AIDS Education and Prevention, 13(1), 78–90, 2001

NEEDLE EXCHANGE PROGRAM ATTENDANCE AND INJECTION RISK IN PROVIDENCE, RHODE ISLAND

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Needle sharing has long been recognized as a primary route of HIV infection. However, recent research has shown that HIV antibody is also detectable in injection supplies other than needles. In this study we tested frequency of attendance at a Providence, Rhode Island, needle exchange program (NEP) as a correlate of injection risk indicators including not just sharing needles but also sharing cookers, sharing cotton filters, cleaning the skin before injecting, and using bleach as a needle disinfectant. Results showed that drug users who attended the NEP less frequently were more likely to report needle sharing, less likely to report always cleaning their skin, and more likely to report sharing cookers. The Providence NEP is one at which alcohol swabs and cookers are distributed along with clean needles. Our results suggest that NEPs represent a valuable and underexploited opportunity to promote risk reduction efforts beyond the avoidance of needle sharing. NEPs should be distributing risk reduction supplies in addition to clean needles and should adopt strategies (e.g., outreach and more days/hours of operation) to encourage frequent attendance.

The sharing of needles or syringes (hereinafter called needles) has long been recognized as a primary route of HIV infection among injection drug users (IDUs). By providing access to clean needles at no cost to the user, needle exchange programs (NEPs) are designed to promote a reduction in needle sharing, and several studies of NEPs have found lower rates of needle sharing among NEP attendees than among nonattendees. But other NEP studies have found no difference in rates of needle sharing among NEP attendees and nonattendees. Moreover, recent research has shown that HIV antibody is detectable in other injection supplies, such as cookers and cotton filters. While NEPs would appear to be excellent venues for distributing such supplies, few prior studies have examined the relationship between sharing of cookers, filters, or other supplies and attendance at NEPs where such supplies are distributed, and findings from those studies are quite mixed.

A needle exchange program in Providence, Rhode Island, has been distributing cookers, cotton filters, alcohol swabs, bleach, and condoms along with sterile needles since its inception. In this study we tested frequency of attendance at the Providence NEP as a correlate of injection practices including sharing needles, cookers,

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and filters; use of alcohol swabs to clean the skin before injecting; and use of bleach as a needle disinfectant. Because IDUs at higher risk of HIV infection may visit NEPs more frequently than IDUs at lower risk (Archibald et al., 1998; Hahn, Vranizan, & Moss, 1997; Lurie, Reingold, & Bowser, 1993) we sought to isolate the particular relevance of NEP attendance by controlling for demographic and other characteristics potentially related to injection risk behavior.

BACKGROUND

Most NEP studies have found that reduced needle sharing is associated with NEP attendance (Drucker, Lurie, Wodack, & Alcabes, 1998; Vlahov & Junge, 1998). In both Oakland and San Francisco, for example, NEP attendees were significantly less likely than nonattendees to share needles (Bluthenthal, Kral, Erringer, & Edlin, 1998; Watters, Estilo, Clark, & Lorvick, 1994). Studies of IDUs recruited from NEPs in New York and Baltimore have found consistent reductions in needle sharing among NEP attendees (Paone, Caloir, Shi, & Des Jarlais, 1995; Paone, Des Jarlais, & Shi, 1998; Vlahov, Junge, & Brookmeyer, 1997). However, the evidence is not universally favorable. A New York study found no significant difference between NEP attendees and nonattendees in the frequency of injecting with needles they knew had been used before (Tortu, Deren, Beardsley, & Hamid, 1996), and a San Francisco study found no relationship between frequency of NEP attendance and the likelihood of needle sharing (Guydish, Bucardo, Clark, & Bernheim, 1998). Thus it cannot be assumed that distribution of needles via NEPs will necessarily result in reduced rates of needle sharing.

