                  |                    |                   |                    |                   |
| Daily or more            | 29% (79)           | 11% (7)*         | 41% (51)           | 17% (35)*         | 33% (54)           | 19% (32)*         |
| <b>Motivations</b>       |                    |                  |                    |                   |                    |                   |
| Prevent injury           | 76% (207)          | 44% (28)*        | 77% (95)           | 66% (140)*        | 77% (126)          | 63% (108)*        |
| Pestered                 | 47% (128)          | 41% (26)         | 55% (68)           | 41% (86)*         | 54% (89)           | 37% (64)*         |
| Skilled                  | ----               |                  | 88% (109)          | 77% (163)*        | 88% (144)          | 74% (127)*        |
| For Money                | 40% (109)          | 23% (15)*        | -----              |                   | 61% (100)          | 14% (24)*         |
| For Drugs                | 53% (144)          | 31% (20)*        | 81% (100)          | 30% (64)*         | -----              |                   |
| For Sex                  | 5% (14)            | 3% (2)           | 7% (9)             | 3% (7)            | 8% (13)            | 2% (3)*           |
| For Shelter              | 7% (18)            | 2% (1)           | 11% (14)           | 2% (5)*           | 10% (17)           | 1% (2)*           |
| For Food                 | 11% (31)           | 2% (1)*          | 22% (22)           | 2% (5)*           | 18% (30)           | 1% (2)*           |
| For Ride                 | 4% (11)            | 2% (1)           | 7% (9)             | 1% (3)*           | 1% (1)             | 7% (11)*          |
| <b>Sociodemographics</b> |                    |                  |                    |                   |                    |                   |
| Female                   | 27% (72)           | 28% (18)         | 37% (45)           | 22% (45)*         | 29% (47)           | 25% (43)          |
| Race/ethnicity           |                    |                  |                    |                   |                    |                   |

