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Research Paper

Acceptability of a HIV self-testing program among people who use illicit drugs

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ABSTRACT

Background: People who use illicit drugs (PWUD) remain at significantly elevated risk for HIV infection and continue to have very low testing rates. HIV self-testing (HIVST) has been shown to be acceptable among many high-risk populations, but less is known about PWUD.

Methods: From May-June 2021, a HIVST program was implemented at a syringe services program (SSP) in Louisville, Kentucky. PWUD were given the option to privately self-test at the SSP or take the test home and follow-up with study staff. Primary outcomes were acceptability, ease of use, usability, reasons for self-testing, testing location, frequency of future testing, and preference for future testing location.

Results: Among 230 study participants, 77% reported high acceptability (i.e., the HIVST kits made them feel much more able to keep track of their HIV status compared to standard testing methods). Virtually all (97.4%) reported the test kits were very easy to use. Problems while using the HIVST kits were rare (range 1.3–3.0%). The most common reasons for testing were a desire to know their status (85.2%), the test was free (37%), and the short duration for results (30.9%). Testing primarily occurred onsite (87.8%). The majority (83%) reported they would use the HIVST kits at least every six months if made available through the health department and would prefer to test at home (71.7%). Multivariate analyses found that awareness of and intention to use pre-exposure prophylaxis (PrEP) were significantly associated with high acceptability and testing onsite.

Conclusion: Study participants found HIVST to be acceptable and very easy to use. The multivariate findings suggest HIVST interventions should be packaged with PrEP interventions and harm reduction programs.

Introduction

People who use illicit drugs (PWUD) remain at significantly increased risk for HIV infection compared to the general population in the United States (U.S.). Their vulnerability is magnified through high-risk injection behaviors. For example, numerous clusters of new HIV infections have been recently documented among people who inject drugs (PWID) in U.S. localities heavily impacted by the overdose and infectious disease syndemic (Donroe, Socias, & Marshall, 2018; Furukawa et al., 2021; Perlman & Jordan, 2018; Zibbell et al., 2018). It is estimated that over 2500 new HIV infections occur each year among PWID and that nearly 20% of PWID are at risk for HIV acquisition compared to 0.4% in the general population (Linley et al., 2019). Similarly, over 200 counties across 26 states and jurisdictions in the U.S. are experiencing increased risk of HIV outbreaks due to injection drug use (Van Handel et al., 2016). Despite increased implementation of evidence-based prevention interventions and harm reduction services, HIV testing rates among PWUD remain extremely low (Bull-Otterson et al., 2020).

HIV self-testing (HIVST) is an evidence-based strategy for people to screen for HIV and has been shown to be an acceptable method among several high-risk populations, including youth, men who have sex with men (MSM), racial and ethnic minorities, pregnant minorities, and transgender individuals (Delaney & DiNenno, 2021; Figueroa, Johnson, Verster, & Baggaley, 2015; Hector et al., 2018; Lippman et al., 2016; Nunn et al., 2017; Sarkar et al., 2016). Among PWUD, emergent evidence suggests high willingness to use HIVST in nonclinical

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settings (Ballard et al., 2021). This is consistent with studies showing that PWUD use health information to take personal precautions, including serosorting for infectious diseases within social networks, carrying naloxone, testing illicit drugs with fentanyl test strips prior to consumption, and engaging in safer drug use behaviors (Duhart Clarke, Kral, & Zibbell, 2022; Kral et al., 2021; Mistler, Chandra, Copenhaver, Wickersham, & Shrestha, 2020; Peiper et al., 2019; Smith et al., 2013; Zibbell et al., 2021). HIVST therefore represents a potentially viable strategy for PWUD to track their HIV status and seek care based upon the result. To date, however, no interventions have been implemented in a real-world setting to understand the acceptability of HIVST among PWUD.

This study sought to evaluate the acceptability of a HIVST program implemented at a syringe services program (SSP) in Louisville, Kentucky, the epicenter of a U.S. metropolitan area at ultra-high-risk for HIV and other infectious disease outbreaks among PWUD (Broz et al., 2018; Kerr, Atlas, Crabtree, Chen, & Moyer, 2019; Van Handel et al., 2016). The primary outcomes were acceptability, ease of use, usability problems, reasons for self-testing, testing location, intentions for future test use, and preference for future testing location. For program planning and reporting purposes, subgroup analyses were performed to explore associations between social, demographic, and behavioral factors with HIVST acceptability and testing location.

