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Predictors of Sharing Injection Equipment by HIV-Seropositive Injection Drug Users

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Abstract

Among HIV-positive injection drug users (IDUs), we examined baseline predictors of lending needles and syringes, and sharing cookers, cotton, and rinse water in the prior 3 months at follow-up. Participants were enrolled in INSPIRE, a secondary prevention intervention for sexually active HIV-positive IDUs in four US cities during 2001–2005. The analyses involved 357 participants who reported injecting drugs in the prior six months at either the 6- or 12-months follow-up visit. About half (49%) reported at least one sharing episode. In adjusted analyses, peer norms supporting safer injection practices, and having primary HIV medical care visits in the prior 6 months were associated with reporting no sharing of injection equipment. Higher levels of psychological distress was associated with a greater likelihood of reporting drug paraphernalia sharing. These findings suggest that intervention approaches for reducing HIV-seropositive IDUs' transmission of blood-borne infections should include peer-focused interventions to alter norms of drug paraphernalia sharing and promoting primary HIV care and mental health services.

Injection drug use continues to be a significant source of HIV transmission. Many countries report injection drug use (IDU) as the primary mode of HIV transmission.^{1–3} In some countries, IDUs have reported reductions in syringe sharing; however, many IDUs continue to share syringes despite high levels of HIV knowledge and a higher proportion report sharing other types of injection equipment used in the drug preparation process, such as cookers, cotton, and rinse water.^{4,5} In addition to the health concern of transmitting HIV, a large proportion of injectors, especially HIV positive IDUs, are co-infected with hepatitis C (HCV), which is readily transmitted through the sharing of injection equipment.⁶

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Numerous studies have identified correlates of sharing injection equipment,^{7–12} including type and frequency of drug use, relationship to injection partners, composition of social networks, availability of clean injection equipment, homelessness, fear of police, and laws and policies governing syringe access. Yet few prospective studies have focused on sharing injection equipment among sexually active HIV seropositive injectors. The current study examined equipment sharing among HIV-seropositive IDUs who were enrolled in the INSPIRE study (2001–05),¹³.

A prior cross-sectional analysis of INSPIRE baseline data examined lending of syringes and needles to partners perceived to be HIV-seronegative or of unknown HIV-serostatus.¹⁴ The multivariate analyses revealed that older IDUs, high school graduates, and those reporting more supportive peer norms for safer injection practices were less likely to report lending syringes. Admission to a hospital for drug treatment in the past 6 months, injecting with more than one person in the past 3 months, and having more psychiatric symptoms, as measured by the Brief Symptom Inventory (BSI), were positively associated with lending syringes. Additional prior cross-sectional studies found that social norms and psychiatric symptoms, especially depressive symptoms, were associated with needle sharing.^{15,16,17,18} The present study examined baseline predictors of sharing injection equipment as well as syringes at subsequent 6- and 12-month follow-up assessments among seropositive IDUs. Based on the findings of Metsch et al.¹⁴ it was anticipated that sharing injection equipment would be associated with age, education, drug treatment, injecting with others, peer injection norms, and psychiatric symptoms.

Methods

Study population: Participants were enrolled in the Intervention for Seropositive Injectors-Research and Evaluation (INSPIRE) study, a 10-session secondary HIV prevention intervention conducted in Baltimore, Miami, New York City, and San Francisco (2001–2005). Participants were recruited from clinic and community settings. Eligibility criteria included being at least 18 years of age, confirmed HIV-positive serostatus, self-reported IDU in the prior year, sex with an opposite-sex partner in the prior three months, and willingness to provide oral and blood specimens. Assessments were administered by audio computer-assisted self interview. The CDC and local site IRBs approved the study protocol. A detailed description of the INSPIRE project has been reported elsewhere.⁸ The overall retention rates for randomized participants were 83% and 85% at 6- and 12-months follow-up, respectively, and 91% for either visit.

Measures: Measures were based on the findings of Metsch et al.¹⁴ and on the sampling distributions. Demographic variables included age, biological sex, educational attainment (having at least a high school degree), employment status, and homelessness (squat, homeless shelter, car, or street). Two questions, with a 5-point response option, assessed whether the participant thought that their friends lent needles or shared injection equipment, and two questions assessed whether the participant thought it was important to comply with friends' expectations about lending needles or sharing injection equipment. A composite score was created from the 4 items. Mental health was assessed by combining 3 subscales (depression, anxiety, and hostility – 18 items) of the BSI ($\alpha=.95$), which assessed psychiatric symptoms in the prior week.¹⁹ HIV primary health care visits were defined as “a visit to a doctor or medical provider to have a check up on how you’re doing with your HIV or AIDS, (which may include) discussion about HIV or AIDS medications, or blood test results.” Drug abuse treatment was measured by: 1) hospital admission for drug treatment; 2) outpatient drug treatment; and 3) methadone maintenance program attendance. The dependent variable, referred to in this study as “sharing” was defined as self-reported sharing of injection equipment (cookers, cotton, or

rinse water) or lending a used syringe to individuals who were HIV-seropositive, HIV-seronegative, or of unknown serostatus at either the 6- or 12-months follow-up.