|                         | Skilled            |                  | For Money          |                   | For Drugs          |                   |
|-------------------------|--------------------|------------------|--------------------|-------------------|--------------------|-------------------|
|                         | Yes N=272 %<br>(n) | No N=64 %<br>(n) | Yes N=124 %<br>(n) | No N=212 %<br>(n) | Yes N=164 %<br>(n) | No N=171 %<br>(n) |
| White                   | 49% (134)          | 41% (26)         | 56% (69)           | 43% (91)*         | 54% (89)           | 41% (70)*         |
| Latinx                  | 17% (47)           | 20% (13)         | 15% (18)           | 20% (42)          | 18% (30)           | 18% (30)*         |
| Black                   | 16% (44)           | 30% (19)*        | 16% (20)           | 20% (43)          | 13% (22)           | 24% (41)          |
| Native                  | 9% (25)            | 5% (3)           | 10% (12)           | 8% (16)           | 9% (15)            | 8% (13)           |
| A/PI                    | 2% (4)             | 0% (0)           | 2% (2)             | 1% (2)            | 2% (3)             | 1% (1)            |
| Mixed                   | 6% (17)            | 5% (3)           | 2% (3)             | 8% (17)           | 3% (5)             | 9% (15)           |
| Age                     |                    |                  |                    |                   |                    |                   |
| Less than 30            | 21% (58)           | 20% (13)*        | 21% (26)           | 21% (45)*         | 24% (39)           | 19% (32)          |
| 30–39                   | 34% (93)           | 9% (6)           | 38% (47)           | 25% (52)          | 34% (56)           | 25% (42)          |
| 40–49                   | 21% (58)           | 39% (25)         | 23% (29)           | 26% (54)          | 21% (35)           | 28% (48)          |
| 50 or more              | 23% (62)           | 31% (20)         | 18% (22)           | 28% (60)          | 21% (34)           | 28% (48)          |
| Sexual orientation      |                    |                  |                    |                   |                    |                   |
| Gay, lesbian, Bi        | 27% (72)           | 17% (11)         | 31% (38)           | 21% (45)          | 29% (47)           | 21% (36)          |
| Straight/Hetero         | 73% (199)          | 83% (53)         | 69% (86)           | 79% (166)         | 71% (117)          | 79% (134)         |
| High school or more     | 73% (197)          | 78% (50)         | 74% (92)           | 74% (155)         | 71% (117)          | 76% (129)         |
| Homeless                | 82% (224)          | 75% (48)         | 86% (107)          | 78% (165)         | 88% (144)          | 74% (127)*        |
| Income source           |                    |                  |                    |                   |                    |                   |
| GR                      | 66% (179)          | 55% (35)         | 68% (84)           | 61% (130)         | 67% (110)          | 60% (103)         |
| Retirement/SSI          | 14% (39)           | 19% (12)         | 16% (20)           | 15% (31)          | 13% (21)           | 18% (30)          |
| Recycling               | 21% (57)           | 28% (18)         | 28% (35)           | 19% (40)*         | 26% (42)           | 19% (33)          |
| Panhandling             | 29% (79)           | 27% (17)         | 36% (45)           | 24% (51)*         | 37% (61)           | 20% (34)*         |
| Illegal                 | 59% (161)          | 47% (30)         | 49% (104)          | 70% (87)*         | 70% (114)          | 45% (77)*         |
| <b>Drug use</b>         |                    |                  |                    |                   |                    |                   |
| Injection frequency     |                    |                  |                    |                   |                    |                   |
| None                    | 5% (13)            | 3% (2)           | 4% (10)            | 5% (5)            | 4% (6)             | 5% (9)*           |
| Less than daily         | 21% (56)           | 30% (19)         | 23% (54)           | 21% (21)          | 14% (23)           | 30% (52)          |
| 1–2 x a day             | 24% (65)           | 27% (17)         | 24% (56)           | 26% (26)          | 27% (45)           | 22% (37)          |
| 3 or more x             | 51% (138)          | 41% (26)         | 49% (115)          | 49% (49)          | 55% (90)           | 43% (73)          |
| Injected drugs, 30 days |                    |                  |                    |                   |                    |                   |
| Speedball               | 34% (91)           | 31% (20)         | 41% (51)           | 28% (60)*         | 38% (62)           | 29% (49)          |
| Goofball                | 59% (159)          | 42% (27)*        | 47% (100)          | 69% (86)*         | 69% (113)          | 43% (73)*         |
| Cocaine                 | 13% (35)           | 14% (9)          | 20% (25)           | 9% (19)*          | 19% (31)           | 8% (13)*          |
| Methamphetamine         | 56% (152)          | 56% (36)         | 57% (70)           | 56% (118)         | 65% (106)          | 48% (82)*         |
| Heroin                  | 81% (221)          | 69% (44)*        | 84% (104)          | 76% (161)         | 81% (133)          | 76% (131)         |
| Rx Opioid               | 11% (29)           | 5% (3)           | 15% (18)           | 7% (14)*          | 13% (21)           | 6% (11)*          |