Methods

Study sample and recruitment

Over a four-week period between May and June 2021, a HIVST program was offered to PWUD in collaboration with the Louisville Metro Department of Health and Wellness (LMDHW) Syringe Services Program, which provides overdose prevention and harm reduction services to PWUD and other high-risk populations. A large conference room at the SSP was sectioned off with walled partitions to maintain privacy during enrollment and distribution of HIVST kits. Recruitment involved posting information flyers at the SSP, direct intercept, and social media posts. People interested in the program engaged with study staff in the conference room during four-hour blocks on operational days of the SSP. Eligibility criteria included being 18 years or older, self-reported illicit drug use (i.e., heroin, illicit fentanyl, methamphetamine, or cocaine use on one or more occasions through any mode of administration) in the past week, no previous positive diagnosis of HIV/AIDS, and being able to provide informed consent. People who were visibly intoxicated, agitated, uncooperative, or unresponsive were not enrolled.

Once study participants were consented, they received a confidential study identifier and completed an online survey on social and demographic factors, health-related indicators, drug use and consequences, and HIV prevention behaviors. After completing the survey, study staff provided a brief psychoeducation session (5 min) on how to use the HIVST kit, procedures in the event of a positive result, and instructions for following up with study staff. Participants then received a HIVST kit at no cost and $25 remuneration on a gift card for time and travel. Participants were given the option to complete the testing onsite or take the kit home (or to an alternative private location) and follow-up with study staff within 14 days. For participants who opted to test at home, the HIVST kit and study materials were put into an unlabeled paper bag to conceal the contents per standard SSP protocols. Participants had up to 14 days to follow-up with study staff to complete a second online survey about their results and experiences. Participants used their confidential study identifier to ensure privacy and prevent duplicate responses. After study staff confirmed responses on the second survey, an additional $25 remuneration was electronically added to the gift card. The online surveys were programmed with Qualtrics and administered on Chromebooks at the SSP. The study protocol was approved through a full review by the Western Institutional Review Board, an independent institutional review board with federal wide assurance.

Self-testing protocols

The OraQuick In-Home HIV Test (OraSure Technologies, Inc.) was used for the study. The OraQuick is an in-vitro test that uses oral fluid to check for the presence of antibodies to HIV-1 and HIV-2 subtypes. It involves swabbing gums with the test device and inserting the device into a vial containing a developer solution that provides a qualitative result (positive, negative, or invalid) in approximately 20 to 40 min. According to the Food and Drug Administration, the OraQuick In-Home HIV Test has a sensitivity of 92% and specificity of 99% following a 90-day window period (U.S. Food & Drug Administration, 2020). In the event of a positive result, the kits included a phone number for a customer support center to answer questions, provide referrals for follow-up care, and advise on obtaining confirmatory tests.

For the study, any participants reporting positive HIV results were offered confirmatory testing through LMDHW or Norton Infectious Diseases Institute (NIDI) as a standard-of-care at no additional cost to the participant. The study budget allocated funds to pay for confirmatory testing fees for people who chose to report positive results directly to LMDHW and who informed LMDHW of study participation. Participants with a positive confirmatory HIV test were referred to appropriate care in a timely manner, per site standard of care. State-mandated HIV reporting was completed for all individuals who received a confirmatory positive result per standard-of-care by the site receiving results.

Study measures

Social and demographic data collected from the online survey instruments included age, gender identity, race/ethnicity, marital status, education, living situation, and employment status. Health-related data included health insurance status, being an existing SSP participant, and self-rated health status. Drug use and consequences data included lifetime overdose, injection drug use in the past month, and concurrent polydrug use in the past month. HIV prevention variables included a previous HIV test, awareness of pre-exposure prophylaxis (PrEP), intention to use PrEP in the future, perceived HIV infection risk, and knowing someone living with HIV.

Participants were instructed to report on their behaviors and experiences with HIVST. Based upon feedback from a community advisory board of PWUD and SSP staff, the primary outcomes measures included:

- Acceptability: degree to which HIVST made participants feel better able to keep track of their HIV status compared to standard methods (much more, somewhat more, about the same, somewhat less, much less able).
- Ease of use: how easy it was to use the HIVST kit (very easy, somewhat easy, a little easy, somewhat difficult, very difficult).
- Usability problems (yes/no): spilled the liquid in the test tube, touched the pad on the test stick, took the test stick out too soon, and used oral care products within 30 min of taking the test.
- Reasons for using the HIVST kit (yes/no): know HIV status, recent risk behavior (e.g., injection with a used syringe, sharing of syringes and drug use equipment, or unprotected sexual intercourse), family or friend influence, test was free, convenience (do not have to travel to a clinic or healthcare facility), short duration for results, and more privacy.
- Testing location: where participants used the HIVST kit (onsite, at home or alternative private location).
- Intentions for future test use: how often participants would use HIVST kits if made available through the SSP (monthly, every three months, every six months, annually, would not use).
- Preference for future testing location (take home or private location, onsite with optional help from SSP staff).

