
Journal of Urban Health: Bulletin of the New York Academy of Medicine Vol. 80, No. 1, March 2003

Gender Differences in Sexual and Injection Risk Behavior Among Active Young Injection Drug Users in San Francisco (the UFO Study)

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ABSTRACT *Female injection drug users (IDUs) represent a large proportion of persons infected with HIV in the United States, and women who inject drugs have a high incidence of hepatitis B virus (HBV) and hepatitis C virus (HCV) infection. Therefore, it is important to understand the role of gender in injection risk behavior and the transmission of blood-borne virus. In 2000–2002, 844 young (<30 years old) IDUs were surveyed in San Francisco. We compared self-reported risk behavior between 584 males and 260 female participants from cross-sectional baseline data. We used logistic regression to determine whether demographic, structural, and relationship variables explained increased needle borrowing, drug preparation equipment sharing, and being injected by another IDU among females compared to males. Females were significantly younger than males and were more likely to engage in needle borrowing, ancillary equipment sharing, and being injected by someone else. Females were more likely than males to report recent sexual intercourse and to have IDU sex partners. Females and males were not different with respect to education, race/ethnicity, or housing status. In logistic regression models for borrowing a used needle and sharing drug preparation equipment, increased risk in females was explained by having an injection partner who was also a sexual partner. Injecting risk was greater in the young female compared to male IDUs despite equivalent frequency of injecting. Overlapping sexual and injection partnerships were a key factor in explaining increased injection risk in females. Females were more likely to be injected by another IDU even after adjusting for years injecting, being in a relationship with another IDU, and other potential confounders. Interventions to reduce sexual and injection practices that put women at risk of contracting hepatitis and HIV are needed.*

KEYWORDS *Epidemiology, Gender differences, Homeless, Injection drug use, Youth.*

INTRODUCTION

In the United States, approximately 1 million persons are active injection drug users (IDUs),[1,2] and it is estimated women make up more than 37% of the population who uses illicit drugs.[3] Among women in the United States, 25% of acquired immu-

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nodeficiency syndrome (AIDS) cases are attributed to injection drug use, and an additional 32% of cases are attributed to having sex with an IDU.[4]

Hepatitis C virus (HCV) and hepatitis B virus (HBV) occur with high incidence among IDUs.[5–7] Female IDUs may be especially vulnerable to these infections because female IDUs have been observed to have greater frequency of injecting with used syringes and other injection equipment than their male counterparts,[8,9] and to have a higher number of lifetime sexual partners[10,11]; they also are more likely to be initiated into injection drug use by their male sex partners.[12] In addition, female IDUs are more likely than male IDUs to have overlapping sexual and drug networks[13–15]; that is, females are more likely to have regular sexual partners with whom they also inject drugs.[16,17]

Young injection drug users are another vulnerable population at high risk for viral infections. Investigators in Baltimore demonstrated that HCV infection is likely to be acquired early in an injecting career.[18] In a study of young IDUs in New York City, Diaz et al.[19] documented that peak prevalence of HCV infection was reached after more than 6 years of injecting. Hagan et al.[20] reported an HCV incidence of 23 per 100 person-years among IDUs under age 25 in Seattle, and we reported a high prevalence of HCV among IDUs under age 30 in San Francisco.[21] More recently, we found a very high HCV incidence rate (25 per 100 person-years of observation [PYO]), and this rate appears to be elevated among the young female IDUs (35 per 100 PYO) compared to males (23 per 100 PYO).[22]

To gain insight into differential risk for viral infections, we compared injecting risk behavior between young male and female IDUs and sought to explain differences by controlling for gender differences in demographics, such as age and years injecting; structural factors, such as homelessness, education, and incarceration; or relationship factors such as who initiated the IDU into injecting and whether the IDU injected with a sex partner.

METHODS

The UFO Study conducted eligibility screening for a prospective cohort study of young IDUs in San Francisco from January 2000 through December 2001. Here, we analyzed cross-sectional data from the baseline interview conducted as part of the cohort screening. Recruitment, interview, and testing methods are described in detail elsewhere. In brief, young IDUs were recruited by street outreach workers and were eligible for the study if they were under age 30 years, reported injecting drugs in the prior month, and spoke English as their primary language. Participants were interviewed anonymously, given pretest counseling, and tested for antibodies for HCV (anti-HCV), markers of HBV infection and immunization, and HIV antibody status. All participants were offered test results, post-test counseling, and referrals for follow-up medical services. Participants without evidence of immunity to HBV were offered immunizations. All participants gave informed consent and were remunerated $10 for the visit and $20 when they returned for laboratory results 1 week later. The study was approved by the Committee on Human Research at the University of California, San Francisco.

