Selective Risk Taking Among Needle Exchange Participants: Implications for Supplemental Interventions

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A B S T R A C T

Objectives. This study characterized social network context of HIV risk behavior among injection drug users who participated in a needle exchange program.

Methods. Interviews were conducted with 1184 injection drug users at the Baltimore Needle Exchange Program enrolled in an evaluation cohort. Analysis consisted of multiple logistic regression with statistical adjustment for the interdependence of observations.

Results. Of the 203 (17.1%) injection drug users who reported using a syringe after someone else, 78.3% reported sharing with close friends, and the adjusted odds ratio of any sharing and sharing with close friends was 30.9. Injection drug users were more likely to report sharing with a strong-tie close friend (adjusted odds ratio = 1.52) and less likely to report sharing with other close friends if those friends were weak ties and new to their network. Friendship ties were not stable, with fewer than 30% of the friends being repeat nominations.

Conclusions. These data show that many injection drug users engage in selective risk taking that may minimize their disease risk exposure in the short term. The turnover in networks, however, suggests that programs need to emphasize the importance of exclusive use. (*Am J Public Health.* 2001;91:406–411)

Epidemiologic evidence and theory suggest that an individual's risk for HIV or other communicable diseases is in part a function of the composition and behavior of his or her network of drug users and/or sexual partners.[1–12] It has been suggested that individuals whose friends engage in high-risk behavior are more likely to engage in high-risk behavior themselves.[13] Because both sexual behavior and drug use via syringes can be network processes, it seems appropriate to use network-based methodologies to study the degree of risk associated with these behaviors.

Injection drug users risk infection with blood-borne pathogens such as HIV and hepatitis B and C viruses when they share drug injection equipment.[14–16] To reduce this risk, some effort has been expended to provide clean, sterile syringes to injection drug users by establishing needle exchange programs.[17–20] The programs generally stress the importance of using clean injection equipment. The current study used a network methodology to characterize disease risk behavior among a sample of injection drug users who visited a needle exchange program between February 1995 and February 1997.

Syringe sharing among a small, closely knit group may insulate an individual and his or her group from outside pathogens, whereas syringe sharing with others outside the group provides a pathway for the entry of pathogens to that individual and his or her set of contacts.[21] Personal network structures range from those that are completely integrated (*dense*) to those that are completely radial (*open*). Dense personal networks may provide protection at the individual level by insulating an individual from outside pathogens. Once a disease infiltrates this tightly closed network, however, it can spread rapidly. In contrast, open personal networks may create increased risk to the individual by exposing him or her to more pathogens.

In populations with low HIV prevalence, integrated or dense personal networks may be protective, whereas in populations with high prevalence, these networks can increase risk because of the greater likelihood that an individual in the personal network is HIV infected. (Of course, completely closed and seronegative networks are protective regardless of the outside prevalence, but such networks are rare.) The interaction between population-level prevalence and individual network structures influences disease spread patterns because the connections between personal networks can accelerate the spread of disease. At the population level, network group formation creates spikes in incidence levels as the disease spreads rapidly through these tightly connected subgroups.[22]

At least 3 methods have been developed to study network influences on risk behavior: (1) *census methods* consist of interviewing all of the members within a bounded community and asking each person for the names of their interaction partners[23–25]; (2) *snowball methods* consist of asking respondents to name their contacts and then interviewing all or a sample of those persons named and, depending on the extent of the study, the contacts of those contacts[26]; and (3) *personal network methods* consist of asking respondents to provide the initials (or names) of those people with whom they interact and asking respondents to provide information on those contacts. In this study, we used the personal network approach and asked each respondent to provide the initials of his or her 5 closest friends. The personal network approach can be applied to any study situation at little additional cost. The data can be treated as a regular data set and also can be converted to a dyadic data set to study the

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relation between individuals and the perceived characteristics of the alters (the persons nominated).[27] (A dyadic data set is one in which the original data are converted so that each new record represents an individual and each network member, so that a person who nominated 3 people would contribute 3 records.)

In this study, we examined the degree of self-reported syringe sharing for a sample of needle exchange participants. We classified syringe sharing as that which occurred with anyone and that which occurred with close friends. Sharing with close friends represents risk behavior with an integrated network, whereas sharing with nonfriends represents risk behavior with a radial network. We then examined associations between sociodemographic characteristics and the friend-based classifications as a measure of risk behavior. Furthermore, we investigated associations between friend-based syringe-sharing classifications and friend characteristics to determine the degree to which injection drug users engage in selective risk taking (i.e., engage in risk behaviors with those whom they know well).