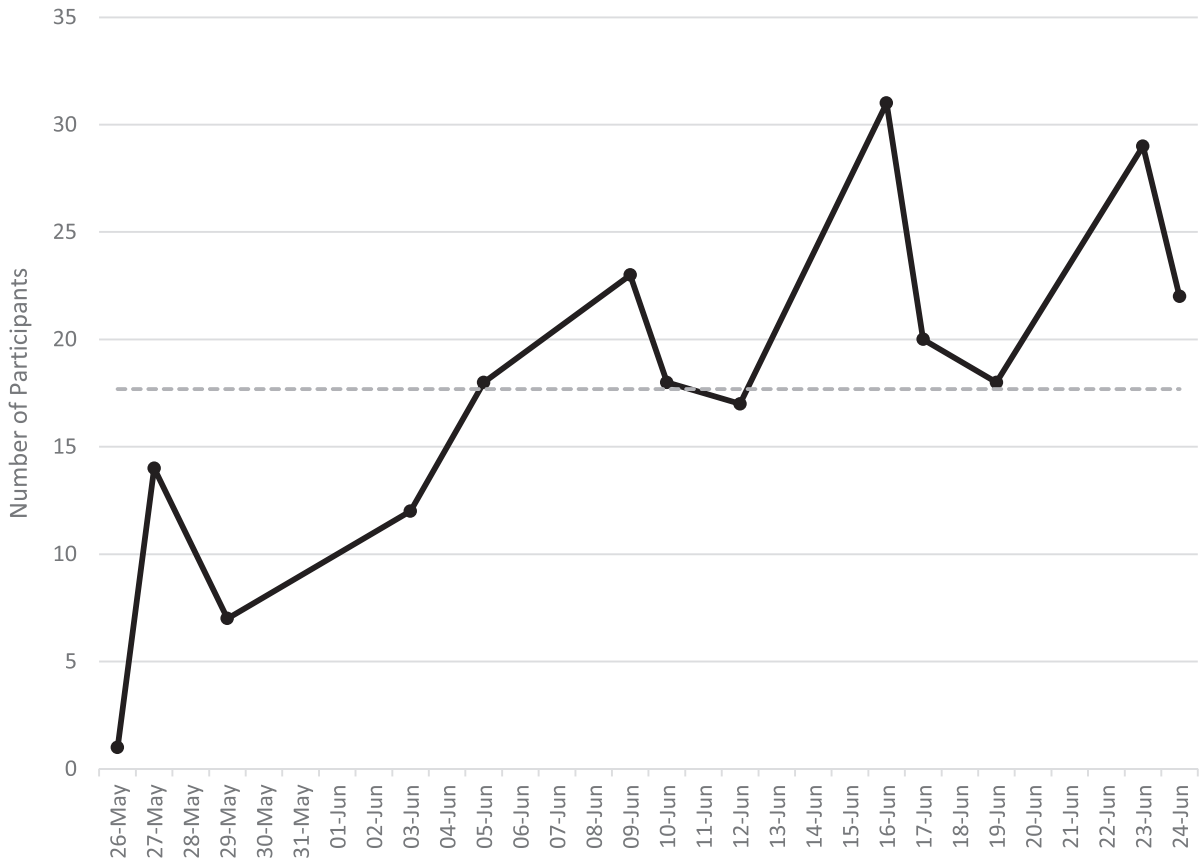

Fig. 1. Flow of Participants into the HIV Self-Testing Study during May-June 2021 ($N = 230$)[a].
[a] Days of operation are indicated by the circular markers ($n = 13$). The dotted line represents the average number of participants per day (Mean=17.7, standard deviation=8.2).

