

RESEARCH ARTICLE

Risk factors among IDUs who give injections to or receive injections from other drug users

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Abstract

Aims. To assess risk factors associated with injection drug users (IDUs) who give injections to or receive injections from other IDUs. **Design and setting.** IDUs were recruited into a cross-sectional study using targeted sampling methods in Oakland, Richmond, and San Francisco, California from August 1996 to January 1997. "Street docs" are IDUs who reported having given injections to other IDUs in the past month. "Injection recipients" are IDUs who reported having received injections from other people in the past month. **Participants.** Of 1166 IDUs interviewed, 283 (24%) reported being injection recipients and 427 (37%) reported being street docs. **Measurements.** Socio-demographic characteristics and injection-related risk behaviors. **Findings.** Injection recipients and street docs were significantly more likely ($p < 0.001$) than other IDUs to report sharing syringes (33% of injection recipients, 21% of street docs and 7% of others), cookers (71% of injection recipients, 55% of street docs and 24% of others), rinse water (44% of injection recipients, 35% of street docs and 13% of others), and filters (60% of injection recipients, 47% of street docs and 20% of others). In a logistic regression model, injection recipients (adjusted odds ratio (AOR) = 4.29) and street docs (AOR = 1.91) were more likely than other IDUs to report having shared syringes. **Conclusions.** Giving and receiving injections is common among IDUs in the San Francisco Bay area. Qualitative and epidemiological studies are needed to understand better the infectious disease risks associated with giving and receiving injections. Interventions need to address these issues and provide practical solutions.

Introduction

Illicit drug injection is associated with several infectious diseases. It is now estimated that injection drug use accounts for as many new HIV infections (estimated at between 40 000 and 80 000 per year) in US urban settings as unprotected male-to-male sex (Holmberg, 1996). More than a third (36%) of the 573 000 adult acquired immune deficiency syndrome (AIDS) cases in the United States are associated either

directly or indirectly with injection drug use (CDC, 1996). Infection with viral hepatitis, specifically hepatitis B virus (HBV) and hepatitis C virus (HCV), is highly prevalent and a significant source of morbidity and mortality among IDUs (Alter, 1993). In 1988, injection drug use accounted for 43% of HBV cases with known risk factors (Alter *et al.*, 1990). Epidemiological studies have found HBV seroprevalence among IDUs ranging from 51% to 90% in the

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United States (Blanck, Rean & Conrad, 1979; Kreek *et al.*, 1990; Levine, Vlahov & Nelson, 1994), with a range of 71–80% in Northern California (Zeldis *et al.*, 1992; Watters & Kral, 1996). Nearly 4 million Americans are estimated to be infected with HCV (Alter, 1997). Injection drug use is estimated to account for half of all new HCV infections annually in the United States and at least half of chronic infections (Alter, 1997). HCV seroprevalence among IDUs varies between 57% and 89% in the United States and 72% in Northern California (Wormser *et al.*, 1991; Zeldis *et al.*, 1992; Levine *et al.*, 1995).

At least five types of injection-related behaviors may expose IDUs to HIV and viral hepatitis. (1) Re-using syringes that have previously been used by other IDUs (“sharing”) has been associated with HIV and viral hepatitis seroprevalence and seroconversion (Des Jarlais & Friedman, 1987; Schoenbaum *et al.*, 1989; Zeldis *et al.*, 1992; van Ameijden *et al.*, 1993; Chitwood *et al.*, 1995; Neaigus *et al.*, 1995; Wiebel *et al.*, 1996). (2) Sharing of injection equipment (e.g. cookers, cotton, rinse water) may place IDUs at risk for HIV and viral hepatitis, although no published studies to date have found an association between these activities and HIV and viral hepatitis infection. None the less, HIV and viral hepatitis are detectable in syringes, cookers, cottons and rinse and mix water (Heimer *et al.*, 1992, 1996; Myers *et al.*, 1993; Shah *et al.*, 1996). (3) Frontloading and backloading, which involves use of a syringe to divide drug solution, may also put IDUs at risk for HIV and viral hepatitis infection if the syringe used for division of drugs has been previously used by another IDU (Grund *et al.*, 1990; Samuels *et al.*, 1991; Jose *et al.*, 1993; Stark *et al.*, 1996). Sharing of injection equipment and behaviors such as frontloading and backloading have been found to be more prevalent than syringe sharing (Battjes, Pickens & Brown, 1995; Koester *et al.*, 1996; Vlahov, 1996; Needle *et al.*, 1999). (4) Needlestick injuries are often overlooked as an HIV and viral hepatitis transmission risk for IDUs. One study of IDUs in the United Kingdom found that 30.2% reported ever having a needlestick injury with someone else’s syringe, and 18.3% had received such an injury in the past year (Hunt, 1997). No studies of which we are aware have examined whether needlestick injuries are associated with HIV or viral hepatitis infection

