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Research Article

Factors Associated with Acquiring Syringes from Syringe Exchange Programs and Pharmacies among Heroin and Cocaine Injectors in Baltimore, Md

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Abstract

Understanding the characteristics of those who use Syringe/Needle Exchange Programs (SEPs) and pharmacies is important for program planning. This study examined the factors associated with where injectors get sterile syringes and if distance to a SEP site is associated with syringe acquisition. Three hundred and four adult heroin and cocaine Injection Drug Users (IDUs) participated in an epidemiologic study of risk factors for HIV/AIDS. Multinomial logistic regression examined the association between where IDUs obtained most new syringes (a SEP, pharmacy, or other less safe source) and other key variables. Results indicated that the relative risk (RR) of getting most syringes from a pharmacy (versus another source) was higher for: males, whites (versus African-Americans [AA]), and those with at least a high school diploma and lower for: those reporting receptive sharing of injection equipment. Results also indicated that the RR of getting most syringes from a SEP (versus another source) was higher for: those injecting more frequently (1-2 times/day vs. <1 time/day and 3 times/day vs. <1 time/day), those who have been arrested for drug paraphernalia in the past six months, and those using syringes for 1-2 hits (vs. 3 or more hits) and lower for: those living farther away from a SEP and those reporting receptive sharing of injection equipment. Results also indicated that the RR of getting most syringes from a SEP (versus a pharmacy) was higher for: those injecting more frequently (1-2 times/day vs. <1 time/day and 3 times/day vs. <1 time/day) and lower for: whites (versus AA), those with at least a high school diploma, and those living farther away from a SEP. SEPs and pharmacies may serve different populations of IDUs and may play complementary roles in preventing infectious disease transmission. Distance to a SEP may be important for where IDUs acquire sterile syringes.

ABBREVIATIONS

SEP: Syringe/Needle Exchange Program; IDU: Injection Drug User; SD: Standard Deviation; RRR: Relative Risk Ratio; 95% CI: 95% Confidence Interval

INTRODUCTION

In the United States (US), chronic illness and infectious disease as well as increased morbidity and mortality have all been linked to injection drug use. According to recent studies, approximately

12% of the new cases of HIV in the US, about 6,600 cases, are among Injection Drug Users (IDUs) [1,2]. Further, injection drug use is also considered responsible for a significant proportion of hepatitis viral infections [3-6].

Injection drug use is an accepted etiological agent of infectious disease. Prevention efforts should then focus on approaches that reduce the risk of transmission. Research has revealed that the practice of sharing injection equipment accounts for a considerable proportion of blood borne viral transmission [7]. Public health authorities and researchers define sharing injection equipment as using syringes or drug solution (frontloading or backloading), rinse water for cleaning syringes, cookers or water for drug mixing, and cotton filters after someone else has already used them [8-12]. The US Department of Health & Human Services and the National Commission on AIDS established that effective risk reduction, for those who are unable to stop injecting drugs should include single use of sterile injection equipment and appropriate discard of used materials [8,12]. In order for IDUs to follow this recommendation, they require access to sterile materials.

To combat the growing spread of HIV/AIDS among IDUs some states began to implement harm reduction measures aimed at getting injectors access to sterile injection equipment and getting used equipment out of circulation. Legal sterile syringe distribution policies, such as Syringe/Needle Exchange Programs (SEPs) and over-the-counter sale of syringes at pharmacies were implemented. There is extensive published evidence for the effectiveness of SEPs and pharmacies in reducing the spread of HIV infection among IDUs. For example, SEPs and pharmacies provide greater access to sterile injection equipment [13-17], lower the risk of injection equipment sharing [14-16,18-22], and play complimentary roles in decreasing adverse injection-related outcomes [15,16,18,20,23-29]. However, despite the empirically supported benefits of harm reduction programming [10,11], a national policy has yet to be implemented. Furthermore, there are state regulations that give pharmacists discretion over syringe sales and laws that impart penalties for possession of syringes without a prescription. In addition, only recently have prohibitive policies regarding federal funding for SEPs been lifted. Despite some political and social opposition to harm reduction programming, most public health officials and scientists favor this public health approach to infectious disease prevention.