Statistical analysis

The flow of participants into the study was graphically examined to characterize program use over the four-week period. Descriptive statistics were calculated for social and demographic factors, health-related indicators, drug use and consequences, HIV prevention behaviors, and primary outcomes. For program planning and reporting purposes, we performed subgroup analyses to explore differences in testing acceptability and location among the relevant correlates. Multivariable logistic regression models were fitted to examine independent correlates of high acceptability and testing onsite. Firth's penalized likelihood method was used to estimate the models to address issues of separation and biased parameter estimates that may arise due to small cell sizes (Firth, 1993). This computed adjusted odds ratios (aOR) and 95% confidence intervals (CI) for the social and demographic factors, health-related indicators, drug use and consequences, and HIV prevention behaviors associated with the outcomes. A two-sided p-value ≤ 0.05 was used as a threshold for statistical significance. The R environment for statistical computing was used to conduct all analyses and the *logistf* package was used to fit the penalized logistic regression models (Heinze & Schemper, 2002; R Core Team, 2017).

Results

A total of 288 PWUD participated in the study. Among these, 47 participants were excluded due to lack of follow-up and 11 had missing data, yielding a final analytical subsample of 230 people. Sensitivity analyses found no evidence of selectivity biases in the analytical subsample ($\chi^2=15.7_{17}$, $p = 0.547$). On average, 18 people per day (standard deviation=8.2) engaged with the self-testing study in May and June 2021 (Fig. 1). There were three positive results and two invalid results. Table 1 shows the participant characteristics. Approximately 60% of participants were male (60%), 25–44 years old (60%), and single (58%). Most were non-Hispanic (NH) White (78%), less than college educated (64%), and unemployed (82%). For the health-related variables, most participants had health insurance (84%) and were existing SSP participants (73%). Lifetime overdoses (61%), injection drug use (75%), and concurrent polydrug use (86%) were common. For the HIV prevention behaviors, awareness of PrEP (34%) and intentions to use PrEP in the future (44%) were low, while 7.8% perceived their HIV infection risk to be high or very high.

Table 2 illustrates the primary outcomes. Most participants reported high acceptability (77%) and that the test kits were very easy to use (97.4%). Problems with usability were rare, ranging from 1.3% for taking the test stick out of the tube too soon to 3.0% for touching the pad on the test stick. The most common reasons for self-testing were a desire to know their status (85.2%), the test was free (37%), the short duration for results (30.9%), recent risk behaviors (17.4%), and convenience (12.6%). Self-testing primarily occurred onsite (87.8%). For intentions for future use, 33% reported they would test monthly, 28.3% every three months, 21.7% every six months, and 17% annually. In terms of preference for future testing location, 71.7% indicated a preference for taking the kits home (or to a private location), while the other 28.3% indicated a desire to self-test at the health department with optional supervision.

Table 3 shows the multivariate associations between the social and demographic factors, health-related indicators, drug use and consequences, and HIV prevention behaviors with high acceptability and testing onsite. In the final multivariable models, PrEP awareness (aOR=2.62, 95% CI=1.22–6.00) and knowing someone with HIV (aOR=0.49, 95% CI=0.24–0.98) were associated with increased and de-

Table 1
Characteristics of Study Participants in a HIV Self-Testing Program: Louisville, Kentucky, United States, May-June 2021.

Characteristics	Overall (*N* = 230)	
	N	(%)[a]
Gender Identity		
Female	92	(40.0%)
Male	138	(60.0%)
Age		
18–24	9	(3.9%)
25–34	68	(29.6%)
35–44	70	(30.4%)
45–54	53	(23.0%)
55+	30	(13.0%)
Race		
NH White	180	(78.3%)
NH Black	34	(14.8%)
Other	16	(7.0%)
Marital Status		
Single	134	(58.3%)
Married/partnership	69	(30.0%)
Separated/divorced	27	(11.7%)
Education		
<College	148	(64.3%)
Some College	57	(24.8%)
Technical/College graduate	25	(10.9%)
Living Situation		
Home/apartment	109	(47.4%)
Shelter/halfway house	29	(12.6%)
Park/public place	65	(28.3%)
Friends/family	4	(1.7%)
Other	23	(10.0%)
Employment Status		
Unemployed	189	(82.2%)
PT/FT	41	(17.8%)
Health Insurance Status		
No	36	(15.7%)
Yes	194	(84.3%)
SSP Participant		
No	62	(27.0%)
Yes	168	(73.0%)
Quality of Life		
Poor/Fair	98	(42.6%)
Good/Excellent	132	(57.4%)
Lifetime Overdose		
No	90	(39.1%)
Yes	140	(60.9%)
Injection Drug Use		
No	57	(24.8%)
Yes	173	(75.2%)
Concurrent Polydrug Use		
No	33	(14.3%)
Yes	197	(85.7%)
Previous HIV test		
No	69	(30.0%)
<1 year	80	(34.8%)
>1 year	81	(35.2%)
PrEP Awareness		
No	151	(65.7%)
Yes	79	(34.3%)
PrEP Intentions[b]		
Less likely	128	(55.7%)
More likely	102	(44.3%)
Perceived HIV Infection Risk		
Zero/Almost Zero	92	(40.0%)
Small/Moderate	120	(52.2%)
Large/Very Large	18	(7.8%)
Know Someone with HIV		
No	131	(57.0%)
Yes	99	(43.0%)

Abbreviations: NH=non-Hispanic; PT/FT=part-time/full-time; SSP=syringe services program; PrEP=pre-exposure prophylaxis.