Methods

Population

The study was conducted at the Baltimore Needle Exchange Program, which operated 1 mobile van at 2 sites to provide 1-for-1 exchange of needles, HIV testing, HIV treatment referrals, and drug treatment referrals. The HIV-positive prevalence in the evaluation sample was approximately 30% and did not change during the study period (February 1995 to February 1997). Since August 1994, the Baltimore Needle Exchange Program has been evaluated by recruiting participants randomly from the total participant population into a cohort that was administered a risk analysis questionnaire and an HIV test.

Every seventh person who visited the Baltimore Needle Exchange Program was solicited to participate in the evaluation cohort sample and given a financial incentive to do so. The total participant list during this study period consisted of 3520 individuals, of whom 448 (12.7%) were systematically recruited into the evaluation sample. Demographic and drug use characteristics of the sample did not differ significantly from the entire program participant population.[28]

Between February 1995 and February 1997, a set of personal network questions was included in the questionnaire administered to the sample cohort (N=1383); 448 (32.4%) subjects were administered a baseline questionnaire, 364 (26.3%) returned to the Baltimore Needle Exchange Program for their 2-week follow-up interview, 308 (22.3%) returned for the 6-month interview, 175 (12.7%) returned for the 1-year interview, and 88 (6.4%) returned for the 18-month interview. Interviews that were missing data on the syringe-sharing question (n=90), were missing data on the network questions (n=105), or had other missing data (n=4) were dropped, yielding a final sample of 1184. Because of variation in the timing and number of interviews, the data were stacked rather than treated as longitudinal. Consequently, all analyses include terms accounting for follow-up time and the number of follow-up surveys completed to determine whether these factors were associated with risk behavior.

Instruments

On enrollment in the Baltimore Needle Exchange Program, participants were administered a short registration questionnaire, which measured sociodemographic characteristics such as sex, age, whether the participant lived with a sexual partner, whether he or she lived in his or her own residence, employment status, and race/ethnicity. The evaluation questionnaire asked about frequency of drug use within the prior 2 weeks, collecting information on speed, cocaine, heroin, "speedballing" (i.e., combining heroin and cocaine in the same syringe), and any other drugs. Frequencies were then averaged into a drug use frequency scale and dichotomized on the mean. We also asked whether the respondent had exchanged sex for drugs or money in the past 2 weeks.

Social networks were measured by asking respondents for the initials of up to 5 of their closest friends. We then asked whether the respondent engaged in any of the following 4 behaviors with each friend in the past 2 weeks: (1) injected drugs together, (2) shared syringes, (3) had sex, or (4) drank alcohol. We assessed syringe sharing by asking each respondent whether in the past 2 weeks he or she had used a syringe that had been used by any other person.

Statistical Tests

Analyses were conducted with multiple logistic regression in which the odds ratios (ORs) were adjusted for all other variables in the model. These data represent nonindependent observations because some individuals were interviewed repeatedly. To account for this intraindividual covariation, statistical models were computed with the general estimating equations with a link function[29] and the Huber-White correction.[30,31] For the dyadic data, the same considerations applied,

TABLE 1—Sociodemographic, Survey, and Syringe-Sharing Characteristics of the Respondent and Dyadic (Respondent–Network Tie) Data, February 1995–February 1997

	Evaluation Sample (N=1184)		Dyadic Data (N=3907)	
	%	n	%	n
Male	66.0	781	67.8	2649
Younger than 39.7 years	49.7	588	49.6	1938
Lives with a sex partner	31.5	373	30.7	1199
Lived in own residence	39.8	471	40.5	1582
African American	91.1	1079	90.7	3545
Employed	6.5	77	6.7	263
Drug use frequency ≥ once per week	48.1	569	49.7	1943
Exchanged sex for money or drugs	4.5	53	4.1	161
Named more than 3 friends	65.9	780	84.0	3280
Survey wave				
Baseline	34.6	410	35.9	1402
2-Week	28.0	331	27.8	1087
6-Month	20.9	248	19.3	753
1-Year or 18-month	16.5	195	17.0	665
Surveys completed				
1	48.9	579	50.5	1973
2	35.1	416	34.8	1361
3	13.0	154	12.2	475
4	3.0	35	2.5	98
First or second friend named	...	...	56.1	2193
Friend named previously[a]	...	...	13.5	528
Shared syringe past 2 weeks	17.1	203	17.9	699
Shared syringe with close friend[b]	21.1	250	11.3	441

