



Research Paper

Public drug use in eight U.S. cities: Health risks and other factors associated with place of drug use

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ABSTRACT

Background: Drug overdose is the leading cause of accidental death in the United States (U.S.). Previous studies have found that place of drug use is associated with risks including overdose, sharing of drug use equipment, and arrest, but the research on this subject in the U.S. is limited.

Methods: Our study describes the relationship between place of drug use and health outcomes through the analysis of associations between frequent public drug use and drug-related arrest, overdose, and reuse of injection equipment. We analysed data from a cross-sectional, observational study of individuals who utilize syringe exchange services in 8 U.S. cities. Using regression analysis, we assessed associations between public drug use, demographic characteristics, and health risks.

Results: Half (48%) of the respondents (N = 575) reported that at least one of their top two most frequent places of drug use is a public place. Street homelessness (AOR = 17.44), unstable housing (AOR = 3.43) and being under age 30 (AOR = 1.85) were independently associated with increased odds of frequent public drug use. Frequent public drug use was associated with increased odds of past-year arrest for drug-related offenses (AOR = 1.87).

Conclusion: Public drug use is associated with negative health and social outcomes. Increased access to harm reduction services, housing, and supervised consumption sites (SCS) interventions and a shift away from punitive approaches to drug use may reduce the some of the harms associated with public drug use.

Introduction

Drug overdose is the leading cause of accidental death in the United States (U.S.); the opioid overdose death rate tripled between 1999 and 2014, and more than 63,000 people died of drug overdose in 2016 (Hedegaard, Warner, & Miniño, 2017; Mack, Jones, & Ballesteros, 2017). The overdose epidemic and high rates of illicit drug use are straining health systems and the economy. Emergency department visits involving misuse of prescription medications rose by more than 100% between 2004 and 2011, and illicit drug-related visits rose by nearly one third in the same time period (Substance Abuse & Mental Health Services Administration Center for Behavioral Health Statistics & Quality, 2013). Estimates of the economic burden of opioid use vary, and are as high as \$500 billion in 2015 (The Council of Economic Advisers, 2017). Though often overlooked amid increasing opioid use, non-opioid drugs such as cocaine are involved in substantial morbidity and mortality in the U.S. (McCall Jones, Baldwin, & Compton, 2017;

Nolan, Tuazon, Mantha, Yim, & Paone, 2015; Walker, Pratt, Schoenborn, & Druss, 2017).

The causes of recent increases in drug use and related morbidity and mortality are complex. Numerous studies have examined the correlation between a precipitous increase in prescription opioid consumption – sales of prescription opioids increased fourfold between 1999 and 2010 – and a subsequent shift to heroin use among a subset of people who developed opioid use disorders (Kolodny et al., 2015; “Vital Signs: Overdoses of Prescription Opioid Pain Relievers — United States, 1999–2008,” 2011). The initiation of heroin use is linked to injection drug use (Lake et al., 2016; Lankenau et al., 2011) and injection drug use increases risk of HIV, viral hepatitis C (HCV), skin and soft tissue infections, and overdose (Adams, 2015; Francisco Author et al., 2000; Kerr et al., 2005; Lloyd-Smith et al., 2005, 2008; Spiller, Broz, Wejnert, Nerlander, & Paz-Bailey, 2015; Wejnert et al., 2016). More recently, public health researchers have begun to explore interrelated social determinants of increased opioid use, including “structural factors such

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as poverty, lack of opportunity, and substandard living and working conditions” as well as a changing population with a higher burden of inadequately managed pain (Dasgupta, Beletsky, & Ciccarone, 2018). Major changes to the U.S. illicit opioid market have compounded these problems; from 2013 to 2016, there was a five-fold increase to approximately 20,000 overdose deaths associated with illicitly manufactured fentanyl and fentanyl analogs (O'Donnell, Halpin, Mattson, Goldberger, & Matthew, 2017). Despite conventional wisdom that the overdose epidemic has primarily affected White people, that is not the case in many parts of the country, such as in New York City where overdose mortality increased more sharply among African-Americans (85%) and Hispanics (84%) than Whites (57%) between 2013–2016, or the six states where African-American opioid overdose mortality exceeds that of Whites (“Opioid Overdose Deaths by Race/Ethnicity,” n.d.; Paone, Nolan, Tuazon, & Blachman-Forshay, 2017).

