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ABSTRACT

Background: In Massachusetts, the number of opioid-related deaths has increased 350% since 2000. In the setting of increasing overdose deaths, one potential intervention is supervised injection facilities (SIFs). This study explores willingness of people who inject drugs in Boston to use a SIF and examines factors associated with willingness. *Methods*: A cross-sectional survey of a convenience sample of 237 people who inject drugs and utilize Boston's needle exchange program (NEP). The drop-in NEP provides myriad harm reduction services and referrals to addiction treatment. The survey was mostly self-administered (92%). *Results*: Results showed positive willingness to use a SIF was independently associated with use of heroin as main substance (odds ratio [OR]: 5.47; 95% confidence interval [CI]: 1.9–15.4; $P = .0004$), public injection (OR: 5.09; 95% CI: 1.8–14.3; $P = .002$), history of seeking substance use disorder (SUD) treatment (OR: 4.99; 95% CI: 1.2–21.1; $P = .05$), having heard of SIF (OR: 4.80; 95% CI: 1.6–14.8; $P = .004$), Hispanic ethnicity (OR: 4.22; 95% CI: 0.9–18.8; $P = .04$), frequent NEP use (OR: 4.18; 95% CI: 1.2–14.7; $P = .02$), current desire for SUD treatment (OR: 4.15; 95% CI: 1.2–14.7; $P = .03$), hepatitis C diagnosis (OR: 3.68; 95% CI: 1.2–10.1; $P = .02$), posttraumatic stress disorder (PTSD) diagnosis (OR: 3.27; 95% CI: 1.3–8.4; $P = .01$), report of at least 1 chronic medical diagnosis (hepatitis C, human immunodeficiency virus [HIV], hypertension, or diabetes) (OR: 3.27; 95% CI: 1.2–8.9; $P = .02$), and comorbid medical and mental health diagnoses (OR: 2.93; 95% CI: 1.2–7.4; $P = .02$). *Conclusions*: Most respondents (91.4%) reported willingness to use a SIF. Respondents with substance use behavior reflecting high risk for overdose were significantly more likely to be willing to use a SIF. Respondents with behaviors that contribute to public health burden of injection drug use were also significantly more likely to be willing to use a SIF. Results indicate that this intervention would be well utilized by individuals who could most benefit from the model. As part of a broader public health approach, SIFs should be considered to reduce opioid overdose mortality, decrease public health burden of the opioid crisis, and promote access to addiction treatment and medical care.

Introduction

The United States is currently experiencing an epidemic of fatal and nonfatal opioid overdoses. Nationwide, the rate of deaths from drug overdoses has increased 137% since 2000, including a 200% increase in the rate of overdose deaths involving opioids.[1] Opioids of some type were involved in 61% of drug overdose deaths in 2014.[1] In Massachusetts, the number of opioid-related deaths has increased an estimated 350% since 2000, with the rate rising sharply since 2011.[2] The estimated rate of unintentional opioid-related overdose deaths increased 41% from 2013 to 2014, and increased another 12.4% from 2014 tro 2015 in which there was an estimated rate of 22.6 opioid overdose deaths per 100,000 Massachusetts residents.[2] In the city of Boston, from 2008 to 2012, there was a significant increase in unintentional overdose/poisoning hospital patient encounters for opioids.[3]

In Boston, individuals experiencing homelessness have been disproportionately affected by this epidemic of opioid use disorder and overdose deaths. In a study of 28,033 adults seen at Boston Health Care for the Homeless Program (BHCHP) in 2003–2008, drug overdose caused 1 in 3 deaths among those under the age of 45 years, a death rate 16 to 24 times higher than in the Massachusetts general population.[4] The study of reference used sex as a measurement. The present study used gender to include those who self identified as transgender.[4] Of the overdose deaths among that cohort of individuals experiencing homelessness, 81% involved opioids and 40% involved multiple drugs.[5]