[a] Percentages may not sum to 100 due to rounding.

[b] How likely participant is to try PrEP in the future. More likely=definitely will or very likely, Less likely=somewhat likely, very unlikely, or definitely will not.

Table 2
Primary Outcomes of a HIV Self-Testing Program: Louisville, Kentucky, United States, May-June 2021 (*N* = 230).

Characteristics	Overall (*N* = 230)	
	N	(%)[a]
Acceptability[b]		
Low	53	(23.0%)
High	177	(77.0%)
Ease of Use[c]		
Less easy	6	(2.6%)
Very easy	224	(97.4%)
Usability Problems[d]		
Spilled liquid in the test tube	4	(1.7%)
Touched pad on the test stick	7	(3.0%)
Took test stick out of tube too soon	3	(1.3%)
Used oral care products within 30 min of test	5	(2.2%)
Reasons for Self-Testing[d]		
Know HIV status	196	(85.2%)
Recent risk behavior[e]	40	(17.4%)
Family or friend influence	11	(4.8%)
Test was free	85	(37.0%)
Convenience	29	(12.6%)
Short duration for results	71	(30.9%)
More privacy	53	(23.0%)
Testing Location		
Home (or private location)	28	(12.2%)
Onsite	202	(87.8%)
Intentions for Future Test Use		
Monthly	76	(33.0%)
Every three months	65	(28.3%)
Every six months	50	(21.7%)
Annually	39	(17.0%)
Would not use	0	(0.0%)
Preference for Future Testing Location		
Home (or private location)	165	(71.7%)
Onsite	65	(28.3%)

Abbreviations: HIV=human immunodeficiency virus.

[a] Percentages may not sum to 100 due to rounding.

[b] The degree to which using a HIV self-testing kit made participants feel better able to keep track of their HIV status compared to standard testing methods. High=much more, Low=somewhat more, about the same, somewhat less, or much less able.

[c] How easy it was to use the HIV self-testing kit. Very easy=very easy, Less easy=somewhat easy, a little easy, somewhat difficult, or very difficult.

[d] Responses are not mutually exclusive.

[e] Recent risk behaviors included injection with a used syringe, sharing of syringes and drug use equipment, or unprotected sexual intercourse.

creased odds, respectively, of high acceptability. Males were more likely than females to test onsite (aOR=3.90, 95% CI=1.43–11.75). Greater intention to use PrEP in the future was associated with increased odds of both high acceptability (aOR=2.23, 95% CI=1.09–4.71) and testing onsite (aOR=9.45, 95% CI=3.05–38.62).

Discussion

This is the first study to evaluate the acceptability of a HIVST program among PWUD. Among a sample of 230 study participants, the majority reported high acceptability and ease of use. Usability problems were rare. The most common reason participants used the HIVST kits was to know their HIV status. Participants also indicated a high willingness to use HIVST kits regularly if they were made available at the SSP in the future. A significant proportion of participants also reported a preference for taking HIVST kits home as a future service modality. Multivariate analyses indicated intention to use and awareness of PrEP were associated with increased odds of high acceptability and testing onsite, suggesting that future HIVST programs may benefit from being packaged with PrEP interventions and harm reduction programs as opposed to a standalone service.

Table 3
Multivariate Associations between HIV Self-Testing Outcomes and Correlates: Louisville, Kentucky, United States, May-June 2021 (N = 230).