Shared use of injection supplies other than needles may be another source of HIV transmission risk (Koester & Hoffer, 1994). Researchers in Miami have been able to detect HIV antibody in cookers and filters, suggesting that sharing of these injection supplies may result in exposure to HIV (Shah et al., 1996). But HIV prevention messages warning IDUs of the potential dangers of HIV transmission through sharing of such items have lagged behind admonitions against needle sharing (Centers for Disease Control and Prevention [CDC], 1993, 1997). This fact is reflected in research examining rates of sharing injection supplies other than needles. Studies in Denver and Baltimore have reported rates of sharing other injection supplies two and three times as great as rates of needle sharing (Koester, Booth, & Zhang, 1996; Vlahov et al., 1997). One national study of out-of-treatment IDUs found that sharing of supplies other than needles was nearly twice as frequent as needle sharing (McCoy, Metsch, Chitwood, Shapshak, & Comerford, 1998).

NEPs would appear to be excellent venues for distributing sterile injection supplies in addition to needles, but NEPs have been slow to take up this opportunity (Lurie et al., 1993). This may explain the mixed findings regarding NEP attendance and sharing of injection supplies other than needles. Reductions in the sharing of cookers and cotton filters by NEP attendees have been reported in Baltimore (Vlahov et al., 1997). A San Francisco study found that frequency of NEP attendance was associated with greater use of alcohol swabs but not with a reduction in the sharing of rinse water (Guydish et al., 1998). NEP attendees in Los Angeles were less likely to share "cotton, cookers, or water" (the findings for each item were not reported separately) (Kipke, Unger, Palmer, & Edgington, 1997, p. 229). On the other hand, there was no association between NEP attendance and sharing other injection items in studies of IDU samples in Oakland and New York City (Bluthenthal et al., 1998;

Tortu et al., 1996). Neither of these studies reported findings for each item separately. For high-risk IDUs, reducing levels of sharing all injection equipment, not just needles, may be crucial.

METHOD

The Providence NEP began in 1995 under the auspices of the Rhode Island Department of Health. Volunteers and one paid coordinator currently operate the anonymous exchange in Providence on 2 days per week (3 hours per day). The site is fixed. Needles are exchanged on a "one-for-one plus one" basis. The NEP also provides cookers, cotton filters, rinse water, alcohol swabs, bleach and bleach bottles, and condoms. Attendees can get referrals to formal drug treatment, health care services, shelters, legal services, and social service support.

STUDY PROCEDURES

Between July 1997 and March 1998 we recruited persons from the Providence NEP and from Codac Inc. (the state's largest methadone maintenance treatment program) for the Providence Methadone and Injection Use Study (Promethius), which examined health service utilization among IDUs. All participants were at least 18 years of age and nonpregnant. All gave informed consent. The Rhode Island Hospital Human Subjects Committee approved the study.

Because of the anonymous nature of NEP attendance and the brevity of most interaction between NEP staff and attendees, we recruited attendees to a separate research site (Rhode Island Hospital) for Promethius. The NEP gave out laminated study cards announcing a "health service use study" to all IDUs seen at the NEP during the recruitment period and kept demographic data (sex, race, and age) for all attendees who received cards. At the study visit, the research interviewer recorded the study card number so that we were able to compare the demographics of those participating in our study versus those who did not choose to participate.

Study participants were asked to complete a 45-minute face-to-face interview with study staff. The interview included sections on demographics, drug use, alcohol use, health service use, and injection risk behaviors in the last 6 months. Persons completing the interview received $40 and information regarding substance-abuse treatment programs.

SAMPLE

Of 354 individuals seen at NEP during the study period, 248 (70%) consented to enroll in our study. There was no significant difference by sex, race, or mean age between participants and nonparticipants (results not shown). As shown in Table 1, the sample was evenly divided by age and was about two-thirds male. Most IDUs in the sample were non-Hispanic whites. All IDUs reported injecting on a daily basis in the past month, and most were injecting at least three times per day. In addition, most were injecting cocaine only. Further background information about the sample appears in Table 1.