among IDUs. (5) The focus of this paper, a fifth risk for HCV transmission, and potentially for HBV and HIV, is receiving an injection administered by another person. Neil Flynn and colleagues (personal communication, 1996) have videotaped numerous injection episodes and found that HCV risk through injection by others is highly prevalent among IDUs in Sacramento, California who have been injecting drugs for many years. In their videotaped episodes of IDUs, the person administering the injection often used his/her thumb to curtail bleeding after removing the syringe from the injection site. Without cleaning the thumb, it was then used for drug preparation and to curtail the bleeding in other injections. Crofts *et al.* documented that being injected by another IDU is common among recent initiates into drug use. (Crofts *et al.*, 1996) No previous epidemiological studies of which we are aware have assessed the prevalence of giving injections to IDUs or receiving injections from other people or which factors may be associated with such behavior. We report here the prevalence and risk factors associated with IDUs who participate in such behaviors from a study of street-recruited IDUs in three San Francisco Bay area cities.

Methods

Recruitment and study procedures

Urban Health Study conducts semiannual surveys of IDUs recruited in inner-city communities in San Francisco, West Oakland and Richmond, California (Watters, 1994; Watters *et al.*, 1994a; Bluthenthal & Watters, 1995; Kral *et al.*, 1998) Respondents are recruited in natural settings using targeted sampling methods in neighborhoods that were selected for high concentrations of IDUs based on review of drug treatment admission data, police arrest data, direct observation and prior ethnographic studies, as described previously (Watters & Biernacki, 1989; Bluthenthal & Watters, 1995). Respondents are not recruited at drug treatment programs, homeless shelters, correctional facilities or hospitals. Eligibility for the studies is based upon recent injection drug use (30 days) or participation in previous waves of data-collection. New respondents are screened for visible signs of recent subcutaneous or intravenous drug use. Prior respondents are screened by confirming various identification information in a large relational

database on a lap-top computer in the field. Informed consent is obtained.

Risk behavior and demographic data are collected using a detailed standard questionnaire administered in field locations by trained interviewers. Topics in the questionnaire include demographic information, medical history, utilization of HIV and drug prevention services, drug use practices and preferences, sexual practices and preferences, and participation in various injection and sex-related risk behaviors. Respondents give blood for HIV antibody tests, are given pre-and post-HIV test counseling and are referred to medical and social services by trained staff. Study participants are paid for their contribution to the study.

Blood specimens are analyzed for HIV antibodies using enzyme immunoassay (EIA). Repeatedly EIA-positive specimens are confirmed using Western blot assay (Wb). Criteria for a seropositive Wb result is the presence of reactive bands at two of the following locations: p24 or gp41 and gp120/160, as described by the CDC (1991).

Study sample

For this study we chose a cross-section of 1271 injection drug users recruited in San Francisco (10/96–1/97), West Oakland (8/96) and Richmond (9/96). IDUs who had stopped using injection drugs in the 30 days prior to interview ($n = 87$) or whose forms contained missing data for the main outcome variables ($n = 18$) were eliminated from analysis, leaving a final sample of 1166.

Outcome variables

The following three questions are included in our questionnaire: "In the past 30 days, how many times have you injected another person", which we defined as being a "street doc"; "in the past 30 days, how many times have you been injected by another person", which we defined as being an "injection recipient"; and "in the last 30 days, how many times did you inject using works that you know had been used by anybody else (including a close friend or lover)?"—our measurement of sharing syringes. It is possible for IDUs to have been both a street doc and an injection recipient in the previous 30 days. Demographic and risk behavior variables among

IDUs who were both a street doc and an injection recipient were more similar to those of injection recipients than street docs. In order to make bivariate and multivariate comparisons between street docs and injection recipients, we therefore classified IDUs who were both as injection recipients in those analyses.

Statistics

Bivariate relationships were examined using the chi-square test of proportions or Fisher's exact test. Non-hierarchical multiple logistic regression was used to control for relevant confounding factors in assessing whether street docs and injection recipients were associated independently with having shared syringes. All variables that were significantly associated with syringe sharing in bivariate analyses or have previously been associated with syringe sharing in research in these communities were entered into forward and backward stepwise models (Watters *et al.*, 1994a, 1994b; Bluthenthal & Watters, 1995; Kral *et al.*, 1997, 1998; Bluthenthal *et al.*, 1998). The final model excluded any variables that did not make a significant contribution to the model. All theoretically grounded interactions between main effects were tested and standard regression diagnostics were performed, including analysis of residuals, examination of the influence of outliers, multi-collinearity and scaling adjustments (Hosmer & Lemeshow, 1989). Data analysis was performed using the *Statistical Package for the Social Sciences* (Chicago, IL) (SPSS, 1990).