Characteristics	High Acceptability				Tested Onsite			
	n	(%)[a]	aOR	(95% CI)	n	(%)	aOR	(95% CI)
Gender Identity								
Female	72	(78.3%)	1.00		73	(79.3%)	1.00	
Male	105	(76.1%)	1.03	(0.48, 2.21)	129	(93.5%)	3.90	(1.43, 11.75)
Age								
18–24	7	(77.8%)	1.00		7	(77.8%)	1.00	
25–34	50	(73.5%)	0.45	(0.06, 2.28)	60	(88.2%)	1.97	(0.21, 15.13)
35–44	56	(80.0%)	0.63	(0.09, 3.36)	59	(84.3%)	1.14	(0.12, 8.49)
45–54	44	(83.0%)	0.78	(0.10, 4.70)	48	(90.6%)	1.35	(0.12, 12.25)
55+	20	(66.7%)	0.40	(0.05, 2.69)	28	(93.3%)	2.21	(0.16, 32.32)
Race								
NH White	139	(77.2%)	0.68	(0.22, 1.96)	155	(86.1%)	0.29	(0.03, 1.65)
NH Black	26	(76.5%)	1.00		32	(94.1%)	1.00	
Other	12	(75.0%)	0.45	(0.09, 2.33)	15	(93.8%)	0.42	(0.03, 6.35)
Marital Status								
Single	104	(77.6%)	1.00		118	(88.1%)	1.00	
Married/partnership	53	(76.8%)	1.03	(0.46, 2.35)	60	(87.0%)	0.89	(0.33, 2.50)
Separated/divorced	20	(74.1%)	0.96	(0.36, 2.76)	24	(88.9%)	3.14	(0.78, 16.39)
Education								
<College	110	(74.3%)	1.00		130	(87.8%)	1.00	
Some college	48	(84.2%)	1.26	(0.54, 3.10)	50	(87.7%)	1.52	(0.51, 5.11)
Technical/College graduate	19	(76.0%)	0.85	(0.28, 2.71)	22	(88.0%)	1.50	(0.37, 7.63)
Living Situation								
Home/apartment	85	(78.0%)	1.00		90	(82.6%)	1.00	
Shelter/halfway house	19	(65.5%)	0.61	(0.22, 1.71)	27	(93.1%)	1.70	(0.35, 10.73)
Park/public place	48	(73.8%)	0.80	(0.37, 1.75)	59	(90.8%)	1.77	(0.62, 5.62)
Jail/hospital/treatment	4	(100.0%)	2.72	(0.22, 395.0)	4	(100.0%)	1.45	(0.10, 260.2)
Other	21	(91.3%)	2.45	(0.67, 13.08)	22	(95.7%)	2.86	(0.59, 27.05)
Employment Status								
Unemployed	142	(75.1%)	1.00		165	(87.3%)	1.00	
PT/FT	35	(85.4%)	1.57	(0.63, 4.35)	37	(90.2%)	1.80	(0.54, 7.27)
Health Insurance Status								
No	25	(69.4%)	1.00		33	(91.7%)	1.00	
Yes	152	(78.4%)	1.59	(0.65, 3.78)	169	(87.1%)	0.51	(0.12, 1.63)
SSP Participant								
No	45	(72.6%)	1.00		57	(91.9%)	1.00	
Yes	132	(78.6%)	0.85	(0.33, 2.08)	145	(86.3%)	0.42	(0.08, 1.77)
Health								
Poor/Fair	73	(74.5%)	1.00		88	(89.8%)	1.00	
Good/Very good/Excellent	104	(78.8%)	1.06	(0.52, 2.13)	114	(86.4%)	0.99	(0.37, 2.67)
Lifetime Overdose								
No	65	(72.2%)	1.00		81	(90.0%)	1.00	
Yes	112	(80.0%)	1.40	(0.68, 2.85)	121	(86.4%)	0.85	(0.32, 2.15)
Injection Drug Use								
No	39	(68.4%)	1.00		50	(87.7%)	1.00	
Yes	138	(79.8%)	1.71	(0.63, 4.64)	152	(87.9%)	2.43	(0.61, 9.73)
Concurrent Polydrug Use								
No	25	(75.8%)	1.00		30	(90.9%)	1.00	
Yes	152	(77.2%)	0.92	(0.32, 2.45)	172	(87.3%)	0.93	(0.20, 3.76)
Previous HIV test								
No	52	(75.4%)	1.00		64	(92.8%)	1.00	
Within past year	62	(77.5%)	1.15	(0.48, 2.75)	69	(86.3%)	0.58	(0.15, 2.06)
Greater than a year	63	(77.8%)	1.15	(0.48, 2.76)	69	(85.2%)	0.69	(0.17, 2.50)
PrEP Awareness								
No	110	(72.8%)	1.00		133	(88.1%)	1.00	
Yes	67	(84.8%)	2.62	(1.22, 6.00)	69	(87.3%)	1.92	(0.75, 5.31)
PrEP Intentions[b]								
Less likely	92	(71.9%)	1.00		103	(80.5%)	1.00	
More likely	85	(83.3%)	2.23	(1.09, 4.71)	99	(97.1%)	9.45	(3.05, 38.62)
Perceived HIV Infection Risk								
Zero/Almost Zero	71	(77.2%)	1.00		81	(88.0%)	1.00	
Small/Moderate	89	(74.2%)	0.89	(0.44, 1.79)	104	(86.7%)	1.42	(0.54, 3.78)
Large/Very Large	17	(94.4%)	2.94	(0.61, 28.39)	17	(94.4%)	1.44	(0.21, 18.10)
Know Someone with HIV								
No	104	(79.4%)	1.00		117	(89.3%)	1.00	
Yes	73	(73.7%)	0.49	(0.24, 0.98)	85	(85.9%)	0.43	(0.16, 1.11)