|                                | Skilled            |                  | For Money          |                   | For Drugs          |                   |
|--------------------------------|--------------------|------------------|--------------------|-------------------|--------------------|-------------------|
|                                | Yes N=272 %<br>(n) | No N=64 %<br>(n) | Yes N=124 %<br>(n) | No N=212 %<br>(n) | Yes N=164 %<br>(n) | No N=171 %<br>(n) |
| Non-injected, 30 days          |                    |                  |                    |                   |                    |                   |
| Speedball                      | 6% (16)            | 8% (5)           | 8% (10)            | 5% (11)           | 8% (13)            | 5% (8)            |
| Goofball                       | 6% (16)            | 8% (5)           | 8% (10)            | 5% (11)           | 9% (14)            | 4% (7)            |
| Crack cocaine                  | 35% (96)           | 41% (26)         | 44% (55)           | 32% (67)*         | 37% (61)           | 35% (60)          |
| Cocaine                        | 11% (30)           | 11% (7)          | 13% (16)           | 10% (21)          | 12% (20)           | 10% (17)          |
| Methamphetamine                | 48% (131)          | 48% (31)         | 49% (61)           | 48% (101)         | 51% (84)           | 45% (77)          |
| Heroin                         | 26% (71)           | 19% (12)         | 25% (31)           | 25% (52)          | 25% (38)           | 25% (45)          |
| Rx Opioid                      | 19% (51)           | 19% (12)         | 24% (30)           | 16% (33)*         | 19% (31)           | 19% (32)          |
| Heroin use frequency, 30 days  |                    |                  | 9% (11)            | 16% (34)*         | 12% (19)           | 15% (26)          |
| 0                              | 11% (31)           | 22% (14)*        | 15% (18)           | 22% (47)          | 17% (27)           | 22% (38)          |
| 1–29                           | 20% (54)           | 17% (11)         | 24% (30)           | 22% (47)          | 21% (35)           | 25% (42)          |
| 30–89                          | 21% (58)           | 30% (19)         | 52% (65)           | 40% (84)          | 51% (83)           | 38% (65)          |
| 90 or more                     | 47% (129)          | 31% (20)         |                    |                   |                    |                   |
| Meth use frequency, 30 days    |                    |                  | 14% (17)           | 14% (17)          | 15% (25)           | 26% (44)*         |
| 0                              | 20% (55)           | 22% (14)         | 33% (41)           | 33% (41)          | 26% (43)           | 35% (60)          |
| 1–29                           | 30% (83)           | 33% (21)         | 32% (40)           | 32% (40)          | 32% (53)           | 26% (44)          |
| 30–89                          | 29% (79)           | 28% (18)         | 21% (26)           | 21% (26)          | 26% (43)           | 13% (23)          |
| 90 or more                     | 20% (55)           | 17% (11)         |                    |                   |                    |                   |
| Cocaine use frequency, 30 days |                    |                  |                    |                   |                    |                   |
| 0                              | 43% (118)          | 39% (25)         | 35% (43)           | 47% (100)*        | 40% (66)           | 45% (77)          |
| 1–29                           | 35% (95)           | 44% (28)         | 38% (47)           | 36% (76)          | 40% (66)           | 33% (56)          |
| 30–89                          | 11% (30)           | 9% (6)           | 11% (14)           | 10% (22)          | 12% (19)           | 10% (17)          |
| 90 or more                     | 11% (29)           | 8% (5)           | 16% (20)           | 7% (14)           | 8% (13)            | 12% (21)          |
| Drug Scene Involvement         |                    |                  |                    |                   |                    |                   |
| Took to place to inject        | 67% (181)          | 53% (34)*        | 74% (90)           | 59% (125)*        | 74% (120)          | 55% (94)*         |
| Shooting gallery               | 13% (34)           | 16% (10)         | 17% (21)           | 11% (23)          | 18% (29)           | 9% (15)*          |
| Purchased syringes             | 49% (132)          | 56% (36)         | 61% (74)           | 45% (94)*         | 53% (86)           | 48% (81)          |
| Sold syringes                  | 48% (128)          | 47% (30)         | 63% (77)           | 39% (81)*         | 58% (63)           | 37% (63)*         |
| Bought drugs                   | 70% (187)          | 63% (40)         | 80% (98)           | 61% (129)*        | 81% (130)          | 56% (96)*         |
| Sold drugs                     | 68% (182)          | 60% (37)         | 82% (98)           | 58% (121)*        | 80% (91)           | 54% (91)*         |
| <b>Other domains</b>           |                    |                  |                    |                   |                    |                   |
| Any PTSD diagnosis             | 29% (80)           | 27% (17)         | 37% (46)           | 24% (51)*         | 31% (51)           | 27% (46)          |
| Violence in the last 6 months  |                    |                  |                    |                   |                    |                   |
| Punched                        | 49% (132)          | 25% (16)*        | 58% (70)           | 37% (78)*         | 54% (86)           | 36% (61)*         |
| Attack by weapon               | 27% (71)           | 22% (14)         | 35% (42)           | 20% (43)*         | 31% (49)           | 21% (36)*         |