Because SEPs and pharmacy policies are effective at reducing the transmission of infectious diseases, researchers are interested in SEPs and pharmacies and in the characteristics of their patrons. Understanding these characteristics may advise policy-makers on policy decisions; they may also help researchers, program administrators, and program developers design more effective programs to reach those in need of services and target existing programs in need of update.

Furthermore, the research base on the determinants of SEP and pharmacy use among IDUs is growing. Studies have shown that SEPs and pharmacies attract different groups of drug injectors. For example, SEPs attract users who inject more frequently [30-35] and have an unstable lifestyle [31,33,36]. Pharmacies attract IDUs who are less disadvantaged [37,38]. While a number of studies have compared SEP users and non-SEP users (for a review see Wodak and Cooney, 2006) [21], few studies have examined geographic distance to sterile syringes and injection risk behaviors. Preliminary findings from that research indicate proximity to a SEP site is an important factor to consider when examining injection risk behaviors. For example, one study found that IDUs living closer to a SEP were more likely to use it compared to those living further away [39]. Another study found that the odds of using injection equipment after someone else increased with each mile increase in average distance from a SEP site [40]. Two other studies found that spatial access to syringes and arrest rates were associated with injection equipment sharing [41,42].

Existing studies comparing SEP users and non-SEP users tend to be confounded by the fact that some non-SEP users may get their syringes from verifiably safe sources, such as pharmacies [21]. Further, by grouping pharmacy users (pharmacies are a safe source of syringe acquisition) with non-SEP users, the protective effect of SEPs may be underestimated. Similarly, studies examining pharmacy use or laws governing pharmacy access to syringes generally do not consider SEP use, which in turn may underestimate the protective effect of pharmacy access to syringes.

Accurate knowledge of the characteristics of IDUs who use pharmacies and SEPs, as well as the impact of geographic distance on injection risk behaviors and SEP or pharmacy use, is needed for a comprehensive infectious disease prevention policy. This study focuses on the factors associated with where injection drug users in Baltimore, MD get most of their new syringes, from a pharmacy, SEP or other source, with a special focus on whether geographic distance to a SEP site affects IDUs' syringe source.

METHODS

Participants and procedure

Injection and non-injection drug users were enrolled in the Baltimore site of the NEURO-HIV Epidemiologic Study [43] an epidemiological examination of neuropsychological, social, and behavioral risk factors of HIV, Hepatitis A Virus, Hepatitis B Virus, and Hepatitis C Virus. To be eligible for the study, participants had to be aged 15-50 years and report using injection or non-injection drugs during the previous 6 months. Participants were enrolled between 2002 and 2004 using multiple recruitment strategies, including street outreach, outreach at local syringe/needle exchange programs, advertisements in local newspapers, referrals from enrolled participants (snowball recruitment), and referrals from social service agencies. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board approved the study protocol in 2001 and annual reviews and human subjects' approvals have been maintained. Informed consent was obtained from all participants.

The present study included 304 current regular injectors of heroin, cocaine, or heroin and cocaine (speedball). Only participants reporting a lifetime history of regular injection of heroin, cocaine, or speedball (ever injected daily or nearly daily for three months or more) and injecting in the past six months were included. The present study was also limited to African-American and white participants. Additionally, only the cross-sectional baseline data were used in the analyses.

Measures

The baseline assessment consisted of a standardized HIV-Risk Behavior Interview that was originally adapted from a similar interview used for the REACH study [44] and included interviewer-administered questions about demographic characteristics, drug use, injection practices, and HIV-risk behaviors. The dependent variable was where participants reported getting most of their new syringes, from a pharmacy, from a Syringe/Needle Exchange Program (SEP), or from another source (including wife, husband, boyfriend, girlfriend, family member, friend or acquaintance, diabetic or their relative, drug dealer, syringe dealer, or some other place).