Abbreviations: aOR=adjusted odds ratio; 95% CI=95% confidence interval; NH=non-Hispanic; PT/FT=part-time/full-time; HIV=human immunodeficiency virus; SSP=syringe services program; PrEP=pre-exposure prophylaxis.

[a] Values expressed as row percentages.

[b] How likely participant is to try PrEP in the future. More likely=definitely will or very likely, Less likely=somewhat likely, very unlikely, or definitely will not.

Our findings are highly consistent with previous studies finding high acceptability and usability of HIVST technologies among other high-risk populations, such as MSM, racial and ethnic minorities, pregnant women, transgender individuals, and youth (Figueroa et al., 2015; Hector et al., 2018; Lippman et al., 2016; Nunn et al., 2017; Sarkar et al., 2016). For example, HIVST has increased the frequency of testing among high-risk populations without reducing the frequency of standard HIV testing (Jamil et al., 2017; Zhang et al., 2020). Thus, HIV screening programs that provide HIVST and give PWUD the option to test on their own or in a safe and non-stigmatizing environment may ameliorate structural barriers associated with standard testing methods. This is especially pertinent for PWUD who commonly report standard HIV testing methods to be stigmatizing, discriminatory, dehumanizing, and isolating, with evidence that negative experiences in clinical settings contribute to high-risk injection behaviors for HIV and other infectious diseases (Biancarelli et al., 2019; Meyerson et al., 2021; Motavalli et al., 2021; Muncan, Walters, Ezell, & Ompad, 2020; Surratt, Otachi, McLouth, & Vundi, 2021). Based on the results of this study, HIVST may represent a novel strategy that facilitates informed decision-making around HIV testing, promotes behaviors protective against HIV transmission, and prevents other adverse health outcomes among PWUD (Ballard et al., 2021; Peiper et al., 2019; Smith et al., 2013).

Another significant finding is the relationship between HIVST and PrEP. In multivariate analyses, those reporting an intention to use PrEP were 9.5 times more likely to self-test at the health department and over twice as likely to indicate high acceptability. Similarly, those reporting high PrEP awareness were more likely to report high acceptability. Because PWUD continue to have low rates of PrEP use and awareness, implementation of HIVST programs may represent a viable strategy to increase uptake of PrEP and other HIV prevention strategies among PWUD (Biello, Mimiaga, Valente, Saxena, & Bazzi, 2021; Escudero, Lurie, Kerr, Howe, & Marshall, 2014). Similarly, those who were not current SSP participants represented nearly 30% of all new SSP enrollees during the study period (62 of 228), which is consistent with other studies showing that self-testing technologies can increase engagement with SSPs and harm reduction programs (Oh et al., 2020; Peckham & Young, 2020; Peiper et al., 2019). Given high acceptability, usability, and satisfaction with HIVST in this study, existing HIV screening and prevention interventions may benefit from packaging a HIVST component to boost participation and provide linkage to care based upon the result (e.g., HIV- to PrEP services, HIV+ to culturally competent providers; Lee et al., 2017; Miller et al., 2018; Nguyen et al., 2019; Ni et al., 2021; Shrestha, Altice, Karki, & Copenhaver, 2018).