Note. Ellipses indicate that data are not applicable.
[a]Represented 27.3% of cases not in baseline and with more than 1 survey (n=1934).
[b]Refers to any friend for the sample data but to a specific friend for the dyadic data.

with the added condition that cases were non-independent within individuals nested within survey waves. In this article, we report the estimates and confidence intervals obtained from the Huber-White estimation, because they provide valid parameter estimates for non-independent data.

Results

The sample consisted of injection drug users who were mostly male (66%), approximately 40 years old, African American (91.1%), and unemployed (93.5%); 31.5% reported living with a sexual partner, and 39.8% reported living in their own residence (Table 1). More than 48% of the persons in the sample injected drugs more than once a week. Few of the respondents (4.5%) exchanged sex for money or drugs. Most respondents (65.9%) provided the initials of more than 3 close friends. Most of the respondents were interviewed at baseline (34.6%), 2-week follow-up (28.0%), or 6-month follow-up (21%), and most were interviewed only once (48.9%) or twice (35.1%).

Table 1 also reports the distributions of the sample after conversion to dyadic data. The distributions are similar, with the exception that more dyadic cases came from respondents who named more than 3 friends (83.9%). Two new variables in the dyadic data not available in the regular data set are friendship rank (named first, second, third, and so on) and whether the friend was named previously. Friends who were named first or second constituted more than half (56.1%) of the dyadic cases. Among cases not in the baseline and with more than 1 survey (n = 1934), 27.3% composed dyads in which the friend had been named previously (these cases represented 13.5% of the total dyadic sample).

Table 2 shows the bivariate distribution and adjusted odds ratios for the association between self-reported syringe sharing and sociodemographic, network, and survey characteristics. More frequent drug users reported more syringe sharing (adjusted OR = 1.60) than did less frequent drug users. Sharing syringes with friends was strongly associated with any syringe sharing (adjusted OR = 30.9). Persons interviewed in the 6-month survey reported less sharing (adjusted OR = 0.40) than did those interviewed at baseline.

For the dyadic data, African Americans reported less sharing (adjusted OR = 0.47) than did those of other races/ethnicities; those who named more friends were more likely to report sharing (adjusted OR = 1.66) than were those who named fewer friends. Again, sharing syringes with friends was strongly associated with any reported syringe sharing (adjusted OR = 15.6). Injection drug users in dyadic cases

TABLE 2—Multiple Logistic Regression (Adjusted Odds Ratios [AORs][a]) for Any Syringe Sharing in the Evaluation and Dyadic (Respondent–Network Tie) Data

	Shared Syringe Past 2 Weeks					
	Evaluation Sample (N = 1184)			Dyadic Data (N = 3907)		
	% Shared	AOR	95% CI	% Shared	AOR	95% CI
Female (reference)	20.3			20.4		
Male	15.5	1.38	0.82, 2.31	16.7	1.25	0.77, 2.04
Age, y						
<39.7 (reference)	22.0			23.2		
>39.7	12.2	0.71	0.44, 1.14	12.5	0.69	0.43, 1.09
Lives alone (reference)	16.5			17.7		
Lives with sex partner	18.5	0.97	0.57, 1.65	18.3	1.00	0.61, 1.63
Does not live in own residence (reference)	18.2			18.7		
Lives in own residence	15.5	0.84	0.52, 1.37	16.7	0.93	0.60, 1.46
Other race/ethnicity (reference)	27.6			28.7		
African American	16.1	0.52	0.25, 1.09	16.8	0.47	0.23, 0.94
Not employed (reference)	17.6			18.6		
Employed	10.4	1.23	0.44, 3.46	8.7	0.64	0.23, 1.78
Low drug use (reference)	14.6			15.6		
High drug use	19.9	1.60	1.02, 2.51	20.2	1.28	0.84, 1.97
No sex for money or drugs (reference)	15.8			16.8		
Sex for money or drugs	45.3	2.34	0.85, 6.41	42.9	2.32	0.85, 6.32
First or second friend named (reference)	14.0			13.2		
Third–fifth friends named	18.8	1.06	0.68, 1.67	18.8	1.66	1.09, 2.53
Not shared with friend (reference)	4.7			11.5		
Shared with friend	63.4	30.89	19.67, 48.27	68.2	15.59	10.60, 22.92
Third–fifth friend named (reference)	...	...	...	18.8		
First or second friend named				17.2	0.82	0.72, 0.93
Friend not named previously (reference)	...	...	...	18.6		
Friend named previously				13.4	0.92	0.62, 1.36
Survey wave						
Baseline (reference)	26.8			27.7		
2-week	14.5	0.47	0.22, 1.03	15.2	0.31	0.12, 0.77
6-month	10.5	0.40	0.19, 0.85	11.6	0.36	0.19, 0.71
1-year or 18-month	9.7	0.43	0.18, 1.06	8.9	0.16	0.06, 0.40
Surveys completed						
1 (reference)	21.4			22.2		
2	13.2	1.62	0.71, 3.00	14.0	1.89	0.81, 4.41
3	11.0	1.44	0.66, 3.72	9.9	1.34	0.54, 3.30
4	20.0	1.88	0.51, 6.26	23.5	6.49	1.69, 24.89