Boston has longstanding and model harm reduction programming. The Boston-based needle exchange program (NEP) Access to Harm Reduction Overdose Prevention and Education (AHOPE) saw over 7000 unique individuals in more than 18,000 encounters during their most recent fiscal year (July 2015 to June 2016), in which they had a syringe uptake rate of 112% (Boston Public Health Commission [BPHC], internal data). A large, statewide naloxone distribution program has been shown to reduce death rates from opioid overdose in communities where overdose education and naloxone distribution was implemented compared with communities in which the program was not implemented.[6]

In April of 2016, a unique harm reduction program to better manage overdoses was opened at BHCHP. The Supportive Place for Observation and Treatment (SPOT) has space for 10 individuals who are intoxicated from the use of opioids and other substances. The program provides medical monitoring for signs of overdose and rapid intervention when overdose occurs, including supplemental oxygen, intravenous fluids, and/or naloxone. The goals of the program are to reduce opioid overdose fatalities, more effectively engage individuals at highest risk for overdose, and lessen the impact of substance use disorder (SUD) on patients, BHCHP, and the surrounding neighborhood. The details of SPOT operations have been described elsewhere.[7]

In the setting of increasing overdose deaths despite many other interventions aimed at mitigating death, additional potential interventions to be considered in the United States are drug consumption rooms (DCRs). Research from other countries has shown health,[8] sociobehavioral,[9] and cost-effective[10] benefits of several models of drug consumption rooms. One such model is supervised injection facilities (SIFs), where people who inject drugs (PWID) can inject pre-obtained substances in the presence of medical staff who provide clinical monitoring, harm reduction education, as well as linkage to addiction treatment. Over 90 SIFs exist worldwide in Canada, Australia, Norway, Germany, Switzerland, Spain, the Netherlands, and Luxembourg,[11,12] but none exist in the United States. SIFs have been shown to significantly reduce overdose mortality,[13] reduce the neighborhood burden of drug use[14] without increasing neighborhood crime and disorder,[15] reduce risky injection behavior,[16] increase access to substance use disorder treatment,[17] and reduce soft-tissue infections.[18] SIFs have also been shown to be cost-effective.[19–23] Two recent studies by Irwin et al.[24,25] estimated that a SIF in San Francisco could produce annual savings of $3.5 million and a SIF in Baltimore could save $7.8 million to the health care system.

Previous studies examining willingness to use SIFs have primarily taken place outside of the United States.[26–28] However, in 2010, Kral et al. assessed the acceptability of a SIF among injection drug users in San Francisco.[29] More recently, in the setting of many collaborative efforts to address an opioid overdose epidemic in Rhode Island,[29a] Bouvier et al. explored willingness to use a SIF among 54 Rhode Island youth who reported nonmedical prescription opioid use.[30] In that cohort, 31 participants reported injection drug use, and willingness to use a SIF among the injection drug users was high (87.1%).[30] The present study expands on this research by exploring willingness to use a SIF among a cohort of 237 adults who inject drugs and use Boston's NEP.

Methods

BHCHP research staff conducted a cross-sectional, descriptive study of a cohort of people who inject drugs and utilize Boston's NEP program, Access to Harm Reduction Overdose Prevention and Education (AHOPE). In addition to providing free, legal, and anonymous needle exchange, AHOPE offers testing, counseling, and referrals to treatment for sexually transmitted illnesses and blood-borne infections, including hepatitis C and human immunodeficiency virus (HIV). AHOPE also provides overdose prevention, education, and training in risk reduction, as well as supplies and supported referrals to treatment programs.[31] While seeking PWID willingness to use SPOT and input on the design of that program, BHCHP research staff also surveyed participants about willingness to use SIF.

Individuals using the NEP were approached about taking an anonymous survey that included items regarding personal history of drug use, demographic information, and opinions about public health interventions for people who inject drugs. Human subject approval for the study was granted by the Boston University Medical Center Institutional Review Board.

Study sample and setting

Adult individuals who accessed the NEP drop-in center between January and April 2016 were approached to participate in the study. Eligibility criteria included ability to read or communicate in English or Spanish.