Results

Demographic characteristics

Of the 1166 IDUs in our sample, 33% were women; 60% African American, 28% Caucasian, 6% Hispanic and 6% other races; 11% HIV positive; and 32% homeless. The majority were over 40 years old (72%), recruited in San Francisco (64%), had an income over \$500 per month (81%), and at least a high school degree (68%). Seventeen per cent were in drug treatment at the time of interview.

Injection recipients

Twenty-four per cent (283/1,166) of IDUs reported having received injections in the previous 30 days. Of these injection recipients, the

Table 1. Risk factors among injection recipients, street docs and other IDUs in San Francisco Bay area, fall 1996 (N = 1166)*

	Injection recipient (n = 283) %	Street doc (n = 295) %	Other IDU (n = 588) %	p < †
Female	43.8	29.2	30.6	0.001
< 40 years old	35.0	33.9	22.1	0.001
Consider self homeless	37.8	43.1	22.9	0.001
HIV antibody positive	7.1	9.5	13.5	0.004
Jail past 6 months	31.4	30.3	20.9	0.001
African American race	47.0	51.2	71.6	0.001
Ever overdosed	46.8	51.5	35.9	0.001
In drug treatment	13.1	13.9	20.7	0.003
10+ years of injection drug use	71.4	86.4	88.6	0.001
Injected cocaine past month	22.6	25.4	13.2	0.001
Injected amphetamines past month	28.3	27.8	10.3	0.001
Smoked crack cocaine past month	63.1	60.2	48.3	0.001
Backloaded in past month	43.5	34.2	15.0	0.001
Shared syringes past month	32.7	20.5	7.4	0.001
Shared cookers past month	71.7	54.9	24.2	0.001
Shared rinse water past month	44.5	35.5	13.0	0.001
Shared filters past month	60.1	47.3	19.5	0.001
Always clean skin before injection	28.3	29.2	41.6	0.001
Has an IDU steady sex partner	37.6	40.5	25.0	0.001
Gave used syringe to other IDU	39.1	31.0	9.2	0.001
Skin popped in past month	36.0	22.4	27.9	0.050

*Respondents who were both injection recipients and street docs were classified as injection recipients since their bivariate characteristics were very similar to those of injection recipients. † p values calculated by Mantel-Haenszel chi-square test.

majority (85.5%) had been an injection recipient more than once in the past month; 38% had received more than 10 such injections. The mean number of times that injection recipients had received injections in the past month was 21.1 (standard deviation 30.63).

In bivariate analysis, injection recipients were more likely than IDUs who were neither an injection recipient nor a street doc to be female, younger than 40 years and homeless, and to have injected stimulants, smoked crack cocaine, spent time in jail in the past 6 months and overdosed (Table 1). They were less likely to be African American, HIV positive, in drug treatment or to have initiated injection drug use more than 10 years prior to interview. The striking differences in injection-related risk behaviors among injection recipients compared with other IDUs deserves notice. Injection recipients were about three times as likely as IDUs who were neither injection recipients nor street docs and about 1.5 times as likely as street docs to report sharing syringes, cookers, rinse water and filters and backloading with dirty syringes. They were less likely to clean their skin before injections, and

more likely to have an injection drug-using steady sex partner, to have given their used syringes to other IDUs and to have "skin-popped" (injected subcutaneously or intramuscularly) in the past month.

Street docs

Thirty-seven per cent (427/1166) of IDUs reported having given injections in the past month. The majority (85.3%) had given more than one injection in the past month; 28% had given more than 10 such injections. The mean number of times that they had given injections to injection recipients in the past month was 17.7 (standard deviation 32.86).