Instrument

Structured questionnaires were administered during a 30-minute interview. Interview topics included demographic data, sexual behaviors, and injection risk behaviors. Behavioral risk questions included both historical (ever) and recent behavior

occurring in the last 3 months. Sexual partnerships were categorized as steady, casual, or paying. *Steady* sexual partnerships were defined as close, ongoing sexual relationships. *Casual* sex was defined as sex at least once, excluding steady or paying partners. Equipment sharing included sharing of cookers, cottons, and rinse water, and needle borrowing was defined as injecting with a used syringe. Those who reported mostly sleeping at home or at the home of friends or relatives in the last 3 months were classified as stably housed. Those who reported mostly sleeping on the street, in a doorway, park, squat, car, or hotel were classified as homeless.

Statistical Analysis

Bivariate analyses were conducted to examine associations of gender with demographic, serological, and injecting behaviors and sexual partnerships. Chi-square tests and Fisher exact test for expected cell sizes of five or fewer were used to compare proportions. The Wilcoxon test was used for continuous variables. If pertinent, some analyses divided males into men who reported ever having sex with men (MSM) and non-MSM. We used logistic regression to control for years injecting and report when this adjustment changed the statistical significance of gender differences.

We identified three behaviors that are generally considered risk factors for transmission of blood-borne infections and were significantly more prevalent among the females compared to the males. These behaviors (in the prior 3 months) were (1) borrowing a used needle, (2) sharing equipment used to prepare drugs, and (3) being injected by someone else. Because an interview question about whether an injection partner was also a sex partner was added 6 months into data collection, the analysis of confounding for that variable is limited to those data (n = 546).

We used logistic regression to determine whether demographic, behavioral, or structural variables could explain the gender difference in these behaviors. One at a time, we included each of these potential confounders in a model that included gender as the only other covariate and examined the change in the adjusted odds ratio (AOR) and *P* value for gender. Any variable that changed the odds ratio (OR) and changed the statistical significance so that it was greater than or equal to .05 was considered a confounder that explained the gender difference in the risk behavior. Potential explaining variables tested in the models were years injecting, age, months lived in San Francisco, homeless status, recent incarceration, education level, neighborhood of recruitment, age began injecting, who initiated participant into injecting, and variables reflecting sexual partnership such as having a known HCV-positive sex partner, having an older steady sex partner, having an IDU steady sex partner, and injecting with a sex partner.

RESULTS

Bivariate Results

Overall 260 (31%) females and 584 males (69%) were recruited for the study (Table 1). Compared to the males, females were significantly younger, had been in San Francisco less time (≤3 months vs. longer than 3 months; 65% vs. 54%, $P < .01$, data not shown), and fewer had been incarcerated in the last 3 months. When we controlled for years injecting, the gender difference in incarceration reached borderline statistical significance ($P = .06$).

TABLE 1. Selected demographic characteristics of young female IDUs compared to young male IDUs in San Francisco

Characteristic	Females, N (%)	Males, N (%)	*P*
Age, years			
15–19	94 (36)	82 (14)	
20–24	122 (47)	290 (50)	<.01
25–29	44 (17)	212 (36)	<.01
Race			
White	205 (80)	465 (80)	
Non-white	52 (20)	114 (20)	.86
Homeless, prior 3 months			
No	85 (33)	165 (28)	
Yes	175 (67)	419 (72)	.19
Spent time in jail or prison, prior 3 months			
No	193 (74)	380 (66)	
Yes	67 (26)	197 (34)	.02
Education level			
Less than high school	132 (51)	303 (52)	
High school graduate	73 (28)	178 (31)	.73
Some college	54 (21)	102 (18)	.32
Symptoms of depression (CES-D),* prior 3 months			
No	102 (40)	246 (44)	
Yes	156 (60)	319 (56)	.28

*Center for Epidemiologic Studies–Depression Scale, eight items, score range (0, 24).

Table 2 shows injection and sexual risk behaviors by gender. Compared to males, females reported initiating injecting at an earlier age and were more likely to have begun injecting using heroin (56% vs. 42%, $P < .01$; data not shown), to have been initiated into injecting by a sex partner, and to have reported a history of needle borrowing. Among those who reported borrowing a used syringe in the last 3 months, both females and males reported borrowing from a median (interquartile range [IQR]) of 1 (1, 2) partner, but a higher proportion of females reported that they had borrowed from a sex partner. Females were more likely to have injected with a sex partner; in the previous 3 months, were more likely to have been injected by someone else; and were less likely to have injected alone. Females were more likely to have shared ancillary injecting equipment and were more likely to have pooled money with other IDUs to buy drugs. No differences were found in needle-exchange use by gender (data not shown). None of the above differences changed when we controlled for years injecting.