AHOPE is the only NEP in Boston, and it is located in an area of Boston that is home to many services, including BHCHP's largest outpatient clinic and 104-bed medical respite program, myriad substance use services, over a thousand emergency shelter beds, and a large safety net hospital.

Study procedures

Research staff visited the NEP drop-in center weekday mornings. Participants within the NEP drop-in center were approached by research staff and verbal consent was obtained. Surveys were self-administered unless a participant expressed that they wanted the administrator to read the survey to them—8% of surveys were administered by survey staff. These methods resulted in a convenience sample of 237 participants, who were given a pair of socks as remuneration. Recruitment strategy was designed to be in line with the low-threshold service model of the NEP. Rate of refusal was not tracked so as to maintain anonymity of respondents and subjects who refused.

Measures and data collection

The survey was developed after a review of previous survey studies of people who inject drugs and incorporated items from evaluations of potential supervised injection facilities (SIFs).[28,29,32,33] The survey contained 61 self-reported items in the following data categories: willingness to use various harm reduction facilities, opinions regarding facility operational factors, current substance use patterns, substance use and treatment history, health and health care indicators, and demographics. The survey was piloted and revised by people with experience injecting drugs from the BHCHP Consumer Advisory Board and AHOPE participants. Pilot feedback was largely focused on maintaining a short, simple survey. Within the survey, a SIF was defined as "A supervised injecting facility is a place where people who use injection drugs can legally bring their own drugs to inject under medical supervision." The survey instrument was not validated.

Data coding and analysis

Items in the survey were multiple choice, yes/no/no opinion, or open response. For indicating substance preferences, participants were given a list of distinct substances based on standard NEP data collection tools and asked to check all that apply for "main substance of choice" and "other substances used in the past month."

Data were double-entered and compared for discrepancies. Fields that were left blank were treated as missing data and not included in aggregations or further analyses. Surveys that were interviewer administered were coded and controlled for in the data analysis. Data were analyzed using SAS 9.3 software (Cary, NC).

Statistical analyses were applied to compare participants who expressed willingness or unwillingness to use SIF. Categorical explanatory variables were analyzed using Pearson χ^2 or Fisher's exact test when appropriate. Univariate analyses were conducted to assess variables associated with willingness to use a SIF. A series of logistic regression models were then conducted considering all variables that were statistically significant at the .05 cutoff while adjusting for potential confounders to determine if there was a method to predict willingness to use SIF based on a combination of 2 variables. The model was limited to 2 predictor variables based on the small number of respondents reporting unwillingness to use SIF. A stepwise analysis was conducted to determine the best-fit model. All reported P values are 2-sided.

Results

Study participants were primarily male (68.6%), white (67.3%), and not Hispanic or Latino (70.1%), with an average age of 39.6 years. The majority of participants reported a housing status of homeless or unstably housed (83.1%). The most frequently reported housing status was staying in emergency shelters (38.7%). Table 1 summarizes descriptive characteristics of the survey participants.

Participants reported many behaviors that portend high risk for overdose. When asked about substance use characteristics, most participants (64.6%) reported 1 or 2 main substances of choice. The most common main substance of choice was heroin (89.0%). Polysubstance use was common, with 87.8% of people reporting using more than 1 substance in the past month and more than half (62.5%) reported use of more than 1 substance as their main substance of choice. The most common substance combinations included heroin, benzodiazepines, and cocaine or crack cocaine, and the majority of participants (77.5%) reported using substances more than once per day. The majority of participants (90.0%) reported having used substances alone. Nearly half (49.4%) of participants reported having had an overdose within the previous month, with 75.7% having experienced an overdose at least once ever.

Ninety-five percent of participants had previously sought treatment for substance use disorder (SUD). The average frequency of NEP use was 3.7 days per week. The majority of participants (91.4%) reported willingness to use a SIF. Table 2 describes the characteristics of substance use as reported by survey participants.

Table 1. Descriptive characteristics of people who inject drugs in Boston's NEP.