Missing data: A total of 89 (out of 966) participants did not return for assessments at the 6- or 12-months follow-up. Sensitivity analyses ($p < 0.10$), revealed that at baseline participants who were lost to follow-up did not differ from participants who were retained on most baseline measures, including study condition, homelessness, recruitment city, health care visits, or drug treatment. Those lost to follow-up were significantly less likely to have a high school education, an annual income below \$5,000, younger, employed, male, and inject heroin and cocaine together.

The sample for this analysis ($n=357$) was restricted to participants who met the study enrollment criteria and reported injecting drugs in the prior 3 months during the 6 or 12-month follow-up assessments. There were 486 participants who reported no injection drug use in the 3 months prior on either follow-up assessment and 44 individuals with missing data who were excluded from the analyses. Participants were categorized as not sharing drug equipment ($n=195$) if they reported using injection drugs at one or more of the follow-up visits and reported not lending syringes or sharing of cookers, cottons, or rinse water.

Analyses: Bivariate analyses were conducted with logistic regression models. Subsequently, a multivariable logistic regression model was constructed to test which baseline variables were associated with sharing injecting equipment at follow-up. In addition to demographic factors of gender, age, and education, the multivariable model adjusted for recruitment city and study condition. Bivariate tests indicating statistical differences at $p < 0.20$ were included in multivariate models. Variables no longer significant ($p > 0.10$) in the multivariable model were removed if the removal did not change the value of the other covariates in the model by more than 10% and were not considered to be theoretically important confounders.

Results

Table 1 presents the number and proportion of participants who shared injection equipment at the follow-up assessments. There was a dramatic drop in self-reported injecting from 84% at baseline to 31% at 12 months follow-up, and equipment sharing reports plummeted from 45% at baseline to 12% at 12 months follow-up. There were 22% who reported injection at both and 45% at one of the follow-ups. Table 2 presents the unadjusted and adjusted associations between baseline factors and drug equipment sharing. Engagement in medical care, as assessed by any primary HIV care services visits and any admission to a hospital for drug treatment in the past 6 months, was significantly associated with not sharing injection equipment. Peer norms supporting safer injection practices was also associated with less sharing. Lower scores on the BSI and current enrollment in methadone maintenance were marginally associated with a lower likelihood of equipment sharing. In the multivariate analyses, which adjusted for recruitment site and study condition, peer norms supporting safer injection practices, having at least one primary HIV medical visit maintained statistically significant associations with reporting no equipment sharing, whereas a higher score on the BSI was associated with a significantly greater likelihood of equipment sharing.

Discussion

Our findings replicate and expand on the prior cross-sectional study by Metsch et al.¹⁴ We found that baseline measures of peer norms and self-reported psychiatric symptoms, as measured by the BSI, strongly predicted sharing of injection equipment among HIV-seropositive IDUs. One difference from the prior study was that self-reported primary HIV health care visits were found to be associated with significantly less injection equipment

sharing but drug abuse treatment was not. It is plausible that those IDUs who received primary HIV care had unmeasured social and economic resources that facilitate access to medical care and enable the regulation of their health behaviors, including sharing of injection equipment. An alternative explanation is that HIV illness may lead to increased health care utilization and reduced injection risk behaviors. However, we did not find that measures of HIV illness (CD4 count < 200) at baseline predicted sharing.

The study findings are subject to the limitations of sampling, attrition, differences in the time periods between assessments and unmeasured key variables, as well as self-reporting biases. Many of the study participants reported that they had stopped injecting and were not included in the analyses. There were also substantially lower levels of self-reported injection risk behaviors at follow-up as compared to baseline. There are several explanations to these findings of risk reduction, including regression toward the mean. The information that all participants received about HIV prevention may have led to a reduction in sharing of injection equipment and heightened the social desirable response bias to report reduced sharing. These study limitations and changes in patterns of drug use may help to explain differences between our results and previously reported findings.