Note. CI = confidence interval. Ellipses indicate that data are not available.
[a]AORs estimated with both generalized estimating equations and Huber-White robust variance estimators. Here, we report the Huber-White sandwich estimates and CIs because these provide the more accurate parameter estimates.

TABLE 3—Multiple Logistic Regression (Adjusted Odds Ratios [AORs]) for Syringe Sharing Categorized as Not Recently (Past 2 Weeks) and With Friend, Recently and With Friend, and Recently and Not With Friend (N = 1184)[a]

	Shared Syringe					
	Not Recently With Friend		Recently With Friend		Recently Not With Friend	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
High drug use	0.72	0.45, 1.14	1.52	0.97, 2.37	1.31	0.66, 2.59
Sex for money or drugs	1.48	0.55, 3.98	3.42	1.55, 7.53	2.23	0.52, 9.51
Third–fifth friends named	1.73	1.02, 2.93	1.31	0.85, 2.03	1.38	0.70, 2.73
Survey wave						
2-week	1.59	0.70, 3.62	0.23	0.11, 0.50	1.45	0.54, 3.86
6-month	0.89	0.41, 1.94	0.26	0.13, 0.54	0.51	0.12, 2.14
1-year or 18-month	0.40	0.11, 1.51	0.08	0.03, 0.24	0.94	0.28, 3.15
Surveys completed						
2	0.60	0.27, 1.32	1.66	0.80, 3.44	0.98	0.41, 2.34
3	0.88	0.33, 2.38	1.83	0.75, 4.44	1.37	0.37, 5.13
4	2.92	0.56, 15.29	9.20	2.16, 39.07	0.85	0.10, 7.62

Note. CI = confidence interval.
[a]Regression also controls for sex, age, living in one's own residence, race/ethnicity, and employment status.

consisting of strong ties (named first or second) were less likely to report any recent sharing (adjusted OR = 0.82) than those in cases consisting of weaker ties (named third, fourth, or fifth). Interviews at follow-up were associated with less sharing (2-week, adjusted OR = 0.31; 6-month, adjusted OR = 0.36; and 1-year or 18-month, adjusted OR = 0.16) than were those at baseline. Injection drug users who completed 4 surveys reported more sharing (adjusted OR = 6.49) than did those who completed only 1 survey.

Of the 203 respondents who said that they had shared a syringe in the past 2 weeks, 159 (78.3%) reported that they had shared syringes with a friend. Table 3 combines information on any syringe sharing in the past 2 weeks with reported syringe sharing with friends. Individuals were classified into the reference group, which consisted of those who did not share in the past 2 weeks and who had never shared with friends in the past (n = 889), or into 1 of 3 risk groups: (1) no sharing in the past 2 weeks but had shared in the past with a friend (n = 92), (2) shared in the past 2 weeks and had shared in the past with a friend (n = 159), and (3) shared in the past 2 weeks but not with a friend (n = 44).

Table 3 shows the results from the multiple logistic regression. Syringe sharing in the past with a friend (model 1) was associated with naming more friends (adjusted OR = 1.73). Sharing recently and with a friend (model 2) was associated with exchanging sex for money (adjusted OR = 3.42) and was negatively associated with later surveys (2-week, adjusted OR = 0.23; 6-month, adjusted OR = 0.26; and 1-year or 18-month, adjusted OR = 0.08). Completing 4 surveys also was associated with recent sharing with a friend (adjusted OR = 9.20). No variables were associated with sharing syringes recently but not with a friend (model 3).