MEASURES

The independent variable of primary interest in this analysis was frequency of needle exchange attendance. Participants were asked, "Over the last 6 months, on

Table 1. Sample Characteristics (by Percentage), *n* = 248

Age	30 or under	30.8
	31–40	36.4
	40 or over	32.8
Sex	Male	66.8
	Female	33.2
Race	White	85.2
	Other	14.8
Injection frequency	Once a day	8.4
	Twice a day	24.4
	Three times a day	30.0
	Four or more	37.2
Primary drug	Heroin only	35.7
	Cocaine or heroin/cocaine	64.3
Years of injection	0–5	29.4
	6–10	14.9
	11–15	14.5
	16–20	13.1
	21 or over	28.1
Treatment experience	No	56.0
	Yes	44.0
Frequency of exchange attendance (times per month)	Not more than 1	10.8
	2–4	33.1
	5 or more	56.2
Shared needle in prior 6 months	No	47.2
	Yes	52.8
Always cleaned skin in prior 6 months	No	57.6
	Yes	42.4
Shared cooker in prior 6 months	No	53.8
	Yes	46.2
Shared filter in prior 6 months	No	59.8
	Yes	40.2
Always used bleach in prior 6 months (needle sharers only, *n* = 120)	No	51.2
	Yes	48.8
Any injection risk in prior 6 months	No	22.7
	Yes	77.3

average, how often did you visit the needle exchange?" Their responses were trichotomized to indicate visiting the NEP once a month or less, two to four times per month, and five or more times per month.

Other independent variables in the analysis included sex, age, race, injection frequency, primary drug, and treatment experience. For the analysis, we converted age to a three-value categorical variable (30 or under, 31–40, and 40 or over). Because the sample was predominantly white, we dichotomized race as white and other. Frequency of injection was separated into four categories (once per day, twice per day, three times per day, and four times or more per day). Primary drug was scored as heroin injection only or injection of cocaine with or without heroin (very few IDUs reported injection of cocaine only). Finally, treatment experience was a dichotomous variable reflecting whether participants reported ever having been in residential,

detoxification, methadone maintenance, or day treatment for drug-use problems. We did not employ years of injection as an independent variable because of multicollinearity concerns; years of injection was highly correlated (r = .70) with age.

Risk indicators in the data set included sharing needles, cookers, or cotton filters; attempting to clean one's skin with "alcohol, soap, iodine, or bleach" before injecting; and using bleach to disinfect needles. The recall period in each case was the prior 6 months. To focus on whether participants incurred any risk, we scored each indicator as dichotomous (yes/no). Our primary dependent variable was any injection risk, created by assigning a value of 1 to participants reporting one or more of the following: sharing needles, sharing a cooker, sharing a filter, and not always cleaning skin. Because IDUs who do not share injection equipment may see no need to disinfect it, we did not consider bleach use in this measure. To examine injection risk in more detail, we also employed these four indicators and (among sharers of injection equipment) bleach use as dependent variables in five separate analyses.

ANALYTIC APPROACH

We performed a multivariate logistic regression analysis for each dependent variable. To adjust for background factors potentially associated with risk behavior, we included these covariates: age, race, sex, injection frequency, primary drug, and treatment experience. Injection frequency is perhaps the most direct source of risk; IDUs who are injecting more frequently may be more dependent (D'Aquila, Peterson, Williams, & Williams, 1989) more often in situations where HIV infection risk is difficult to avoid (e.g., shooting galleries; Vlahov et al., 1990) or less risk averse (Falck, Siegal, Wang, & Carlson, 1995). Demographic traits such as race and sex may also be associated with risk behavior (e.g., women may be less likely to share needles with strangers or at shooting galleries; Longshore, Anglin, Hsieh, & Annon, 1993). Regarding primary drug, studies have found that cocaine injectors share needles more than heroin injectors (Calsyn, Saxon, Wittaker, & Freeman, 1989; Chaisson et al., 1989; Wiebel, Ouellet, Guydan, & Samairat, 1990). Finally, treatment experience may serve as a useful proxy for background factors associated with risk behavior. IDUs with prior exposure to treatment are less likely to meet criteria for an antisocial personality diagnosis and less likely to be HIV positive (Anglin & Hser, 1990; Wiebel, Biernacki, Mulia, & Levin, 1993).