Syringe services programs (SSP), which provide sterile syringes and drug use equipment, have demonstrably reduced HIV and HCV transmission among people who use drugs (PWUD) (Bluthenthal, Anderson, Flynn, & Kral, 2007; Des Jarlais et al., 2005). SSPs also connect participants to healthcare, social services, and other services, such as overdose education and naloxone distribution, to reduce the health risks associated with drug use (Des Jarlais et al., 2005; Piper et al., 2008). However, by 2017 only 27 states and the District of Columbia had taken action to legalize SSPs, and 9 additional states had local laws permitting SSPs (American Foundation for AIDS Research (amfAR), n.d.). Several states with limited syringe distribution have experienced HIV and HCV outbreaks in recent years, demonstrating the need for expanded SSP access (Conrad, Bradley, Broz, Buddha, & Chapman, 2015; Heller, Paone, Siegler, & Karpati, 2009; Nguyen, Weir, Des Jarlais, Pinkerton, & Holtgrave, 2014; Zibbell, Iqbal, Patel, Suryaprasad, & Sanders, 2015). Despite the benefits, a significant limitation of SSPs is that current federal and state laws strictly limit their ability to provide a safe, hygienic place to use the sterile equipment they distribute. SSP participants who are homeless, have limited access to private space, or face situational factors that necessitate immediate drug use are more likely to use drugs in public (Rhodes et al., 2007).

Prior international studies show a link between public drug use (in this study defined as drug use outside of a private home) and many health and social harms. Public drug use is associated with higher-risk injection (including unhygienic practices and rushed use), overdose, homelessness, emergency department utilization, and reuse of injection equipment (Kerr, Fairbairn et al., 2007; Marshall, Kerr, Qi, Montaner, & Wood, 2010; Small, Rhodes, Wood, & Kerr, 2007). People who use drugs in public also face fear, stigmatization, and marginalization, which contribute to poor health outcomes (Parkin & Coomber, 2009; Rhodes et al., 2007; Tempalski & Mcquie, 2009).

While environmental factors are linked to health outcomes, interventions intended to reduce the harms of drug use often focus on individual behaviour as the key determinant of health. The “risk environment” framework is an alternative approach that incorporates environmental, economic, political, and structural factors that influence drug-related health risks, and is “oriented towards generating data of practical value for the development of interventions rather than attempting to delineate causative factors” (Rhodes, 2002; Rhodes et al., 2003). Previous research indicates that analysis of the physical and social context in which people use drugs can inform “safer environment interventions” and structural interventions that reduce the harms associated with public drug use (Rhodes, 2002; Rhodes et al., 2006).

To reduce environment-related risks associated with public drug use, more than 65 cities in ten countries have implemented supervised consumption sites (SCS) (Drug Policy Alliance, 2017). SCSs are spaces where people can lawfully use drugs under the supervision of trained staff. They are shown to decrease risk of fatal overdose by providing medical management of overdose and drug adulteration testing, and by reducing rushed injection and other unsafe practices (Marshall, Milloy, Wood, Montaner, & Kerr, 2011; Stoltz et al., 2007). SCSs also

successfully connect participants to other health and social services (Kappel, Toth, Tegner, & Lauridsen, 2016; Small, Wood, Lloyd-Smith, Tyndall, & Kerr, 2008). Despite the demonstrated benefits, there are not legal SCSs operating in the U.S. and research on the health impacts of public drug use in the U.S. is limited.

This study builds upon existing international research in order to describe the demographic characteristics, drug use practices, and risk factors associated with public drug use in the U.S. Specifically, we analyse the associations between frequent public drug use and drug-related arrest, overdose, and reuse of injection equipment (Rhodes, 2002). The study aims to contribute to a better understanding of the relationship between place of drug use and health outcomes among people who use drugs in 8 U.S. cities.

Methods

This study analyses data from a cross-sectional, observational study of individuals who utilize syringe services in the U.S. Data were collected from a convenience sample of 684 individuals from 10 SSPs in 8 U.S. cities. The study was approved by the Columbia University Institutional Review Board.

Study population

Participants were recruited in 12 SSPs in the U.S. through convenience sampling by field interviewers and SSP staff. Participants were recruited at SSP drop-in centres and street-based outreach sites. Eligibility criteria included self-report age of over 18 years, self-reported illicit drug use in the past three months, the ability to participate in an English-language interview, and the ability to provide verbal informed consent.