Table 4 shows these same multiple logistic regression models for the dyadic data that refer to a specific friend ("this friend"). Syringe sharing in the past with this friend (model 1) was associated with being a closer friend to the re-

TABLE 4—Multiple Logistic Regression (Adjusted Odds Ratios [AORs]) for Syringe Sharing Categorized for Dyadic Data as Not Recently (Past 2 Weeks) and With This Friend, Recently and With This Friend, Recently and Not With This Friend; and Shared With Other Friend (N = 3907)[a]

	Shared Syringe							
	Not Recently and With This Friend		Recently and With This Friend		Recently and Not With This Friend		Shared With Other Friend	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
High drug use	0.64	0.38, 1.08	1.68	1.04, 2.70	1.05	0.51, 2.19	0.96	0.64, 1.43
Sex for money or drugs	2.10	0.71, 6.24	2.54	1.25, 5.14	1.51	0.24, 9.53	2.32	1.08, 4.98
Third–fifth friends named	1.29	0.75, 2.22	0.84	0.53, 1.31	1.90	0.91, 3.96	3.80	2.26, 6.41
First or second friend named	1.65	1.15, 2.36	1.52	1.22, 1.89	0.94	0.81, 1.10	0.69	0.58, 0.83
Friend named previously[b]	0.82	0.45, 1.48	1.19	0.72, 1.98	1.21	0.67, 2.20	0.55	0.35, 0.88
Survey wave								
2-week	1.60	0.80, 3.22	0.29	0.15, 0.56	1.57	0.44, 5.58	0.39	0.18, 0.84
6-month	0.94	0.38, 2.37	0.28	0.12, 0.66	0.48	0.13, 1.82	0.58	0.31, 1.11
1-year or 18-month	0.43	0.09, 1.99	0.15	0.05, 0.44	0.61	0.15, 2.40	0.15	0.05, 0.46
Surveys completed								
2	0.68	0.32, 1.41	1.62	0.86, 3.04	1.12	0.34, 3.66	1.48	0.71, 3.06
3	1.04	0.31, 3.41	1.32	0.50, 3.51	0.59	0.11, 3.07	1.61	0.68, 3.81
4	2.21	0.33, 15.01	3.87	0.93, 16.16	2.09	0.22, 20.06	10.98	2.61, 46.16

Note. CI = confidence interval.
[a]Regression also controls for sex, age, living in one's own residence, race/ethnicity, and employment status.
[b]Results are substantively unchanged when restricted to the eligible sample of those respondents who were interviewed more than once.

spondent (named first or second, adjusted OR = 1.65). Sharing recently and with this friend (model 2) was associated with being a more frequent drug user (adjusted OR = 1.68), exchanging sex for money or drugs (adjusted OR = 2.54), and being a closer friend (adjusted OR = 1.52) and was negatively associated with later surveys (2-week, adjusted OR = 0.29; 6-month, adjusted OR = 0.28; and 1-year or 18-month, adjusted OR = 0.15). No variables were associated with sharing syringes recently but not with this friend (model 3).

The results for the respondent and dyadic data were similar, but the further advantage of the dyadic data was that we could classify observations as representing those individuals who shared with one friend but not with another friend and determine whether respondent or friend characteristics were associated with this behavior. In 423 dyadic cases, the respondent shared in the past *not* with this friend but with another named friend (243 of these also reported recent sharing and 180 did not). The last column in Table 4 reports associations for whether the respondent–friend case consisted of sharing with a friend other than the one represented by this case (model 4).

Sharing with a friend other than this friend was associated with exchanging sex for money or drugs (adjusted OR = 2.32), naming more friends (adjusted OR = 3.80), not being a strong or close friend (adjusted OR = 0.69), and not being a friend who was named in the prior interview (adjusted OR = 0.55). Sharing with a friend other than this friend was negatively associated with the 2-week (adjusted OR = 0.39) and 1-year or 18-month survey (adjusted OR = 0.15) but was positively associated with completing 4 surveys (adjusted OR = 11.0).