RESULTS

Slightly over half (56%) of the sample reported NEP attendance five or more times per month (see Table 1). Most of the less frequent attendees (33% of the overall sample) reported using the NEP two to four times per month. The remaining 11% attended the NEP not more than once per month.

ANY INJECTION RISK

As shown in Table 2, none of the background covariates was associated with overall injection risk. Turning to the primary independent variable and using high-frequency attendees as the reference category, we found that less frequent NEP attendance was associated with greater likelihood of incurring injection risk. The adjusted odds ratio for IDUs attending the NEP two to four times per month (adjusted odds ratio [OR] = 2.16) is statistically significant (p = .04). The adjusted odds ratio for

Table 2. Needle Exchange Attendance and Any Injection Risk

Variables	Adjusted Odds Ratio	Lower Confidence Interval	Upper Confidence Interval
Age			
30 or less	1.74	.81	3.75
31–40	1.82	.86	3.86
Over 40	—	—	—
Male	.81	.41	1.58
White	.82	.34	2.00
Injection frequency			
1 time a day	.52	.17	1.57
2 times a day	1.71	.69	4.21
3 times a day	1.15	.53	2.44
4 or more times a day	—	—	—
Primary drug			
Heroin only	1.01	.52	1.98
Heroin/cocaine	—	—	—
No drug treatment	1.58	.83	2.99
Needle exchange			
Not more than 1	2.39	.75	7.60
2–4	2.16**	1.04	4.48
More than 4	—	—	—

Note. Confidence intervals are .95. Hosmer-Lemeshow goodness-of-fit test $\chi^2 = 2.57$, $df = 8$, $p = .96$, Cox & Snell $R^2 = .055$.

**$p \leq .05$.

IDUs attending no more than once per month (adjusted OR = 2.39, $p = .14$) is similar but does not meet conventional levels of statistical significance. Few IDUs (11%) attended the NEP so seldom (see Table 1). As a result, the .95 confidence interval around the odds ratio for this category is wide; the p value, high. But an overall pattern of association between NEP attendance and injection risk is apparent nonetheless.

While the overall measure serves as a global indicator of risky injection, we also wanted to "unpack" the data to see how the four separate indicators, as well as bleach use, were associated with NEP attendance. Findings are reported below.

NEEDLE SHARING

As shown in Table 3, treatment experience was the only covariate associated with needle sharing. IDUs with no treatment experience were more likely to have shared needles than IDUs with such experience (the reference category). After adjustment for treatment experience and the other covariates, lower frequency of NEP attendance was associated with a greater likelihood of needle sharing, as indicated by the finding for IDUs attending two to four times per month (adjusted OR = 2.04, $p = .02$) and for those attending no more than once per month (adjusted OR = 3.20, $p = .01$).

ALWAYS CLEANED SKIN

As shown in Table 3, none of the covariates in our dataset was associated with skin cleaning. Infrequent NEP attendees were less likely to report having always cleaned their skin before injecting (adjusted OR = 0.33). The reliability of this find-