Participants were recruited at SSPs in 8 U.S. cities: Atlantic City, NJ, Boston, MA, Denver, CO, Los Angeles, CA, New York City, NY, Oakland, CA, Paterson, NJ, and San Francisco, CA. Data from the initial sample of 684 participants was reviewed, and all variables had less than 5% missing data with no patterns in missing values detected. Listwise deletion excluded all cases with any missing data and resulted in a final sample size of 575 participants.

Study design

The survey instrument was adapted from the Injection Drug Users Health Alliance Citywide Study (IDUCS) and covered demographic characteristics, behaviours related to drug use, associated health and safety outcomes, and drug use locations (“IDUHA Citywide Evaluation Study,” 2015). Survey sites volunteered to participate and devote staff and volunteer time to data collection. Interviewer administered surveys were conducted over a four month period (November 2016–March 2017) and responses were recorded on paper field-coded surveys. Field interviewers consisted of staff, volunteers, and interns from the SSPs, and were familiar with the subject matter and cultural competence. Field interviewers were required to watch a training video that described informed consent, confidentiality, and survey content as well as a demonstration of survey administration. A lead interviewer at each site confirmed training completion with the study coordinator before conducting interviews. Six sites offered gift cards valued at \$20 or less (independently funded by the sites) as a participation incentive; these sites used pre-existing anonymous identifiers assigned to SSP clients to prevent duplicate interviews.

Paper surveys were printed with survey identification codes consisting of a site number and a unique 3-digit code and shipped to survey sites. Completed paper surveys were returned to the study coordinator and entered manually. After completion of data entry, a random sample of 10% of the surveys was selected and reviewed for accuracy to ensure data quality.

Measures

The primary outcomes of interest for this study were drug-related arrests, overdose, receptive reuse of drug use equipment, and emergency department utilization; all variables were dichotomous (yes/no). To measure overdose, participants were asked if they had ever overdosed, if they had overdosed in the past year, and if they had ever witnessed someone else experiencing an overdose. To measure arrest, participants were asked if they were arrested for having, using, or selling drugs in the past year. If participants reported injection drug use in the past three months, they were asked if they had reused a syringe, cooker, cotton, or water for injection after someone else had already used them. If participants reported smoking drugs in the past three months, they were asked if they had reused a pipe for smoking after someone else had already used it.

The primary explanatory variable was frequent public drug use. To measure public drug use, participants were asked if in the past three months they had used illicit drugs in the following categories: street or park, a stairwell, an abandoned building, a public bathroom, public transportation, a car, the bathroom of a syringe exchange program, a shooting gallery, the private home of someone else, their own home, or another place not mentioned with an option to write in the response. All categories except for home of someone else or their own home were coded as *public*. The home of someone else and their own home were coded as *private*. Then, we created a new variable to capture the top two places of reported drug use. Participants were asked in which two places they used drugs most frequently in the past three months. Cases with at least one public place in the top two most frequent places of drug use were categorized as *frequent public drug use*, and cases without a public place in the top two most frequent places of drug use were categorized as *infrequent public drug use*.

Demographic characteristics measured in the survey included age, gender, race/ethnicity, and housing status. To assess housing status, participants were asked “In the past three months, where have you spent the night most often?” and responses were collapsed into three categories; street-homeless (street, park) unstable/temporary (shelter, jail, home of someone else, single room occupancy facility, drug treatment centre), or stable (house or apartment that they lease or own).

Measures of drug use and risk behaviour included type of drug use, method of drug use, frequency of injection, and frequency of assistance with injection. Type of drug use was measured by asking if participants had used any of the following substances in the past three months: methadone, alcohol, marijuana, synthetic cannabinoids, cocaine, crack, heroin, methamphetamine, benzodiazepines, or opioids other than heroin. Those who reported use of non-heroin opioids were asked if the opioids were prescribed to them. Participants who reported injection drug use in the past three months were asked on average how many times per day they injected drugs in the past three months and how frequently someone else helped them inject, for example by helping them find a vein or by injecting them.

Statistical analysis

Analysis was performed using SPSS version 24. Univariate logistic regression analysis was conducted to assess factors associated with frequent public drug use. Multivariable logistic regression models were conducted for all variables whose association with frequent public drug use was significant at the $p < 0.05$ level. Chi-square tests were used to assess associations between independent variables, and variables with p -values greater than 0.20 were excluded to create parsimonious models through backward stepwise selection.