Several independent variables were shown in the literature to be associated with where injectors acquired their syringes. Demographic characteristics included age, African-American or white race, gender, and education (less than high school or GED vs. high school diploma or higher). Injection risk behaviors included any receptive sharing of injection equipment (using syringes, drug solutions, including backloading and frontloading, or works, including cookers, cottons, filters, and rinse water after someone else has already used them) in the past six months, how many times a syringe was used for drug injection in the past six months (one or two times vs. three or more times), and frequency of drug injection in the past six months (less than daily, 1-2 times per day, or 3 or more times per day). Other variables included having been arrested for possession of drug paraphernalia in the past six months and distance from the participant's residence to the nearest syringe/needle exchange program (categorized into tertiles).

The variable measuring distance from the participant's residence to the nearest SEP was created using the reported residential address of each participant and the address for the nearest syringe/needle exchange program site within Baltimore City and in operation during the study period. Baltimore City Needle Exchange Program data was obtained from the Baltimore Substance Abuse Systems, Inc [45]. ArcGIS was used to map participant addresses and SEP locations. The Hawth's Tools extension for ArcGIS was used to obtain the distance between each participant's residence and the nearest SEP site [46]. The resulting spatial distance was then categorized into tertiles for analysis.

Statistical analyses

All analyses were performed using Stata, version 10.1. Initial unadjusted analyses (cross tabulations and multinomial logistic regressions) examined the relationship between independent variables and where injectors obtained most of their new syringes. Additional exploration included adjusted multivariable analyses. Examination of the unadjusted results revealed a very similar pattern of results compared to the adjusted results, therefore only the adjusted results are presented here.

Multinomial logistic regression was used to examine factors related to where injectors obtained most of their new syringes (pharmacies, syringe/needle exchange programs, or other sources). Analytical results revealed a cumulative missing data percentage of 20.4%. Using methods outlined by Van Buuren (1999) [47] data missingness was examined and it was determined that the missingness was not missing completely at random but missing at random. Therefore, missing values were imputed using multiple imputation, which accounts for missing data that is not missing completely at random. The multiple imputation methods used chained equations via the ice command in Stata, version 10.1; these methods are described in more detail elsewhere [47,48]. Data were imputed and analyzed multiple times (m=5). Estimates from the multiple analyses were then combined using Rubin's rule of inference [49]. Multinomial logistic regression results are presented as relative risk ratios.

RESULTS

The sample was 63.5% male, 70.7% African-American, ranged in age from 17 to 50 years, and had a mean (SD) age of 31.5 (7.3) years (see Table 1). Participants were mainly heroin users (56.5% had ever used heroin regularly and had used in the past six months), 39.1% were speedball (both heroin and cocaine) users, and 4.4% were cocaine users. Participants had been injecting drugs regularly for a mean (SD) of 8.9 (7.4) years and 22 (7.9%) were seropositive for HIV. Over a third (33.9%) of the sample reported obtaining their new syringes from pharmacies, one quarter (26.0%) obtained syringes from SEPs, and 40.1% obtained syringes from other sources, including wife/husband/boyfriend/girlfriend (N=6), family member (N=3), friend or acquaintance (N=8), diabetic or their relative (N=14), drug dealer (N=11), syringe dealer (N=60), or some other place (N=3).

After adjusting for other covariates, the multinomial logistic regression model revealed that the relative risk of getting most syringes from a pharmacy versus from another source was higher for males (versus females, Relative Risk Ratio [RRR]=3.08, 95% Confidence Interval [CI]=1.61-5.91), whites (versus African-Americans [AA], RRR=6.73, 95% CI=2.58-17.56), and those with a high school education or higher (versus those having less than a high school diploma or a GED, RRR=2.53, 95% CI=1.29-4.98). Also, the relative risk of getting most syringes from a pharmacy versus from another source was lower for those reporting receptive sharing of injection equipment in the past six months (RRR=0.44, 95% CI=0.22-0.88).

Moreover, after adjusting for other covariates, the relative risk of getting most syringes from a SEP versus from another source was higher for those injecting one or two times per day in the past six months (versus those injecting less than once per day, RRR=4.23, 95% CI=1.68-10.68), those injecting three or more times per day in the past six months (versus those injecting less than once per day, RRR=4.68, 95% CI=2.01-10.91), those reporting that they had been arrested for possession of drug paraphernalia in the past six months (RRR=4.74, 95% CI=1.26-17.80), and those reporting that they used a new syringe for one or two hits (versus those using a syringe for three or more hits, RRR=3.34, 95% CI=1.27-8.76). In addition, after adjusting for other covariates, the relative risk of getting most syringes from a SEP versus from another source was lower for those living the furthest away from a SEP (those in the third tertile, compared to those living nearest to a SEP, in the first tertile, RRR=0.31, 95% CI=0.12-0.79) and those reporting receptive sharing of injection equipment in the past six months (RRR=0.44, 95% CI=0.21-0.92).