Table 3. Needle Exchange Attendance and Each Injection Risk Indicator

	Needle Sharing			Always Cleaned Skin			Shared Cooker			Shared Filter			Always Using Bleach		
	Adjusted Odds Ratio	Lower Confidence Interval	Upper Confidence Interval	Adjusted Odds Ratio	Lower Confidence Interval	Upper Confidence Interval	Adjusted Odds Ratio	Lower Confidence Interval	Upper Confidence Interval	Adjusted Odds Ratio	Lower Confidence Interval	Upper Confidence Interval	Adjusted Odds Ratio	Lower Confidence Interval	Upper Confidence Interval
Age															
30 or less	1.48	.75	2.91	.88	.42	1.81	1.63	.83	3.19	1.62	.82	3.19	.80	.30	2.18
31–40	1.62	.85	3.10	.62	.30	1.28	1.59	.84	3.04	1.44	.75	2.76	.55	.22	1.41
Over 40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Male	1.26	.72	2.20	1.20	.65	2.19	.96	.55	1.67	.92	.52	1.60	.79	.34	1.80
White	.51	.24	1.11	.97	.44	2.15	.55	.26	1.17	.57	.27	1.20	.68	.24	1.95
Injection frequency															
1 time a day	.68	.24	1.92	2.36	.79	7.05	0.32**	.10	1.17	.40	.12	1.34	4.81	.71	32.51
2 times a day	1.40	.68	2.88	1.25	.55	2.81	1.45	.71	2.95	1.72	.85	3.49	1.93	.69	5.45
3 times a day	1.40	.73	2.72	.78	.38	1.63	1.01	.53	1.93	1.32	.69	2.54	1.28	.51	3.23
4 or more times a day	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Primary drug															
Heroin only	.66	.37	1.16	1.47	.80	2.70	1.23	.70	2.16	.80	.45	1.42	1.50	.64	3.55
Heroin/cocaine															
No drug treatment	1.91**	1.09	3.32	.59	.33	1.08	1.10	.64	1.90	1.33	.77	2.30	.47	.21	1.07
Needle exchange															
Not more than 1	3.20*	1.27	8.03	.33[a]	.10	1.11	2.55**	1.05	6.17	1.57	.66	3.75	1.04	.32	3.35
2–4	2.04**	1.13	3.66	.69	.36	1.29	2.00**	1.12	3.59	1.14	.63	2.04	1.26	.55	2.86
More than 4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Note. All confidence intervals are .95. Needle sharing: Hosmer-Lemeshow goodness-of-fit test $\chi^2 = 6.77$, $df = 8$, $p = .56$, Cox & Snell $R^2 = .093$. Always cleaned skin: Hosmer-Lemeshow goodness-of-fit test $\chi^2 = 13.30$, $df = 8$, $p = .10$, Cox & Snell $R^2 = .067$. Shared cooker: Hosmer-Lemeshow goodness-of-fit test $\chi^2 = 3.41$, $df = 8$, $p = .91$, Cox & Snell $R^2 = .076$. Shared filter: Hosmer-Lemeshow goodness-of-fit test $\chi^2 = 6.57$, $df = 8$, $p = .58$, Cox & Snell $R^2 = .053$. Always using bleach: Hosmer-Lemeshow goodness-of-fit test $\chi^2 = 21.6$, $df = 8$, $p = .006$, Cox & Snell $R^2 = .085$.

[a] $p = .07$.

* $p \leq .01$.

** $p \leq .05$.

ing, as suggested by the significance level (p = .07), falls just short of the conventional cut-off for statistical significance, again perhaps due to the low number of IDUs in this category.

SHARED COOKER

IDUs who injected no more than once per day were less likely to report sharing a cooker (adjusted OR = 0.32, p = .05). After accounting for this and other covariates, we found that lower frequency of NEP attendance was clearly associated with a greater likelihood of sharing cookers (adjusted OR = 2.00, p = .02, for IDUs who attended the NEP two to four times per month; adjusted OR = 2.55, p = .04, for IDUs who attended the NEP no more than once per month; see Table 3).

SHARED FILTER

The sharing of cotton filters was not associated with any of the background covariates or with NEP attendance (see Table 3).

ALWAYS USED BLEACH

IDUs who share needles are likely to be incurring some risk of HIV infection unless they disinfect their needles before they inject. IDUs who avoid needle sharing entirely may, on the other hand, see no need to disinfect their needles as an HIV risk avoidance strategy. As indicated in Tables 2 and 3, IDUs with more frequent NEP attendance had lower overall injection risk scores and, more specifically, were less likely to report any needle sharing. Thus we restricted the analysis of bleach use to IDUs who reported needle sharing in the past 6 months. The number of these IDUs was 122. Table 3 reports results of this analysis. Bleach use was not associated with any of the background covariates or with NEP attendance.