Results

Participants were predominantly male (69%), White (46%), and age

Table 1

Descriptive characteristics of people who use drugs in 8 U.S. cities (N = 575).

	N	%
Age		
Under 30	98	17%
30 to 39	137	24%
40 to 49	138	24%
50 or older	202	35%
Gender		
Female	170	30%
Male	395	69%
Transgender	10	2%
Race/Ethnicity		
White	263	46%
Black	185	32%
Latino	106	18%
Other	21	4%
Housing Status		
Street-homeless	193	34%
Unstably/temporarily housed	262	46%
Stably housed	120	21%

50 or older (35%) (Table 1). One third (34%) of participants reported that they were street-homeless, and nearly half (46%) were temporarily or unstably housed.

Nearly three quarters (73%) of participants reported heroin use in the past three months (Table 2). Of the 31% of participants who used non-heroin opioids in the three months before the survey, most (62%) said that the opioids were not prescribed to them. Three quarters (78%) of participants reported injection drug use in the past three months, and of those one in four (27%) reported receptive reuse of a syringe in the past three months. In the past year, one in four (25%) of participants experienced an overdose, and more than half (56%) were admitted to an emergency department. One in four participants (26%) reported a recent drug-related arrest in the year preceding the study.

Half (48%) of participants reported that they frequently use drugs in public. The most common places of public drug use were a street or park (77%), a public bathroom (63%), and a car (53%) (Table 3). One in five (21%) participants reported using drugs in a SSP bathroom in the past three months, though this varied widely by site (range 0%–43%).

Half of participants reported that they frequently use drugs in public in both the Eastern U.S. (51%) and Western U.S. (47%) (Table 4). One in three participants (34%) in the Eastern U.S. and one in four (23%) in the Western U.S. reported receptive reuse of a syringe in the past three months. One in three participants (33%) in the Eastern U.S. and one in four (23%) in the Western U.S. reported a recent drug-related arrest in the year preceding the study.

Factors associated with frequent public drug use are presented in Table 5. In univariate analysis, compared with participants who were stably housed, participants who were street-homeless were nearly 19 times more likely to report frequent public drug use (OR 18.54) and participants who were unstably or temporarily housed were nearly 4 times more likely to report frequent public drug use (OR 3.79). Participants under 30 years of age and between 30 and 39 years of age were about twice as likely to report frequent public drug use (OR 2.31, OR 1.67, respectively) compared to those age 50 or older.

Participants who reported frequent public drug use were more than twice as likely to report arrest for drug-related offenses in the past year (OR 2.32). Participants who had overdosed in the past year or witnessed an overdose had twice the odds of reporting frequent public drug use (OR 1.65, OR 2.16, respectively).

In a parsimonious multivariable regression model, age, housing status, and arrest were significantly associated with frequent public drug use. Participants under 30 years of age were nearly twice as likely to report frequent public drug use (AOR = 1.85) when controlling for race, housing status, alcohol use, heroin use, and injection drug use.

Table 2
Drug use & risk behaviour among people who use drugs in 8 U.S. cities (N = 575).

	N	%
Type of drugs used (past 3 months)		
Alcohol	319	55%
Marijuana	349	61%
Methadone	197	34%
Heroin	418	73%
Cocaine	224	39%
Crack	242	42%
Synthetic cannabinoids	33	6%
Methamphetamine	275	48%
Non-heroin opioids	180	31%
Prescribed	69	38%
Not prescribed	100	62%
Benzodiazepines	185	32%
Injection drug use (past 3 months)	448	78%
Injections per day (Mean, SD) (N = 448)	(3.32, 3.79)	
Less than once per day	78	17%
1–2 times per day	125	28%
3–4 times per day	136	30%
5 or more times per day	105	23%
Received help with injection (N = 448)		
Rarely	268	60%
Sometimes	65	14%
Usually	12	3%
Almost Always	37	8%
Reused injection equipment (past 3 months)^a (N = 448)		
Reuse of syringe	120	27%
Reuse of cooker	195	43%
Reuse of cotton	150	33%
Reuse of water	173	39%
Reuse of any injection equipment	249	55%
Smoked drugs (past 3 months)^b		
Reuse of pipe/stem (N = 420)	308	73%
Overdose		
Lifetime overdose	319	55%
Past year overdose	142	25%
Ever witnessed overdose	392	68%
Emergency department utilization		
Admitted in the past year	323	56%
Due to overdose	90	28%
Due to injection-related infection	101	31%
Past year drug-related arrest	151	26%

^a Only includes participants who reported injection drug use in the past 3 months.