Discussion

In this study, we did not collect data from the friends who were named by the respondent and we did not gather detailed data on these friends' characteristics. Such data would provide more insight into the characteristics, either perceived or actual, associated with risk networks. The aims of the study were limited to investigation of the degree of syringe sharing with friends. Participants were asked only for the initials of their 5 closest friends and their syringe-sharing behaviors with those friends. Nonetheless, the results provided some insight into the dynamics of risk behavior among injection drug users attending a needle exchange program.

An important limitation of these findings, however, is that these data were derived from interviews with respondents who participated in the needle exchange program, some of whom returned to the site repeatedly. Whether these data can be extended to injection drug users not participating in the program is unclear, because a community-based sample might report higher-risk behavior and less-selective risk behavior. Analysis of these data, however, showed that those injection drug users who did not return for follow-up interviews had the same reported syringe-sharing behaviors as those who remained in the sample.

Despite these limitations, the results have shown the usefulness of considering risk behavior in the context of the social networks of the persons being studied. We have shown that some of the injection drug users in this sample engaged in selective risk taking by sharing syringes with close friends. This selective risk taking may present less risk for infection in closed networks that insulate the individual from outside exposure. This is particularly true in contexts in which disease prevalence is low. When prevalence is high, however, such as for hepatitis C, selective risk taking places individuals at increased risk for infection.

In general, these data show that risk taking was not random but rather was more likely to occur with strong-tie close friends than with weak-tie ones. The selectivity of syringe-sharing behavior helps explain why HIV and other infectious diseases might not spread as rapidly as one might expect. Selective risk taking can minimize to some extent the risk to which individuals expose themselves. In an extreme case in which 2 individuals share syringes exclusively with each other, risk can be greatly diminished.

To be sure, the restricted nature of this risk-taking behavior does not completely eliminate risk of infection. Although syringe sharing occurred within integrated networks at a particular point in time, these friendship networks had considerable turnover (<30% repeated nominations), making them somewhat open over time. This is analogous to serial monogamy, in which persons stay with 1 partner for a while but then switch partners repeatedly. Thus, sharing may occur with strong ties, but there seems to be considerable change in the identity of these strong ties. This is particularly true for women, who reported higher sharing rates and higher sharing with strong-tie friends but only marginally less turnover in networks (30% vs 26% repeated nominations, $P < .10$).

These results must be considered in the context of the setting, namely, the needle exchange program. This program may have reduced the degree of syringe sharing that occurred because of legal restrictions and economic reasons[32] but, thus far, has not eliminated risk due to syringe sharing for social or ritualistic reasons, because injection drug users still feel compelled to share syringes with their close friends. Injection drug users often share syringes with their closest friends because they consume alcohol and drugs together, and refusal to share a syringe in such settings would indicate a lack of trust among friends. One counseling strategy, then, would be to have injection drug users list the friends with whom they have shared syringes and then ask them whether they would have shared syringes with these persons 6 months ago. This might communicate to them the manner in which they put themselves at risk.

Earlier studies of the Baltimore Needle Exchange Program reported that program participants claimed reduced levels of drug injection and sharing of syringes after entry into the program,[28] and this is consistent with findings from at least a dozen other studies.[33] However, reductions do not equate with absence of needle sharing, and this study indicated that some sharing of syringes persists. Furthermore, our data indicate that multiple reuse of syringes tends to be more common with close friends and less common with strangers, which might suggest a reduction in risk, but a more disturbing finding is that these close-tie partnerships are not necessarily long-standing. The turnover in relationships among injection drug users represents a risk potential for infection transmission that within a population of injection drug users could be ongoing.

Although needle exchange programs have provided a needed service in permitting access to sterile syringes to injection drug users who cannot or will not stop injecting, these data suggest that programs need to renew efforts to discourage further sharing of syringes obtained from the program. The US Public Health Service published the *HIV Prevention Bulletin: Medical Advice for Persons Who Inject Illicit Drugs,*[34] which advised that drug users unwilling or unable to cease injection drug use should use sterile syringes only once and then discard the syringe to minimize the risk of infection transmission. Needle exchange programs that are part of a comprehensive HIV, hepatitis virus, and other infections prevention program must do more than provide access to sterile syringes and drug treatment referral. These data suggest that information and persuasion techniques must be improved to further minimize sharing of syringes by participants of such programs. □

Contributors

T. W. Valente and D. Vlahov conducted the statistical analysis and cowrote the paper. D. Vlahov designed and conducted the evaluation of the Baltimore Needle Exchange Program, and T. W. Valente designed the network component.

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