DISCUSSION

IDUs who attended the Providence NEP more frequently were less likely to engage in needle sharing than were IDUs whose attendance was less frequent. This is consistent with most prior studies. However, in a departure from some prior research, we controlled for demographic and other background covariates potentially related to the degree of injection risk incurred by IDUs. Chief among these covariates was drug injection frequency. Thus we were able to isolate the relationship between NEP attendance and HIV risk avoidance after accounting for some of the factors that might have obscured this relationship.

Lack of control for background risk factors may explain why some studies (e.g., Guydish et al., 1998; Tortu et al., 1996) have found NEP attendance not to be associated with reductions in needle sharing. If IDUs are drawn to an NEP in part because they are at higher risk than other IDUs, a comparison of the behavior of attendees and nonattendees, or the behavior of more frequent attendees to less frequent attendees, may be misleading unless background differences are taken into account. Another possible explanation for the lack of association between NEP attendance and needle sharing in some studies is that some aspect of NEP operations may inadvertently encourage needle sharing among some attendees, as might be the case if restrictions on the exchange procedure (e.g., users allowed to exchange only

a few needles per visit) or low accessibility (e.g., insufficient or unreliable hours of operation) make it difficult to avoid depleting one's supply of needles before the next NEP visit. Under that circumstance, an IDU might not accomplish a significant reduction in the frequency of needle sharing. If NEP operations affect a non-negligible proportion of attendees in this way, favorable effects among other attendees might be masked, resulting in the overall lack of association indicated by some studies. Low NEP accessibility might, in addition, generate more pressure on NEP attendees to share, lend, give, or sell their needles to users who cannot or will not attend the NEP (Klee, Faugier, Hayes, & Morris, 1991; Klee & Morris, 1995). Depending on how the term *sharing* is defined by evaluators or understood by IDUs, this side effect of low NEP accessibility might preclude a significant decrease in sharing among NEP attendees. Finally, because any adverse effect of an NEP might be more pronounced among users for whom it is the primary or sole source of needles, certain aspects of local context (e.g., strict enforcement of paraphernalia laws or pharmacists' unwillingness to sell needles to known or suspected users) must also be examined as possible contributors to patterns of needle sharing among NEP attendees (Fernando, 1991).

We have added to prior research by examining the relationship between NEP attendance and risk indicators other than needle sharing. As an alternative to relying on multiple comparisons, which might have led to chance findings, our primary analysis employed a single measure of injection risk, reflecting occurrence of at least one of four indicators in our data set: sharing cookers, sharing cottons, and always cleaning skin, as well as sharing needles. This analysis showed that less frequent NEP attendance was significantly associated with greater overall injection risk. When we revisited each risk indicator separately, we found that less frequent NEP attendance was associated with a greater likelihood of needle sharing (as already discussed), a greater likelihood of sharing cookers, and a lower likelihood of always cleaning the skin. NEP attendance was not associated with sharing filters or (among needle sharers) always using bleach.

Our findings suggest that NEPs represent a valuable and underexploited opportunity to promote risk reduction efforts beyond the avoidance of needle sharing (Needle et al., 1998). Consistent skin cleaning has been shown to reduce the incidence of subcutaneous abscesses and may reduce the incidence of endocarditis. Thus the distribution of alcohol swabs along with instructions for proper use of them might reduce the frequency of serious bacterial complications among IDUs (Stein, 1990; Vlahov, Sullivan, Astembrowski, & Nelson, 1992). Although HIV antibody can be detected in cookers and cotton filters, it has not been established that HIV is transmissible therefrom. However, until it becomes clear that transmission cannot occur through cookers and filters, it will remain important that IDUs avoid sharing them. In addition, hepatitis B and C viruses are detectable in used syringes (Heimer, Khoshnoud, Jariwala-Freeman, Duncan, & Harima, 1996). Because hepatitis B and hepatitis C viruses are transmitted via needle sharing more easily than HIV, they may also be transmitted by the shared use of cookers and filters. More NEPs should exploit their potential impact on risk reduction by distributing alcohol wipes, cookers and filters to attendees. In addition, NEPs may be able to promote risk reduction through aggressive efforts to educate attendees on the range of infectious disease risks that they face and referring attendees to community-based risk reduction services and support groups. They may also be able to enhance their public health value by actively promoting condom use and other safer sex strategies and by offering on-

site HIV and tuberculosis testing, vaccination against hepatitis B, and medical care for acute conditions such as skin abscesses.