Table 1: Characteristics of injection drug users in Baltimore, MD and cross tabulations by where they obtained most of their sterile syringes[a].

		Obtained most syringes from pharmacy	Obtained most syringes from SEP	Obtained most syringes from other place
	N (%)	N (%)	N (%)	N (%)
Total	304	103 (33.9)	79 (26.0)	105 (34.5)
Age (mean [SD]=31.5 [7.3] years)				
17-20 years of age	17 (5.6)	8 (7.8)	1 (1.3)	8 (7.6)
21-30 years of age	120 (39.5)	51 (49.5)	23 (29.1)	35 (33.3)
31-40 years of age	141 (46.4)	37 (35.9)	49 (62.0)	50 (47.6)
41-50 years of age	26 (8.6)	7 (6.8)	6 (7.6)	12 (11.4)
Gender				
Female	111 (36.5)	24 (23.3)	29 (36.7)	50 (47.6)
Male	193 (63.5)	79 (76.7)	50 (63.3)	55 (52.4)
Race/ethnicity				
African-American	89 (29.3)	11 (10.7)	29 (36.7)	42 (40.0)
White	215 (70.7)	92 (89.3)	50 (63.3)	63 (60.0)
Education				
< HS or GED	195 (64.1)	55 (53.4)	61 (77.2)	70 (66.7)
≥ HS	109 (35.9)	48 (46.6)	18 (22.8)	35 (33.3)
Frequency of drug injection, past 6 months				
<daily[c]	114 (37.5)	36 (34.9)	18 (23.1)	52 (49.5)
1-2 times/day	67 (22.0)	24 (23.3)	20 (25.6)	19 (18.1)
3 or more times/day	120 (39.5)	43 (41.8)	40 (51.3)	34 (32.4)
Missing	3 (1.0)			
Distance from home to nearest SEP				
1st tertile (0.0003-0.0131 miles)	89 (29.2)	15 (18.1)	36 (50.0)	32 (32.7)
2nd tertile (0.0135-0.0584 miles)	88 (29.0)	26 (31.3)	23 (31.9)	35 (35.7)
3rd tertile (0.0595-0.7627 miles)	88 (29.0)	42 (50.6)	13 (18.1)	31 (31.6)
Missing	39 (12.8)			
Arrested for possession of drug paraphernalia, past 6 months				
No	260 (85.5)	95 (93.1)	64 (83.1)	99 (96.1)
Yes	24 (7.9)	7 (6.9)	13 (16.9)	4 (3.9)
Missing	20 (6.6)			
Receptive sharing of injection equipment, past 6 months				
No	147 (48.4)	51 (49.5)	46 (58.2)	39 (37.1)
Yes	157 (51.6)	52 (50.5)	33 (41.8)	66 (62.9)
Number of hits a new syringe was used for, past 6 months				
3 or more times	212 (23.4)	48 (79.2)	83 (63.2)	80 (79.8)
1-2 times	71 (69.7)	28 (12.8)	21 (36.8)	21 (20.2)
Missing	**21 (6.9)**			

[a]Column percentages are presented; Missing data are not presented for cross tabulations; Seventeen participants (5.6%) had missing responses on where they got most of their new syringes; SEP: Syringe/Needle Exchange Program

Table 2: Multinomial logistic regression results examining the factors associated with where injection drug users in Baltimore, MD obtained sterile syringes.