Characteristic	Mean (SD)	Range
Demographics		
Age in years (N = 201)	39.6 (9.7)	(21–67)
	n	%
Gender (N = 229)		
Male	157	68.6
Female	70	30.6
Transgender	2	0.9
Race (N = 211)		
White	142	67.3
Black/African American	15	7.1
Asian	2	1.0
American Indian/Alaska Native	6	2.8
Native Hawaiian Pacific Islander	2	1.0
Other	28	13.3
More than one	16	7.6
Ethnicity (N = 211)		
Hispanic or Latino	63	29.9
Not Hispanic or Latino	148	70.1
Housing status		
Housed	38	16.9
Doubled up (staying with family or friends)	20	8.9
Street	23	10.2
Shelter	87	38.7
Transitional program/Residential treatment	3	1.3
Other	4	1.8
Multiple responses	20	8.9
Shelter and street (both)	30	13.3

In univariate analyses, willingness to use a SIF was associated with Hispanic ethnicity (odds ratio [OR]: 4.22; 95% confidence interval [CI]: 0.9–18.8; $P = .04$), posttraumatic stress disorder (PTSD) diagnosis (OR: 3.27; 95% CI: 1.3–8.4; $P = .01$), hepatitis C diagnosis (OR: 3.68; 95% CI: 1.2–10.1; $P = .02$), report of at least 1 of the chronic medical diagnoses listed (hepatitis C, HIV, hypertension, diabetes) (OR: 3.27; 95% CI: 1.2–8.9; $P = .02$), comorbid medical and mental health diagnoses (OR: 2.93; 95% CI: 1.2–7.4; $P = .02$), history of seeking SUD treatment (OR: 4.99; 95%

Table 2. Descriptive characteristics of substance use.

Characteristic	*n* or average	% or standard deviation
Number of substances reported as main drug of choice (Avg, SD)	2.5	2.2
Number of other substances reported used in past month (Avg, SD)	2.2	2.3
Total number of substances reported used in the past month (main plus other) (Avg, SD)	4.8	3.7
Main substance of choice		
Heroin	211	89.0
Benzodiazepines	87	36.7
Cocaine	85	35.9
Amphetamines	66	27.9
Crack cocaine	66	27.9
Speedball (mix of heroin and cocaine)	27	11.4
Other opioids	25	10.6
Substance use risk behavior characteristics		
Use more than once a day (N = 227)	176	77.5
Ever sought SUD treatment (N = 229)	219	95.6
Ever use alone (N = 231)	208	90.0
Ever had an overdose (N = 222)	168	75.7
Last overdose within 1 month	117	49.4
Months since last overdose (N = 148) (avg, SD)	31.4	79.9
Needle exchange use per week (N = 165) (avg, SD)	3.7	2.4
Ever heard of SIF (N = 231)	118	51.1
Willing to use SIF (N = 232)	212	91.4

CI: 1.2–21.1; $P = .05$), public injection (OR: 5.09; 95% CI: 1.8–14.3; $P = .002$), desire for SUD treatment now (OR: 4.15; 95% CI: 1.2–14.7; $P = .03$), frequent NEP use (4 or more times per week) (OR: 4.18; 95% CI: 1.2–14.7; $P = .02$), use of heroin as main substance of choice (OR: 5.47; 95% CI: 1.9–15.4; $P = .0004$), having previously heard of SIF (OR: 4.80; 95% CI: 1.6–14.8; $P = .004$), and having more than 2 drugs as a main drug of choice (OR: 3.23; 95% CI: 0.9–11.4; $P = .08$). Primary response variables based on mode of administration were statistically significant—93% of self-administered surveys reported willingness to use a SIF, and 78% of interviewer administered surveys reported willingness to use a SIF ($P = .06$). Table 3 compares characteristics of participants who expressed a willingness to use a SIF versus those who did not.