Of 427 IDUs who had given injections, 132 were classified as injection recipients because they had also received injections, leaving 295 (25.3%) whom we classified as street docs. With regard to most demographic variables, street docs resembled injection recipients when compared with IDUs who had neither been an injection recipient nor a street doc (Table 1). Two exceptions were that females and respondents

Table 2. Risk factors for sharing syringes in San Francisco Bay area, fall 1996 (N = 1156)*

Risk factor	% Shared syringes	Crude odds ratio (95% confidence interval)
Female	17.9	1.12 (0.80, 1.56)
Male	16.3	
< 40 years old	26.5	2.38 (1.72, 3.33)
40 years or older	13.1	
Consider self homeless	27.7	2.84 (2.05, 3.94)
Not homeless	11.9	
HIV antibody positive	6.3	0.30 (0.13, 0.65)
HIV antibody negative	18.2	
Jail past 6 months	22.4	1.64 (1.16, 2.31)
No jail past 6 months	15.0	
African American race	8.8	0.23 (0.17, 0.33)
Other race	29.2	
Injection recipient**	32.7	6.11 (4.03, 9.29)
Street doc	20.5	3.25 (2.09, 5.05)
Other IDU	7.4	1.0 (referent)
Used syringe exchange past month	13.8	0.56 (0.40, 0.77)
Did not use syringe exchange past month	22.3	
Ever overdosed	20.0	1.47 (1.07, 2.03)
Never overdosed	14.6	
Currently in drug treatment	13.2	0.71 (0.44, 1.13)
Not in drug treatment	17.6	
< 10 years of injection drug use	24.6	1.79 (1.20, 2.63)
10+ years of injection drug use	15.4	
Injected cocaine past month	25.2	1.91 (1.32, 2.77)
No cocaine injection past month	15.0	
Injected amphetamines past month	28.0	2.32 (1.62, 3.34)
No amphetamines injection past month	14.3	
Smoked crack cocaine past month	19.0	1.39 (1.00, 1.93)
No crack cocaine past month	14.4	
Backloaded in past month	32.2	3.74 (2.68, 5.21)
No backloading in past month	11.3	
Always clean skin before injection	7.8	0.30 (0.20, 0.46)
Do not always clean skin before injection	21.8	
Has an IDU steady sex partner	25.5	2.32 (1.67, 3.21)
No IDU steady sex partner	12.9	
Skin popped in past month	17.1	1.02 (0.72, 1.45)
No skin popping past month	16.8	

*10 cases are missing data for syringe sharing variable. **"Injection recipient" is defined as having received injections in past month. "Street doc" is defined as having given injections to an injection recipient in past month. If the respondent has engaged in both "street doc" and "injection recipient" activities, they are classified as an "injection recipient".

who had initiated injected drug use more than 10 years prior to interview were represented equally among street docs and non-street docs/non-injection recipients. Street docs were about twice as likely as non-street docs/non-injection recipients to report sharing syringes, cookers, rinse water and filters and backloading with dirty syringes. Street docs were less likely to always clean their skin before injection, and more likely to have an IDU steady sex partner and to have given their used syringes to other IDUs in the past month.

Sharing syringes

Seventeen per cent (195/1,156) of the overall sample reported sharing syringes. While street docs and injection recipients together made up about half the respondents, they accounted for 78% (152/195) of all IDUs who reported sharing syringes. Factors associated with syringe sharing in bivariate analysis are summarized in Table 2. To assess whether being an injection recipient or street doc was independently associated with syringe sharing, we used logistic regression analysis to control for relevant confounding factors

Table 3. Association between injection recipients/street docs and syringe sharing in logistic regression among IDUs in SF Bay area, fall 1996 (N = 1143)*

Independent variable	% among sharers (n = 195)	% among non-sharers (n = 948)	AOR	95% CI
Injection recipient †	47	20	4.29	(2.76, 6.65)
Street doc	31	24	1.91	(1.20, 3.04)
Other IDU	22	56	1.00	Referent

*This model controlled for homelessness, African American race, HIV antibody status, crack cocaine use in past month, syringe exchange use in past month, and whether they have a steady sex partner who is an IDU. Due to missing data in these variables, 23 cases were dropped from the analysis. † Respondents who were both injection recipients and street docs were classified as injection recipients since their bivariate characteristics were very similar to those of injection recipients.

(Table 3). Injection recipients were 4.3 times (95% CI = 2.8, 6.6) and street docs 1.9 times (95% CI = 1.2, 3.0) as likely as other IDUs to report sharing syringes.

Discussion

This study shows that half of all IDUs gave injections to other IDUs and/or received injections from other people. Most of the street docs and injection recipients had participated in these behaviors more than once in the past month. As far as we know this is the first epidemiological study to assess the prevalence of these behaviors. As discussed above, Flynn and colleagues documented the exposure to blood associated with receiving injections from another IDU. This behavior may lead to transmission of viral hepatitis and possibly HIV (Flynn, personal Communication 1996).