^b Only includes participants who reported smoked drug use in the past 3 months.

Table 3
Place of drug use in 8 U.S. cities (N = 575).

	N	%
Public Drug Use		
One of top two places of use public	278	48%
In the past 3 months, used drugs in...		
Street or Park	441	77%
Stairwell	300	52%
Abandoned building	221	38%
Public bathroom	362	63%
Public transit	149	26%
Car	303	53%
SSP bathroom	119	21%
Shooting gallery	122	21%
Private home - someone else	416	72%
Own home	327	57%
Other ^a	98	17%

^a Includes Airplane (1), Alley (10), Boat (1), Bowling Alley (1), Bridge (1), Camper/Campsite (2), Casino (1), Courthouse (1), Hospital (3), Jail (5), Library (1), Methadone clinic (1), Motel/Hotel (11), Police car/police station (4), Shelter (6), Tent (13), Wooded areas (1).

Street-homeless participants had much greater odds of frequent public drug use compared with stably housed participants (AOR = 17.44), as did unstably housed people (AOR = 3.43), independent of age, heroin use, and injection drug use. Participants who reported frequent public drug use were nearly twice as likely to have been arrested for drug-related offenses in the past year, when controlling for age, housing status, alcohol use, heroin use, and injection drug use (AOR = 1.87).

Discussion

This study highlights that public drug use is common among PWUD who access harm reduction services in the 8 cities included in the study, with half of the sample reporting frequent public drug use, and is associated with negative health and social outcomes. The three key findings of this study are that frequent public drug use is independently associated with housing status, age, and arrest.

Street-homelessness and unstable or temporary housing were strongly associated with frequent public drug use. People who do not have stable housing are less likely to have access to private spaces where they can use drugs. In the U.S., there is limited access to subsidized housing that does not require abstinence as a condition of tenancy. Supportive housing models that do not require abstinence have shown success in client retention and linkage to services without increasing substance use (Padgett, Gulcur, & Tsemberis, n.d.; Padgett, Henwood, Abrams, & Davis, 2008; Tsemberis, Moran, Shinn, Asmussen, & Shern, 2003) and may be an effective approach to reducing public drug use.

Participants who used drugs in public were nearly twice as likely to report past-year arrest for drug-related offenses when controlling for age, housing status, alcohol use, heroin use, and injection drug use. Several studies have found that fear of arrest is associated with rushed drug use and unsafe injection practices (Cooper, Moore, Gruskin, & Krieger, 2005; Small et al., 2007). Fear of arrest may also deter PWUD from accessing SSPs and carrying drug use equipment, which can lead to syringe and pipe reuse and improper disposal of used equipment (Cooper et al., 2005). Training, operations orders, and other policies that reduce police targeting of PWUD may reduce drug-related arrests and associated health outcomes. Partnerships between harm reduction programs and criminal justice agencies, such as the Law Enforcement Assisted Diversion (LEAD) program, that connect PWUD with services rather than criminal justice involvement have shown promise in reducing criminal justice recidivism and increasing stable housing and employment (Clifasefi, Lonczak, & Collins, 2017; Collins, Lonczak, & Clifasefi, 2017).

In univariate analysis, frequent public drug use was associated with past year overdose and experience witnessing an overdose, consistent with prior research (Kerr, Fairbairn et al., 2007). The association between public drug use and overdose may be explained by rushed injection practices resulting from fear of arrest and stigmatization. While using drugs in public, people who are afraid of interaction with law enforcement and being seen by the general public may feel too hurried to make time for a “test shot” to assess potency, which can lead to overdose (Dovey, Fitzgerald, & Choi, 2001; Kerr, Fairbairn et al., 2007).