Additional substances that participants reported using were also analyzed but showed no significant association with willingness to use a SIF. Those substances include amphetamines ($P = 1.0$), supplements ($P = 1.0$), methamphetamines ($P = 1.0$), and steroids ($P = .6$). Each of these substances had fewer than 25 participants reporting it as the main substances of choice.

Logistic regression models determined that the 2 factors most associated with willingness to attend a SIF were a history of ever having injected in public and ever having sought treatment for SUD.

Table 4 shows logistic regression for factors associated with willingness to use a SIF.

Discussion

This study expands on previous research about willingness of PWID to use a SIF and identifies characteristics of PWID in Boston associated with willingness to use SIFs. This study shows that 91.4% of respondents report positive willingness to use a SIF. The results also highlight that those respondents most vulnerable to an overdose (people who use multiple substances, people who use alone, and people who have had a prior overdose), those who contribute to the public health burden of the opioid crisis (by injecting and discarding syringes in public), and those for whom SUD treatment and medical care could be most beneficial (people interested in SUD treatment now, and people with substantial burden of disease) are those who would be most willing to use a SIF.

Trends in opioid overdose have shown that the majority of heroin-related overdose deaths involve the use of another substance.[34–36] A recent report from the Massachusetts Department of Public Health showed that benzodiazepines were also present in the toxicology in over 50% of overdose deaths.[36] In our study, more than half (62.5%) of respondents reported use of more than 1 substance as their main substance of choice and 87.8% of respondents reported using more than 1 substance in the past month, indicating substance use behaviors putting respondents at high risk of overdose death.

A history of nonfatal overdose is a risk factor for fatal overdose.[37] Our sample reported a much higher lifetime rate of overdose than a recent study among PWID in San Diego (75.7% vs. 55%),[38] demonstrating the increased risk of opioid overdose death among our cohort. Studies have shown that individuals experiencing homelessness have a higher risk of

death by overdose.[4,39] The majority of participants (83.1%) reported being homeless or unstably housed. Bouvier et al.[30] found that experiencing homelessness in the previous 6 months was significantly associated with willingness to use a SIF.

The results of this study also suggest a high willingness to use a SIF among those who contribute to the public health burden of the opioid crisis. Our cohort reported a high rate (90.0%) of public use of substances. Public injection has been previously shown to be associated with higher-risk injection behavior and harms related to that behavior such as syringe-sharing, bacterial infection, and overdose.[40–42] Public injection also incurs neighborhood and community health risks, such as publicly discarded syringes.[14] In this study, reported history of public injection was associated with and was the strongest predictor for willingness to use a SIF, with individuals who had ever injected publicly being 16 times more likely to answer affirmatively. The implementation of a SIF may mitigate the public health burden of the opioid overdose crisis as people who inject outside are offered an alternative space within which to inject and dispose of syringes.

Additional characteristics of this cohort suggest that access to health care services associated with use of a SIF[43] would be particularly beneficial for the population surveyed. In this study, those reporting having comorbid medical and behavioral health diagnoses were significantly more likely (OR = 2.9) to be willing to use a SIF. This association indicates a need for SIFs to serve as a linkage to primary care and behavioral health care, in addition to the harm reduction services provided on-site.

SIFs can also serve as a portal into SUD treatment. In this study, history of seeking SUD treatment was a strong predictor of willingness to use a SIF, with individuals who had previously sought treatment 4.99 times more likely to respond affirmatively. Those respondents who reported a current interest in treatment were also 4.15 times more likely to be willing to use a SIF, suggesting that implementation of a SIF with concurrent SUD treatment services could be well utilized by the population surveyed. Frequent (4 or more times per week) NEP use was significantly associated (OR = 4.18) with willingness to use a SIF, indicating a need for expansion of harm reduction programming to include SIF.

This study has specific limitations. The data collected were based on a convenience sample and a response rate was not tracked, limiting the generalizability of our results. The study did not include individuals who do not utilize NEPs. The data were collected via self-report, which is subject to recall bias and social desirability bias when reporting on sensitive information. The survey was anonymous in an effort to minimize these effects. The survey tool was not validated. It is possible that individuals surveyed were not currently using substances. It is possible that some participants filled out the survey while under the influence of substances. Although SIFs were described within the survey, no local SIF existed at the time of the survey, and participants may have been uncertain about the actual nature of the model.