|                      | Skilled            |                       | For Money          |                     | For Drugs          |                        |
|----------------------|--------------------|-----------------------|--------------------|---------------------|--------------------|------------------------|
|                      | Yes N=272 %<br>(n) | No N=64 %<br>(n)      | Yes N=124 %<br>(n) | No N=212 %<br>(n)   | Yes N=164 %<br>(n) | No N=171 %<br>(n)      |
| Rape                 | 4% (10)            | 6% (4)                | 7% (9)             | 2% (5) <sup>*</sup> | 2% (3)             | 7% (11) <sup>*</sup>   |
| Stolen from          | 84% (226)          | 81% (51)              | 88% (107)          | 81% (170)           | 77% (130)          | 91% (146) <sup>*</sup> |
| Police contact       | 70% (188)          | 46% (29) <sup>*</sup> | 67% (81)           | 65% (136)           | 74% (117)          | 58% (99) <sup>*</sup>  |
| Police arrest        | 39% (105)          | 31% (19)              | 35% (42)           | 39% (82)            | 41% (65)           | 34% (58)               |
| Security contact     | 47% (126)          | 35% (22)              | 50% (61)           | 41% (87)            | 54% (86)           | 36% (61) <sup>*</sup>  |
| Assignment condition |                    |                       |                    |                     |                    |                        |
| Experimental         | 50% (136)          | 39% (25)              | 50% (62)           | 47% (99)            | 50% (82)           | 79 (47%)               |

<sup>\*</sup>  
p<0.05

**Table 3:**

Logistic regression analysis of factors associated with assisted injection for injury prevention (N=336)

|  | <b>Odds ratio 95% Confidence Interval</b> | <b>Adjusted odds ratio 95% Confidence Interval</b> |
|--|---|--|
| Non-injection methamphetamine use, in the last 30 days |   |  |
| YES  | 1.65 (1.03, 2.64)                         | 2.16 (1.27, 3.67)                                  |
| Recycling income in the last 6 months                  |   |  |
| Yes  | 0.56 (0.33, 0.96)                         | 0.49 (0.27, 0.88)                                  |
| Provided injection assistance in                       |   |  |
| NECK   | 2.27 (1.40, 3.66)                         | 1.98 (1.17, 3.34)                                  |
| Motivation for assisted injection                      |   |  |
| Skilled at it  | 4.10 (2.32, 7.22)                         | 3.42 (1.87, 6.22)                                  |
| Intervention assignment                                |   |  |
| Experimental   | 1.42 (0.88, 2.27)                         | 1.34 (0.88, 2.22)                                  |

**Table 4:**

Logistic regression analysis of factors associated with assisted injection due to being pestered (N=336)

|   | <b>Odds ratio 95% Confidence Interval</b> | <b>Adjusted odds ratio 95% Confidence Interval</b> |
|---|---|--|
| Sold syringes                                   |   |  |
| YES   | 2.00 (1.29, 3.11)                         | 2.05 (1.28, 3.30)                                  |
| Non-injection speedball use in the last 30 days |   |  |
| Yes   | 4.10 (1.47, 11.48)                        | 4.85 (1.62, 14.52)                                 |
| Provided injection assistance in                |   |  |
| NECK  | 2.56 (1.60, 4.09)                         | 1.98 (1.20, 3.26)                                  |
| Provided injection assistance in                |   |  |
| HAND  | 2.14 (1.36, 3.45)                         | 1.70 (1.05, 2.75)                                  |
| Motivation for assisted injection               |   |  |
| Skilled at it                                   | 2.48 (1.51, 4.07)                         | 2.23 (1.30, 3.80)                                  |
| Intervention assignment                         |   |  |
| Experimental                                    | 0.68 (0.44, 1.05)                         | 0.56 (0.35, 0.90)                                  |