The findings have implications for HIV prevention efforts among HIV-seropositive IDUs. They underscore the need to promote social norms of not sharing injection equipment. One method of promoting risk reduction social norms is through peer outreach education and social network approaches. The findings of high BSI scores predicting sharing suggest the potential importance of addressing mental health in this population. Future studies need to examine the extent to which mental health treatment for HIV positive IDUs' may reduce their HIV transmission risk.²⁰ Finally, these data indicate that HIV medical care utilization is linked to injection risk. Future studies should also assess this link to determine if greater engagement in HIV health care may also reduce HIV injection risk behaviors.

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Reference List

1. Aceijas C, Stimson GV, Hickman M, Rhodes T. Global overview of injecting drug use and HIV infection among injecting drug users. *AIDS* 2004;18:2295–2303. [PubMed: 15577542]
2. UNAIDS. Report on the Global AIDS Epidemic. Geneva: UNAIDS; 2006.
3. Preventing HIV Infection among Injecting Drug Users in High Risk Countries: An Assessment of the Evidence. Washington, DC: The National Academies Press; 2006. Committee on the Prevention of HIV Infection among Injecting Drug Users in High-Risk Countries.
4. Des J, Braine N, Yi H, Turner C. Residual injection risk behavior, HIV infection, and the evaluation of syringe exchange programs. *AIDS Educ Prev* 2007;19:111–123. [PubMed: 17411414]

5. Page JB, Shapshak P, Duran EM, Even G, Moleon-Borodowski I, Llanusa-Cestero R. Detection of HIV-1 in injection paraphernalia: risk in an era of heightened awareness. *AIDS Patient Care STDS* 2006;20:576–585. [PubMed: 16893327]
6. Thorpe LE, Ouellet LJ, Hershow R, Bailey SL, Williams IT, Williamson J, Monterroso ER, Garfein RS. Risk of hepatitis C virus infection among young adult injection drug users who share injection equipment. *Am J Epidemiol* 2002;155:645–653. [PubMed: 11914192]
7. McCoy CB, Metsch LR, Chitwood DD, Shapshak P, Comerford ST. Parenteral transmission of HIV among injection drug users: assessing the frequency of multiperson use of needles, syringes, cookers, cotton, and water. *J Acquir Immune Defic Syndr Hum Retrovirol* 1998;18:S25–S29. [PubMed: 9663620]
8. De P, Cox J, Boivin JF, Platt RW, Jolly AM. The importance of social networks in their association to drug equipment sharing among injection drug users: a review. *Addiction* 2007;102:1730–1739. [PubMed: 17935581]
9. Santibanez SS, Garfein RS, Swartzendruber A, Purcell DW, Paxton LA, Greenberg AE. Update and Overview of Practical Epidemiologic Aspects of HIV/AIDS among Injection Drug Users in the United States. *Journal of Urban Health* 2006;83:86–100. [PubMed: 16736357]
10. Bluthenthal RN, Do DP, Finch B, Martinez A, Edlin BR, Kral AH. Community characteristics associated with HIV risk among injection drug users in the San Francisco Bay Area: a multilevel analysis. *J Urban Health* 2007;84:653–666. [PubMed: 17657607]
11. Thiede H, Hagan H, Campbell JV, Strathdee SA, Bailey SL, Hudson SM, Kapadia F, Garfein RS. Prevalence and correlates of indirect sharing practices among young adult injection drug users in five U.S. cities. *Drug Alcohol Depend* 2007;91:S39–S47. [PubMed: 17466464]
12. Miller CL, Strathdee SA, Li K, Kerr T, Wood E. A longitudinal investigation into excess risk for blood-borne infection among young injection drug users (IUDs). *Am J Drug Alcohol Abuse* 2007;33:527–536. [PubMed: 17668338]
13. Purcell DW, Latka MH, Metsch LR, Latkin CA, Gomez CA, Mizuno Y, Arnsten JH, Wilkinson JD, Knight KR, Knowlton AR, Santibanez S, Tobin KE, Rose CD, Valverde EE, Gourevitch MN, Eldred L, Borkowf CB. Results from a randomized controlled trial of a peer-mentoring intervention to reduce HIV transmission and increase access to care and adherence to HIV medications among HIV-seropositive injection drug users. *J Acquir Immune Defic Syndr* 2007;46:S35–S47. [PubMed: 18089983]
14. Metsch LR, Pereyra M, Purcell DW, Latkin CA, Malow R, Gomez CA, Latka MH. Correlates of lending needles/syringes among HIV-seropositive injection drug users. *J Acquir Immune Defic Syndr* 2007;46:S72–S79. [PubMed: 18089987]
15. Davey-Rothwell MA, Latkin CA. Gender Differences in Social Network Influence among Injection Drug Users: Perceived Norms and Needle Sharing. *J Urban Health* 2007;84:691–703. [PubMed: 17682947]
16. Bailey SL, Ouellet LJ, Mackesy-Amiti ME, Golub ET, Hagan H, Hudson SM, Latka MH, Gao W, Garfein RS. Perceived risk, peer influences, and injection partner type predict receptive syringe sharing among young adult injection drug users in five U.S. cities. *Drug Alcohol Depend* 2007;91:S18–S29. [PubMed: 17434267]
17. Stein MD, Solomon DA, Herman DS, Anderson BJ, Miller I. Depression severity and drug injection HIV risk behaviors. *Am J Psychiatry* 2003;160:1659–1662. [PubMed: 12944342]
18. Lundgren LM, Amodeo M, Chassler D. Mental health status, drug treatment use, and needle sharing among injection drug users. *AIDS Educ Prev* 2005;17:525–539. [PubMed: 16398575]
19. Derogatis, LR.; Spencer, PM. *The Brief Symptom Inventory (BSI): Administration, scoring, and procedural manual -1*. Baltimore, MD: John Wiley; 1982.
20. Stein MD, Anderson BJ, Solomon DA, Herman DS, Ramsey SE, Brown RA, Miller IW. Reductions in HIV risk behaviors among depressed drug injectors. *Am J Drug Alcohol Abuse* 2005;31:417–432. [PubMed: 16161727]