Implementation of packaged HIV interventions and harm reduction programs would be particularly timely, especially since only 8% of PWUD in our study perceived a large or very large risk of acquiring HIV. Misperceptions about negative health consequences have been well-documented with use of other types of substances, such as cigarettes, alcohol, and prescription drugs (Dijkstra, 2009; Garcia, Fairlie, Litt, Waldron, & Lewis, 2018; Xu & Cao, 2020; Yeomans-Maldonado & Patrick, 2015). Recent studies among PWUD have demonstrated similar misperceptions about HIV transmission and misinformation about the risks of illicit drug use (Beletsky et al., 2020; Biello et al., 2021; Walters, Kral, Simpson, Wenger, & Bluthenthal, 2020), pointing to a need for evidence-based psychoeducation to address cognitive and social factors that may complicate uptake of HIV interventions (Cerdá et al., 2021; Park, Stockman, Thrift, Nicole, & Smith, 2020; Strathdee, Beletsky, & Kerr, 2015; Taylor et al., 2018). Another complicating factor found in this study was the 51% reduced odds of acceptability among PWUD with a person living with HIV in their social network. It is possible that membership in such social networks may be accompanied with perceived inevitable harm, external locus of control, trauma, and helplessness (Dasgupta, Beletsky, & Ciccarone, 2018; Yi, Sandfort, & Shidlo, 2010). Interventions incorporating novel peer-based supports that embrace the capacities and expertise of PWUD may be critical in countering maladaptive norms and mechanisms tied to increased HIV transmission, avoidance of care, and reduced agency (Broz et al., 2021; Chang et al., 2021; Salazar, Vincent, Figgatt, Gilbert, & Dasgupta, 2021; Zibbell et al., 2021).

Several limitations are considered. While the HIVST kits used in this study allowed for a rapid result within 20 to 40 min, the 90-day window period is higher than laboratory methods. This raises the possibility of false negatives among participants who recently acquired HIV. The test kits were also provided free of charge to study participants. With a retail price of approximately $40, PWUD may be unable or unwilling to procure kits on their own. Given historically low rates of standard HIV testing among PWUD, however, the high levels of acceptability and intentions for future use found in this study suggest HIVST may be a viable tool for HIV screening and prevention in nonclinical settings. Further investigations will be necessary to evaluate the need for subsidizing costs to facilitate access and uptake of HIVST among PWUD (Bell et al., 2021; Choko et al., 2019). The generalizability of the study is limited, as data were collected from PWUD in a single metropolitan area where infectious diseases and drug overdoses are widespread. Multisite studies throughout the U.S. are now warranted to understand potential heterogeneity in acceptability and uptake of HIVST among PWUD. Similarly, larger study teams will be necessary to increase recruitment and improve the efficiency of program logistics, as the popularity of this study frequently led to queues. Nevertheless, this study increased the number of new SSP clients and provided an adequate sample size to derive base rates for future interventions. Larger implementation studies are now needed to further evaluate the scalability of HIVST programs among PWUD. Lastly, the study was conducted during the COVID-19 pandemic, which has caused prolonged interruptions to standard HIV testing capabilities (Frost et al., 2021; Wenger et al., 2021). It is possible that secular trends in HIV testing capabilities and healthcare operations may have influenced study participation, although the rate of standard testing during the study period (n = 21) was significantly outpaced by our HIVST program.

The current study provides evidence that HIVST has the potential to improve screening and prevention among PWUD, although investigating the full cascade of care after confirmatory testing for participants with positive results was beyond the study's scope. Follow-up studies are currently underway to more thoroughly investigate the results from confirmatory tests and treatment uptake. Nonetheless, the need for more evidence should not deter public health agencies, harm reduction programs, and other community-based organizations from implementing HIVST as part of a packaged strategy for HIV screening and prevention in nonclinical settings. Such evidence would help inform the Ending the HIV Epidemic in the U.S. initiative and federal guidelines for HIV testing among PWUD in nonclinical settings (Broz et al., 2021; Delaney & DiNenno, 2021; Garrison & Haberer, 2021). Myriad clinical and epidemiological studies on HIVST in high-risk populations support this approach, finding that packaged interventions have effectiveness in reducing morbidity and mortality (Blanco, Wiley, Lloyd, Lopez, & Volkow, 2020; Garrison & Haberer, 2021; Jo et al., 2020; Low et al., 2016; Tookes et al., 2019). In addition, there remains a need to examine the acceptability of self-testing for other types of infectious diseases, including hepatitis C and common sexually transmitted infections (Fistonich, Troutman, & Visconti, 2021; Nguyen et al., 2021; Reipold et al., 2021; Serumondo et al., 2021). Given increasing incidence of HIV and infectious diseases among PWUD, HIVST programs represent a promising strategy for creating packaged screening and prevention interventions for PWUD.

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Ethical approval

Ethical approval was obtained through a full review by Western Institutional Review Board (#20211536).

Declarations of Interest

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