The results of this study show remarkably high rates of willingness to use a SIF among adult NEP users in Boston. It is interesting to note that the affirmative response rate to willingness to use a SIF of 91.4% is notably higher than positive

Table 3. Univariate analyses comparing characteristics of participants willing to use supervised injection facility (SIF) versus those not willing to use a SIF.

	Willing to use SIF				
Characteristic	Yes	No	Unadjusted odds ratio	(95% CI)	P value
Gender					
Male	139 (90.9)	14 (9.2)	1.05	(0.4–2.9)	.91
Female	63 (91.3)	6 (8.7)			
Race					
White	126 (90.7)	13 (9.4)	0.90	(0.3–2.4)	.83
Nonwhite	61 (89.7)	7 (10.3)			
Ethnicity					
Hispanic or Latino	60 (96.8)	2 (3.2)	4.22	(0.9–18.8)	.04
Not Hispanic or Latino	128 (87.7)	18 (12.3)			
Housing status					
Stably housed	35 (92.1)	3 (7.9)	1.20	(0.3–4.3)	1.00
Unstably housed	165 (90.7)	17 (9.3)			
Medical condition diagnoses					
Hypertension	72 (94.7)	4 (5.3)	2.44	(0.8–7.8)	.20
No hypertension	96 (88.1)	13 (11.9)			
Diabetes	32 (97.0)	1 (3.0)	4.20	(0.5–32.8)	.20
No diabetes	122 (88.4)	16 (11.6)			
Depression	158 (92.4)	12 (7.6)	2.50	(0.9–6.7)	.08
No depression	34 (82.9)	7 (17.1)			
Anxiety	162 (92.1)	14 (7.9)	2.3	(0.8–6.5)	.10
No anxiety	30 (83.3)	6 (16.7)			
PTSD	131 (93.6)	9 (6.4)	3.27	(1.3–8.4)	.01
No PTSD	49 (81.7)	11 (18.3)			
HIV	18 (94.7)	1 (5.3)	2.22	(0.3–17.7)	.70
No HIV	130 (89.0)	16 (11.0)			
Hepatitis C	171 (92.9)	13 (7.1)	3.68	(1.2–10.1)	.02
No hepatitis C	25 (78.1)	7 (21.9)			
Any medical diagnosis	182 (93.3)	13 (6.7)	3.27	(1.2–8.9)	.02
No medical diagnosis	30 (81.1)	7 (18.9)			
Any mental health diagnosis	175 (92.6)	14 (7.4)	2.03	(0.7–5.6)	.22
No mental health diagnosis	37 (86.1)	6 (13.9)			
Comorbid medical and mental health diagnoses	158 (94.1)	10 (5.9)	2.93	(1.2–7.4)	.02
No comorbid medical and mental health diagnoses	54 (84.4)	10 (15.6)			
Substance use behavior characteristics					
Use more than once a day	160 (92.5)	13 (7.5)	1.67	(0.6–4.7)	.39
Don't use more than once a day	44 (88.0)	6 (12.0)			
Ever sought SUD treatment	198 (92.1)	17 (7.9)	4.99	(1.2–21.1)	.05
Never sought SUD treatment	7 (70.0)	3 (30.0)			
Ever use alone	186 (90.7)	19 (9.3)	0.45	(0.06–3.5)	.70
Never use alone	22 (95.7)	1 (4.3)			
Ever use in public	135 (95.7)	6 (4.3)	5.09	(1.8–14.3)	.002
Never use in public	53 (81.5)	12 (18.5)			
Ever OD	152 (92.7)	12 (7.3)	1.58	(0.6–4.4)	.40
Never OD	48 (88.9)	6 (11.1)			
Currently on OAT	120 (93.0)	9 (7.0)	2.11	(0.8–5.6)	.13
Not Currently on OAT	57 (86.4)	9 (13.6)			
Would like SUD treatment now	93 (93.0)	7 (7.0)	4.15	(1.2–14.7)	.03
Would not like SUD treatment now	16 (76.2)	5 (23.8)			
NEP use 4+ times per week	90 (96.8)	3 (3.2)	4.18	(1.2–14.7)	.02
NEP use 3 or fewer times per week	122 (87.8)	17 (12.2)			
Heard of SIF	114 (96.6)	4 (3.4)	4.80	(1.6–14.8)	.004
Never heard of SIF	95 (85.6)	16 (14.4)			
Main substance of choice					
Heroin	193 (93.7)	13 (5.6)	5.47	(1.9–15.4)	.0004
Not heroin	19 (73.1)	7 (26.9)			
Heroin and benzodiazepines	76 (95.0)	4 (5.0)	2.2	(0.7–6.9)	.15
Not heroin and benzodiazepines	136 (89.5)	16 (10.5)			
Benzodiazepines	81 (94.2)	5 (5.8)	1.86	(0.6–5.3)	.24
Other opioids	25 (100.0)	0 (0.0)	1.11	(1.1–1.2)	.14
Cocaine	76 (92.7)	6 (7.3)	1.30	(0.5–3.5)	.60
Crack	60 (90.9)	6 (9.1)	0.92	(0.3–2.5)	.87
Speedball (mixed heroin and cocaine)	26 (100.0)	0 (0.0)	1.11	(1.1–1.2)	.14
More than 1 substance	133 (92.4)	11 (7.6)	1.38	(0.55–3.5)	.50
1 substance or fewer	79 (89.8)	9 (10.2)			
More than 2 substances	77 (96.3)	3 (3.7)	3.23	(0.9–11.4)	.08
2 substances or fewer	135 (88.8)	17 (11.2)			