	Adjusted RRR (95% CI)[a]		
	Obtained most syringes from pharmacy vs. Other place[b]	**Obtained most syringes from SEP vs. Other place[b]**	**Obtained most syringes from SEP vs. Pharmacy**
Age (continuous)	0.99 (0.95-1.04)	1.03 (0.98-1.08)	1.03 (0.98-1.08)
Gender			
Female	1.0	1.0	1.0
Male	3.08 (1.61-5.91)*	1.74 (0.87-3.50)	0.57 (0.27-1.20)
Race/ethnicity			
African-American	1.0	1.0	1.0
White	6.73 (2.58-17.56)*	1.79 (0.72-4.49)	0.27 (0.09-0.78)*
Education			
< HS or GED	1.0	1.0	1.0
≥ HS	2.53 (1.29-4.98)*	0.72 (0.33-1.54)	0.28 (0.13-0.64)*
Frequency of drug injection, past 6 months			
<daily	1.0	1.0	1.0
1-2 times/day	1.47 (0.63-3.43)	4.23 (1.68-10.68)*	2.88 (1.08-7.65)*
3 or more times/day	1.60 (0.77-3.32)	4.68 (2.01-10.91)*	2.92 (1.22-7.01)*
Distance from home to nearest SEP[c]			
1st tertile (0.0003-0.0131 miles)	1.0	1.0	1.0
2nd tertile (0.0135-0.0584 miles)	1.03 (0.41-2.64)	0.51 (0.23-1.14)	0.49 (0.19-1.25)
3rd tertile (0.0595-0.7627 miles)	1.55 (0.63-3.83)	0.31 (0.12-0.79)*	0.20 (0.08-0.52)*
Arrested for possession of drug paraphernalia, past six months			
No	1.0	1.0	1.0
Yes	1.72 (0.45-6.63)	4.74 (1.26-17.80)*	2.75 (0.95-7.97)
Receptive sharing of injection equipment, past 6 months			
No	1.0	1.0	1.0
Yes	0.44 (0.22-0.88)*	0.44 (0.21-0.92)*	1.00 (0.46-2.15)
Number of hits a new syringe was used for, past 6 months			
3 or more times	1.0	1.0	1.0
1-2 times	1.57 (0.66-3.72)	3.34 (1.27-8.76)*	2.12 (0.76-5.91)

[a]RRR, relative risk ratio; 95% CI, 95% confidence interval; [b]Other place is from a partner, friend, family, diabetic, drug/syringe dealer, or other place; [c]SEP, syringe/needle exchange program; *P<0.05.

Furthermore, after adjusting for other covariates, the relative risk of getting most syringes from a SEP versus a pharmacy was higher for those injecting one or two times per day in the past six months (versus those injecting less than once per day, RRR=2.88, 95% CI=1.08-7.65) and those injecting three or more times per day in the past six months (versus those injecting less than once per day, RRR=2.92, 95% CI=1.22-7.01). In addition, after adjusting for other covariates, the relative risk of getting most syringes from a SEP versus from another source was lower for whites (versus African-Americans, RRR=0.27, 95% CI=0.09-0.78), those with a high school education or higher (versus those having less than a high school diploma or a GED, RRR=0.28, 95% CI=0.13-0.64), and those living the furthest away from a SEP (those in the third tertile, compared to those living nearest to a SEP, in the first tertile, RRR=0.20, 95% CI=0.08-0.52).

DISCUSSION

In summary, this study examined the factors related to where heroin and cocaine injectors obtained most of their new sterile syringes (pharmacies vs. other sources, syringe/needle exchange programs vs. other sources, and syringe exchange programs vs. pharmacies). The study found that IDUs who use SEPs to get their syringes were less likely to live farther away from a SEP and more likely to inject more frequently, compared to those who use other less safe syringes sources or pharmacies. In addition, SEP users and pharmacy users were less likely to share injection equipment compared to those using other less safe sources. SEP users were also more likely to use syringes for fewer hits, compared to those using other sources. Finally, pharmacy users were more likely to be male, white, and have at least a high school diploma (compared to those using other sources). SEP users, compared to pharmacy users, were less likely to be white or have a high school diploma or higher. The findings suggest there are different factors associated with each syringe acquisition source.