**Table 5:**

Logistic regression analysis of factors associated with assisted injection for skill at injecting (N=336)

|                                   | Odds ratio 95% Confidence Interval | Adjusted odds ratio 95% Confidence Interval |
|-----------------------------------|------------------------------------|---|
| Age                               |                                    |   |
| <30                               | Referent                           | Referent                                    |
| 30–39                             | 3.47 (1.25, 9.65)                  | 4.18 (1.37, 12.79)                          |
| 40–49                             | 0.52 (0.24, 1.12)                  | 0.65 (0.28, 1.55)                           |
| 50 or older                       | 0.70 (0.32, 1.52)                  | 1.01 (0.42, 2.46)                           |
| Violence in the last 6 months     |                                    |   |
| Punched                           | 2.91 (1.58, 5.38)                  | 2.57 (1.28, 5.17)                           |
| Provided injection assistance in  |                                    |   |
| NECK                              | 3.62 (2.05, 6.36)                  | 2.84 (1.52, 5.30)                           |
| Provided injection assistance in  |                                    |   |
| HAND                              | 2.54 (1.34, 4.81)                  | 2.19 (1.06, 4.50)                           |
| Motivation for assisted injection |                                    |   |
| Injury prevention                 | 4.10 (2.32, 7.22)                  | 3.18 (1.71, 5.93)                           |
| Intervention assignment           |                                    |   |
| Experimental                      | 1.57 (0.90, 2.74)                  | 1.77 (0.94, 3.34)                           |

**Table 6:**

Logistic regression analysis of factors associated with assisted injection for money (N=336)

|                                   | Odds ratio 95% Confidence Interval | Adjusted odds ratio 95% Confidence Interval |
|-----------------------------------|------------------------------------|---|
| Sex                               |                                    |   |
| Female                            | 2.12 (1.29, 3.47)                  | 2.38 (1.28, 4.41)                           |
| Provided injection assistance in  |                                    |   |
| Armpit                            | 5.01 (2.64, 9.51)                  | 2.88 (1.31, 6.35)                           |
| Motivation for assisted injection |                                    |   |
| For drugs                         | 9.57 (5.61, 16.32)                 | 7.08 (3.95, 12.69)                          |
| Motivation for assisted injection |                                    |   |
| For food                          | 11.52 (4.31, 30.84)                | 6.33 (1.92, 20.83)                          |
| Frequency of assisted injection   |                                    |   |
| Daily or more                     | 3.53 (2.12, 5.88)                  | 2.65 (1.40, 4.99)                           |
| Intervention assignment           |                                    |   |
| Experimental                      | 1.13 (0.73, 1.76)                  | 1.20 (0.69, 2.11)                           |

**Table 7:**

Logistic regression analysis of factors associated with assisted injection for drugs (N=336)

|  | Odds ratio 95% Confidence Interval | Adjusted odds ratio 95% Confidence Interval |
|--|------------------------------------|---|
| Income source in the last 6 months     |                                    |   |
| Panhandling/soliciting                 | 2.39 (1.46, 3.90)                  | 2.31 (1.27, 4.23)                           |
| Sold drugs                             |                                    |   |
| Yes                                    | 3.56 (2.05, 5.49)                  | 2.31 (1.31, 4.09)                           |
| Goofball injection in the last 30 days |                                    |   |
| Yes                                    | 2.97 (1.90, 4.66)                  | 2.46 (1.44, 4.21)                           |
| Motivation for assisted injection      |                                    |   |
| For money                              | 9.57 (5.61, 16.32)                 | 6.57 (3.66, 11.79)                          |
| Motivation for assisted injection      |                                    |   |
| For food                               | 18.92 (4.44, 80.59)                | 8.75 (1.81, 42.28)                          |
| Intervention assignment                |                                    |   |
| Experimental                           | 1.15 (0.75, 1.77)                  | 0.95 (0.56, 1.63)                           |