Our data suggest that an education campaign is needed in the San Francisco Bay area to inform IDUs of the risks involved with being an injection recipient or street doc. Current messages tend to assume self-administered injections. For those IDUs who continue to be injection recipients or street docs, exposure to blood and the risk of blood-borne disease transmission would be reduced if the injection recipient curtails the bleeding for him/herself. Preferably, the injection recipient should use a band-aid or other covered gauze or pad. If a band-aid is not available, a paper towel or clean cloth would be better than a thumb. In general, IDUs should avoid handling any blood-contaminated materials, since such materials present possible routes of HCV transmission in multi-

person injection episodes. (Caramelo *et al.*, 1994) Community outreach organizations, syringe exchange programs and drug treatment centers should provide band-aids and education about these issues.

Although this study did not assess whether the syringe sharing episodes occurred in the street doc-injection recipient context, 78% of IDUs who reported sharing syringes, also reported being a street doc and/or an injection recipient. The multi-variate model of sharing syringes showed that injection recipients were more than four times as likely and street docs almost twice as likely as other IDUs to report sharing syringes. These findings suggest that sharing of syringes occurs in the context of social relationships between IDUs. There has been much research into the nature of social networks of IDUs (Williams & Johnson, 1993; Latkin *et al.*, 1995; Trotter, Rothenberg & Coyle, 1995; Friedman *et al.*, 1997). Social network research shows that the nature of the relationship between IDUs who use drugs together affects the likelihood of risky injection behaviors and HIV (Friedman *et al.* 1997). One way to interpret the findings of this study is that the street doc/injection recipient variables are proxy variables for IDUs who have close relationships with other people who inject drugs. Having such relationships may make them more likely to use other IDUs' syringes. Another possibility is that street docs use their own used syringes to administer injections to injection recipients.

While this study was not designed to ascertain why injection recipients do not always inject themselves, there is anecdotal evidence that some IDUs do not know how to do so properly.

We suggest assessing the feasibility and efficacy of teaching IDUs safe methods for administering injections to themselves and others. One way to do this would be to set up a booth at syringe exchanges run by current users, past users or phlebotomists to teach IDUs proper injection techniques, including how and where to inject. These sessions could include messages to clean skin prior to injection, rotate injection sites and use sterile techniques. It is also important that proper injection paraphernalia is distributed, including alcohol wipes for cleaning skin and various sizes of syringes. Since most of the IDUs in this sample had been injecting drugs for many years, we do not think that it is merely new initiates who need assistance in injection techniques.

IDUs who "skin-pop" were more likely to be injection recipients and less likely to be street docs. Skin-popping has been associated with a higher risk of acquiring abscesses and necrotizing fasciitis (Richter, 1993). IDUs prefer intravenous over intramuscular injection because intravenous entry of drugs is more efficient (Murphy & Waldorf, 1991; Stephens, 1991). One of the main reasons why IDUs skin-pop is that they do not have easily accessible veins. This lack of accessibility is often due to loss of surface veins (Meador *et al.*, 1979) resulting from long-term, repeated use under unsterile conditions. It is more difficult and dangerous to inject into non-surface veins. This suggests that some IDUs may be having street docs inject them because they do not have any unscarred surface veins.

Women were over-represented among injection recipients. We offer two possible reasons why women are more likely to be injection recipients. First, women report that their surface veins are smaller than those of men, making it harder for them to inject themselves (Murphy & Waldorf, 1991). Secondly, the gender dynamics among IDUs are such that men often control the administration of drugs (Murphy, 1987). Because of these existing gender dynamics, women may sometimes defer to men to inject them even if they know how to inject themselves.

Several limitations of the study deserve attention. The targeted sampling technique utilized to recruit respondents makes it impossible to generalize our findings to the overall population of IDUs in these cities. Due to the clandestine nature of drug use, no sampling technique can draw drug users at random. It is also not possible

to derive true refusal rates since much of the refusal takes place informally, outside the research venues. Another limitation concerns biases of self-reported drug use and risk behavior data due to social desirability, recall, psychological functioning and intoxication (Huang, Watters & Case, 1988). However, previous multi-center survey research has shown high validity in self-report among drug users recruited outside clinical settings (Watters *et al.*, 1992; Dowling-Guyer *et al.*, 1994; Weatherby *et al.*, 1994).

Despite the limitations, we feel that this study highlights important new findings regarding risks associated with injection drug practices. The most important findings of this study are that many IDUs give or receive injections from other people, and those who do are more likely to engage in other risky injection behaviors. Beyond those observations, this study brings up many questions that need to be answered through ethnographic, qualitative and further epidemiological research. Risk reduction intervention programs need to integrate issues relevant to injection recipients and street docs.

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