This study was one of the few, that we are aware of, to empirically find that distance to a SEP is an important factor in getting syringes from a SEP, such that those living farthest

away (between 0.06 and 0.76 miles) were less likely to use SEP (compared to those who use other sources or pharmacies). It is important to note here that all study participants lived within a mile from a SEP site. While several studies note that convenience, especially location, is an important factor in sterile syringe access [50,51], only a few that we are aware of tested this association quantitatively [39-42]. When planning programs for infectious disease prevention, distance to the target population may be an important factor to consider.

Additionally, a main finding of this study was that those who injected more frequently were more likely to get their syringes from SEPs when compared to users of other less safe sources or pharmacies. This finding is consistent with extant research suggesting that SEPs may attract IDUs with more severe drug dependence [30-36]. In the absence of SEPs, those who inject more frequently may not be able to get sterile syringes. Our finding showing those who had been arrested for drug paraphernalia in the past six months were more likely to use SEPs is also consistent with the tenet that SEPs may attract IDUs with more severe dependence. Another explanation for this finding may be that SEP users are more likely to carry syringes with them and get caught and arrested for carrying syringes. At present, it is illegal to possess syringes without a prescription (drug paraphernalia) unless they are obtained from a SEP; in Maryland, SEPs are legal in Baltimore City only [52]. This highlights an important issue: if an injector does not have proof of SEP membership (such as a membership card) or has more than "trace" amounts of drug left in a used syringe that person may be arrested for possessing drug paraphernalia [52]. Given the results of this study, SEPs may be especially important in delivering services, to include referrals to drug treatment and/or health care, to this marginalized and hard-to-reach population.

Consistent with previous studies, this study found that SEP users and pharmacy users were less likely to share injection equipment, compared to users of less safe sources [19,21,22]. SEP users (versus users of other sources) were also less likely to reuse syringes (three or more times) for injection, which is also consistent with previous research [35,53-55]. This study and others support the notion that those using SEPs or pharmacies to acquire sterile syringes (compared to other sources) may engage in fewer high risk injection behaviors. This study offers further support for the claim that giving injectors more access to sterile syringes, through pharmacies or SEPs, may lower their risk of injection equipment sharing and reuse of contaminated syringes, thereby lowering their risk of contracting and transmitting infectious diseases.

Study results also support findings that pharmacies and SEPs serve different populations of IDUs. In this study, IDUs who were male, white, and had more education were more likely to use pharmacies to get syringes, compared to other sources. SEP users, in comparison to pharmacy users, were also less likely to be white or have a high school diploma. There are several empirical studies which suggest that pharmacy users tend to be less disadvantaged than those using SEPs [38] and that class and ethnic differences may influence the sale of sterile syringes to IDUs in pharmacies [15,37]. Although it is legal to purchase syringes without a prescription in Baltimore City, regulations give discretion to pharmacists to restrict the sales of syringes to medical purposes only [52]. Some pharmacists see HIV prevention as a medical purpose while others do not [56].

The present study had some limitations that should be considered. The study's cross-sectional design precludes causal claims. Also, the study sample was recruited from one urban area, Baltimore, MD and participants were not randomly selected; therefore, they may not be representative of injection drug users in other areas. Additionally, the outcome was measured by participants' self-report of where they obtained *most* of their new syringes in the past six months. Some of the participants may have obtained their syringes from multiple sources which may introduce misclassification bias. Further, studies such as this one using self-report measures are subject to biases, such as recall and social desirability. However, the query time period was recent, during the past 6 months, and a review by Darke and colleagues (1998) [57] suggests that self-report data from IDUs are valid and reliable. Only 16 (5.3%) participants reported distributive sharing of syringes in the past six months (selling, returning, or giving a syringe away after using it); therefore, this variable was not included as an independent variable in the analyses. Also, this study was unable to examine how distance to a pharmacy may affect where IDUs get their syringes.

Overall, the current study addressed a gap in the literature by examining the predictors of where drug injectors get their sterile syringe sources (pharmacies, SEPs, and other less safe sources). Study findings indicate that patrons of pharmacies, SEPs, and other sources are different with respect to many characteristics. Findings also suggest that different sources of syringes may complement one another in terms of providing access to sterile syringes. Study findings have implications for the design of targeted intervention programs aimed at preventing the spread of infectious diseases (such as HIV/AIDS and Hepatitis) among injection drug users.

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