response rates in other studies. Fry,[27] Kral et al.,[29] Hunt et al.,[26] Bouvier et al.,[30] and Wood et al.[28] reported rates of willingness to use a SIF of 89%, 85%, 84%, 63%, and 36.6%, respectively.

The higher rate of willingness to use a SIF in this study may be explained by the high proportion of unstably housed individuals, which in Bouvier et al.[xx] was associated with willingness to

Table 4. Logistic regression analysis of factors associated with willingness to attend safe injection facilities were they available.

Variable	Adjusted odds ratio	95% confidence interval	P value
Ever inject in public	6.020	2.0–18.1	.0014
Ever sought SUD treatment	16.588	2.6–107.5	.0032

use a SIF. The population served by BHCHP's SPOT is representative of one vulnerable subpopulation likely to be served by a SIF: unstably housed, medically complicated PWID, and use substances in public. SPOT has seen over 500 individuals in almost 4000 encounters in just over a year of operation, highlighting the need for expanded harm reduction programming for this population in Boston.

The results of this study suggest that a supervised injection facility in Boston would be well utilized by people who inject drugs, as the overwhelming majority (91.4%) of study participants reported willingness to use such a facility. Willingness to use a SIF was independently associated with many behaviors and characteristics of the target population for supervised injection: people at high risk for overdose death, people who inject in public, and people with a substantial burden of disease. Considering the willingness of people with such characteristics to utilize a supervised injection facility, research cited here on the outcomes of SIF in other countries, and in the setting of an unprecedented opioid overdose crisis, SIFs should be considered as a key part of the broader approach in communities most affected in the United States.

Acknowledgments

Author contributions

Jessie Gaeta, Casey León, and Barry Bock developed the concept for this study as they were planning the implementation of a new low-threshold facility for people who inject drugs. All 5 authors were involved in the design of the research project, as well as the writing and review of the manuscript. Casey León developed the survey with guidance from Sarah Mackin, using language that already existed from the needle exchange program, AHOPE. Casey León and Lena Cardoso collected the data, with logistical help from Sarah Mackin. Data analysis was conducted by Casey León.

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