Table 1

Injection drug use and equipment sharing[^] at baseline, 6- month, and 12-month assessments, the INSPIRE study.

Assessment	Total sample size	% injecting of total sample	% sharing among those who injected	% sharing of total sample
Baseline	1161	84.3	53.6	45.0
6-month	807	38.0	44.1	16.4
12-month	821	31.0	41.0	12.4
6 or 12 Months	877	43.3	48.7	21.1

[^] Defined as sharing a cooker, cotton, or rinse water or leading a used syringe.

Table 2

Unadjusted and adjusted associations of baseline characteristics with sharing injection equipment in the past 3 months at 6 or 12 month follow-up among those who reported injecting in the 3 months prior to one or more of the follow-up assessments, INSPIRE study (n = 357).

Respondent Characteristic	Descriptive Statistics & Unadjusted Tests			Adjusted Logistic Regression Modeling ^a	
	Overall %	Odds Ratio	95% CI	Odds Ratio	95% CI
Biological Sex: male	64.5	1.12	0.73, 1.73	1.26	0.79, 2.03
Race/ethnicity					
Non-Hispanic African American	59.7	1.00	-	1.00	-
Non-Hispanic white	13.7	1.05	0.57, 1.94	1.24	0.61, 2.50
Hispanic	16.1	0.84	0.47, 1.53	1.35	0.66, 2.75
Other	10.5	0.84	0.41, 1.70	0.77	0.35, 1.69
High School Graduate	55.1	0.88	0.58, 1.33	0.91	0.58, 1.45
Income ≥ \$5000 per year	45.5	1.17	0.77, 1.78		
Currently employed	4.8	1.86	0.66, 5.24		
Currently homeless	31.2	1.40	0.89, 2.19		
Injecting heroin (alone) in the past 3 mo.	56.5	1.13	0.72, 1.76		
Injecting heroin & cocaine in past 3 mo.	53.7	1.25	0.80, 1.94		
Injected > 1 person in the past 3 mo.	69.9	1.05	0.63, 1.76		
Any PHC visits for HIV in past 6 mo.	78.8	0.52*	0.31, 0.88	0.48*	0.27, 0.85
Currently receiving HAART	45.8	0.78	0.51, 1.19		
CD4 count < 200	28.5	1.19	0.75, 1.89		
Any admission to a hospital for drug treatment in the past 6 mo.	31.7	1.60*	1.01, 2.52		
Outpatient drug treatment in the past 6 mo.	43.8	0.81	0.53, 1.23		
Currently in methadone maintenance	38.3	0.71	0.46, 1.09		
	Mean				
Age (years)	42.4	0.99 [^]	0.96, 1.02	1.01	0.97, 1.05
Time since HIV diagnosis (months)	109.1	1.00	1.00., 1.00		
Peer norms for safer drug use	1.2	0.93*	0.88, 0.99	0.92*	0.86, 0.98
Empowerment	2.8	0.69	0.32, 1.47		
Brief Symptoms Inventory	1.9	1.21 [^]	0.93, 1.57	1.34*	1.01, 1.79
Taking control of health care	2.9	1.04	0.70, 1.54		

* p < 0.05,

** p < 0.01,

[^] p < .20 by Wald test, t-test, or χ^2 test, comparing those who did and did not share injection equipment.

^a Adjusted for study condition and study site.