We found no association between NEP attendance and use of bleach as a needle disinfectant. One might expect less bleach use among frequent NEP attendees because frequent attendees engage in less needle sharing and thus may see less reason to use bleach. Accordingly we restricted the analysis of bleach use to IDUs who continued to engage in needle sharing. It is possible that IDUs who shared needles and attended the NEP more frequently were sharing with people whom they knew to be uninfected, or sharing mainly with intimates, or in some other way incurring less risk of infection than IDUs who attended the NEP less frequently. If so, they may have seen less reason to disinfect the needles they were sharing. We were unable to explore this possibility, as the data set did not include the detailed information necessary for calibrating an IDU's degree of risk behavior more sensitively. It is also possible that IDUs find bleach use to be more difficult than the use of other risk reduction supplies. The protocol for effective bleach use is complicated (Shapshak et al., 1994), and social norms can weigh heavily against introduction of bleach use into needle-sharing groups (Connors, 1992; Longshore, 1996). This suggests that NEPs need to boost their efforts to educate IDUs on the need to use bleach and on interpersonal strategies by which they can broach the subject of bleach use with needle-sharing peers.

We cite four limitations of our analysis. First, interviewers asked about use of any of four items—alcohol, soap, iodine, or bleach—for the purpose of skin cleaning, but alcohol swabs were the only skin-cleaning item distributed by the Providence NEP. Because of this lack of exact correspondence between items covered in the interview and NEP procedure, we may have underestimated the relevance of NEP attendance for skin cleaning. Notably, however, we found a significant relationship despite this problem. Second, results were based on the self-report measures of risk behavior. Apart from a general concern with the reliability of self-reports, there is also the particular concern that more frequent NEP attendees, because they felt more normative pressure, were more likely to underreport risk behavior. We do not believe that such normative pressure was a significant factor in our analysis, however. Interviews were conducted at a separate research site, not at the NEP. IDUs may have felt some normative pressure in interaction with the interviewer but were not put in the position of admitting risky behavior in proximity to NEP staff. Moreover, the lack of association between frequency of NEP attendance and either sharing filters or using bleach suggests that normative pressure, if any, was not strong enough to induce systematic underreporting of risk behaviors. A third limitation of our analysis is that frequency of NEP attendance is not a very sensitive measure. We had no way to account for particular aspects of attendance, such as number of needles exchanged or quality of the relationship between attendee and staff. Finally, IDUs were not randomly assigned to the NEP or a non-NEP control group, and NEP attendees were not randomly assigned to various frequencies of attendance. Thus the association we found between NEP attendance and lower risk behavior may reflect a favorable impact of the NEP or may, alternatively, reflect a greater willingness to attend the NEP among IDUs who were more risk averse. We attempted to overcome this self-selection problem by controlling for demographic and other background factors potentially associated with risk behavior. Factors available in the data set may not have sufficed for this purpose.

Despite these limitations, we believe that our results can be viewed as favorable evidence for the potential value of NEPs in promoting riskreduction efforts beyond avoidance of needle sharing. If alcohol swabs and cookers are among the supplies distributed by NEPs, IDUs apparently will use them. We hope to see an increase in the proportion of NEPs that distribute these supplies. The public health value of NEPs may also be enhanced if adequate and stable funding enable them to remain "open for business" on more days and for longer hours. We also look forward to research on IDU and NEP characteristics associated with frequent attendance at NEPs and to the development of outreach and service protocols that enhance the capacity of NEPs to sustain frequent IDU attendance over time.

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