Participants under 40 years of age were significantly more likely to frequently use drugs in public in univariate analysis. When controlling for race, housing status, alcohol use, heroin use, and injection drug use, participants under age 30 were nearly twice as likely to report frequent public drug use. This finding is consistent with other studies indicating that young people frequently use drugs in public spaces (Calvo et al., 2017; Riley et al., 2016). Youth homelessness and drug use are correlated, and a lack of access to private homes may lead to more frequent drug use in public spaces (Greene, Ennett, & Ringwalt, 1997; Mallett, Rosenthal, & Keys, 2005; Quimby et al., 2012). Young PWUD are also more likely to engage in high-risk injection-related behaviour including reuse of injection equipment and failure to clean injection sites, are less likely than their older counterparts to utilize SSP, and are at increased

Table 4

Risk behaviour and place of drug use among people who use drugs in 8 U.S. cities by region (N = 575).

	Total (N = 575)		Eastern U.S. (N = 194) ^a		Western U.S. (N = 381) ^b	
	N	%	N	%	N	%
Public Drug Use						
One of top two places of use public	278	48%	99	51%	179	47%
Overdose						
Ever overdose?	319	55%	105	54%	214	56%
Past year overdose?	142	25%	46	24%	96	25%
Witness overdose?	392	68%	131	68%	261	69%
Reused injection equipment ^c (past 3 months)						
Syringe	120 (N = 448)	27%	51 (N = 152)	34%	69 (N = 296)	23%
Arrested in the past year?	151	26%	64	33%	87	23%

^a Includes Atlantic City, Boston, New York City, and Paterson.^b Includes Denver, Los Angeles, Oakland, and San Francisco.^c Only includes participants who reported injection drug use in the past 3 months.**Table 5**

Factors associated with frequent public drug use in 8 U.S. cities (N = 575).

	Frequent public drug use (N = 278)		Infrequent public drug use (N = 297)		OR ^a	95% CI	p-value	AOR ^b	95% CI	p-value
	N	%	N	%						
Age										
Under 30	60	22%	38	13%	2.31	1.41–3.79	0.001 ^c	1.85	1.02–3.36	0.044 ^c
30 to 39	73	26%	64	22%	1.67	1.08–2.59	0.022 ^c	1.29	0.76–2.21	0.345
40 to 49	63	23%	75	25%	1.23	0.79–1.90	0.355	0.85	0.50–1.42	0.522
50 or older	82	29%	120	40%	Ref			Ref		
Gender										
Female	74	27%	96	32%	Ref					
Male	198	71%	197	66%	1.30	0.91–1.87	0.150			
Transgender	6	2%	4	1%	1.95	0.53–7.15	0.316			
Race/Ethnicity										
White	137	49%	126	42%	Ref					
Black	82	29%	103	35%	0.73	0.50–1.07	0.106			
Latino	49	18%	57	19%	0.79	0.50–1.24	0.308			
Other	10	4%	11	4%	0.84	0.34–2.04	0.693			
Housing Status										
Street-homeless	150	54%	43	14%	18.54	10.22–33.65	> 0.001 ^c	17.44	9.50–32.00	> 0.001 ^c
Unstably/temporarily housed	109	39%	153	52%	3.79	2.19–6.55	> 0.001 ^c	3.43	1.97–5.99	> 0.001 ^c
Stably housed	19	7%	101	34%	Ref					
Drug-related arrest in the past year ^d										
No	182	65%	242	81%	Ref			Ref		
Yes	96	35%	55	19%	2.32	1.58–3.41	> 0.001 ^c	1.87	1.15–2.93	0.006 ^c
Overdose										
Lifetime overdose										
No	114	41%	142	48%	Ref					
Yes	164	59%	155	52%	1.32	0.95–1.83	0.101			
Past year overdose										
No	88	51%	103	64%	Ref			Ref		
Yes	83	49%	59	36%	1.65	1.06–2.55	0.026 ^c	1.22	0.73–2.04	0.440
Witnessed overdose										
No	65	23%	118	40%	Ref					
Yes	213	77%	179	60%	2.16	1.50–3.10	> 0.001 ^c	1.31	0.85–2.00	0.221
Reuse of Injection Equipment										
Syringe										
No	166	71%	162	76%	Ref					
Yes	68	29%	52	24%	1.28	0.84–1.94	0.260			
Any Injection Equipment										
No	98	42%	100	47%	Ref					
Yes	136	58%	113	53%	1.23	0.85–1.79	0.280			

^a Univariate logistic regression.^b Multivariable logistic regression with backward stepwise selection.^c Statistically significant at p < 0.05.^d Drug-related arrest is the outcome variable.

risk of overdose and HIV (Bailey, Huo, Garfein, & Ouellet, 2003; Broz et al., 2014; Evans et al., 2012; Marshall et al., 2010; Riley et al., 2016). Existing research to assess differences in PWUD by age is limited, however, these initial findings indicate that young PWUD need dedicated services that address their particular health and safety risks.

When comparing the Eastern U.S. to the Western U.S., the frequencies of frequent public drug use and overdose reported by participants were similar. However, the frequencies of receptive reuse of syringes and drug-related arrests were higher in the Eastern U.S. as compared to the Western U.S. Due to federal restrictions on SSP funding and differing levels of political support, SSP access has developed unevenly between states (Bramson et al., 2015; McLean, 2011; Showalter, 2018). California, where most of the West Coast data in this study was collected, has historically had a higher concentration of SSP programming compared to other states which may explain these results (Showalter, 2018). Additionally, cannabis legalization in California and Colorado, the states in which data was collected for this study, has led to reduced arrest rates and may be a factor in these findings (Becerra, 2017; Reed, 2016). As this study was limited to SSP participants in 8 cities, further research is needed to assess geographic differences in public drug use in the U.S.

It is noteworthy that one in four study participants reported receptive reuse of syringes and more than half reported reuse of at least one type of injection equipment (syringe, cooker, cotton, or water) in the past three months. Study recruitment took place at SSPs, therefore all participants should have had access to sterile injection equipment. Previous studies have found a number of factors to be associated with inadequate access to sterile injection equipment among SSP participants, including confiscation of materials by police or during destruction of homeless encampments and restrictive syringe access schemes imposed by law or at the program level (Beletsky et al., 2014, 2015; Cooper et al., 2005; Eckhardt et al., 2017; Golub et al., 2005; Heller et al., 2009; Jones, Case, & Meehan, 1998; Kerr et al., 2010; Vogt, Breda, Des Jarlais, Gates, & Whitticar, 1998). This demonstrates the need for expanded access to sterile injecting equipment, as well as a safer environment in which to use drugs.

Consistent with our findings, previous research has indicated that participants report using drugs in SSP site bathrooms. In this analysis, there was substantial variation between research sites in the proportion of people who reported using drugs at an SSP. This may be related to differences in infrastructure (e.g. availability of a drop-in centre with an accessible restroom) and/or program policies (e.g. not choosing to deny services to people found to have used drugs on-site). This finding points to the need for accessible spaces where people may use drugs more safely while engaging with health-promoting services. SCSs, which studies have demonstrated to reduce fatal overdose, promote safer injection practices, connect participants to health and social services, and offer a more private environment for drug use that may encourage safer drug use practices among people who do not have access to other private spaces (Kerr, Small, Moore, & Wood, 2007; Marshall et al., 2011; Stoltz et al., 2007; Wood, Tyndall, Montaner, & Kerr, 2006).

This study was subject to several limitations. Participants were recruited at SSPs, indicating that they were already linked to harm reduction services. Risks associated with drug use may be different for PWUD who are not connected to services, and therefore our results are not generalizable to all PWUD. Additionally, data was collected in a convenience sample of 8 cities whose characteristics are not necessarily representative of the entire population of SSP participants in the U.S. The choice of some, but not all, participating SSPs to offer incentives for study respondents may be a source of bias. The cross-sectional design of the study does not allow for causal inference between exposure and outcome variables. Survey questions were adapted from the Injection Drug Users Health Alliance Citywide Study (“IDUHA Citywide Evaluation Study,” 2015).

Despite these limitations, this study provides important insight into the prevalence of public drug use in certain U.S. cities and the risks

associated with public drug use at a moment when there is increased public attention focused on mitigating drug use-related harms. In order to reduce the risk of overdose, arrest, and unsafe drug use behaviours, several cities have announced plans to establish SCSs and have introduced legislation to permit their operation. Further place-based analyses of drug use in the U.S. are needed, as existing research on this topic is limited. The findings point towards concrete environmental and structural opportunities to improve the health of PWUD in public, including increased access to harm reduction services, housing, and SCSs, and movement away from punitive approaches to drug use. Approaches that address the risk environment in which people use drugs are urgently needed to change the course of the current drug overdose crisis and related health harms.

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