More females reported recent sexual partnerships than males: 92% reported at least 1 sex partner in the previous 3 months compared to 75% of males ($P < .01$); and 75% of females reported having a steady partner compared to 47% of males ($P < .01$). Among those with one or more sex partners in the last 3 months, both females and males reported a median (IQR) of 2 (1, 4) partners. Females had steady partners who were a median of 3 years older (IQR 0–6 years), while males had steady partners who were a median of 1 year younger (IQR 3 years younger to 1 year older, $P < .01$). Females were more likely to have IDU sex partners.

TABLE 2. Injection and sexual risk behaviors in prior 3 months of young female compared to young male injection drug users in San Francisco

Characteristic	Females, N (%)	Males, N (%)	*P*
Duration of injection drug use, years			
0–2.9	105 (40)	172 (29)	<.01*
3–5.9	94 (36)	179 (31)	
6–8.9	41 (16)	127 (22)	
9 or more	20 (8)	106 (18)	
Age began injecting, median (IQR)	17 (15, 19)	18 (16, 20)	<.01
Initiator†			
Self	18 (7)	89 (15)	
Sexual partner	67 (26)	48 (8)	<.01
Friend/other	175 (67)	447 (77)	.01
Borrowed needles			
Never	62 (24)	199 (34)	.11
Past	67 (26)	155 (27)	<.01
Current (prior 3 months)	131 (50)	230 (39)	
Shared ancillary equipment			
Never	20 (8)	73 (13)	.63
Past	27 (10)	84 (14)	.03
Current (prior 3 months)	211 (82)	427 (73)	
Frequency of injection in last month			
Daily	102 (39)	219 (38)	
Less than daily	158 (61)	365 (62)	.63
Median number of injections/day, prior month (IQR)	3 (2, 4)	3 (2, 4)	.72
Injected by someone else			
No	91 (35)	364 (63)	
Yes	169 (65)	218 (37)	<.01
Injected someone else			
No	120 (46)	273 (47)	
Yes	140 (54)	309 (53)	.84
Number of people with whom pooled money to buy drugs			
0	33 (13)	106 (18)	.01
1	54 (21)	90 (16)	.10
>1	172 (66)	384 (66)	
Sexual partners			
No sexual partners	21 (8)	146 (25)	
Males only	195 (77)	43 (7)	<.01
Females only	0 (0)	324 (56)	<.01
Males and females	39 (15)	69 (12)	<.01
Had a steady sex partner			
No	64 (25)	310 (43)	
Yes	190 (75)	272 (47)	<.01
Had a casual sex partner			
No	149 (58)	329 (57)	
Yes	107 (42)	253 (43)	.65

TABLE 2. ***Continued***

Characteristic	Females, N (%)	Males, N (%)	*P*
Engaged in sex for money			
No	216 (85)	506 (87)	
Yes	38 (15)	75 (13)	.45
Number of sex partners, median (IQR)‡	2 (1, 4)	2 (1, 4)	.14
Age difference between respondent and most recent steady partner, median (IQR)	3 (0, 6)	−1 (−3, 1)	<.01
Self-reported HCV status of steady partner (among those with a steady partner, n = 460)			
Negative	112 (59)	178 (66)	
Unknown	34 (18)	51 (19)	.76
Positive	43 (23)	42 (16)	.05
Injected with a sex partner (n = 546)§			
No sexual partners	15 (9)	92 (25)	
Did not inject with sexual partner	33 (19)	120 (32)	.12
Injected with sexual partner	123 (72)	163 (43)	<.01
Borrowed needle from a sex partner (n = 543)§			
No sexual partners	15 (9)	92 (25)	
Did not borrow from sexual partner	99 (59)	220 (59)	<.01
Borrowed from sexual partner	55 (32)	62 (16)	<.01

HCV, hepatitis C virus; IQR, interquartile range.
*Mantel-Haenszel test for trend.
†*Initiator* is defined as person who first injected respondent or showed how to inject.
‡Among those with one or more sex partners.
§Data limited to second version of instrument.

Of females, 23% (versus 16% of males) reported having a known HCV-positive steady partner. In analyses that stratified by the HCV status of the main partner (positive versus negative/unknown), neither female nor male participants reported reduced frequencies of needle or equipment sharing if the steady partner was HCV positive. Among females with partners who were known to be hepatitis C positive, compared to negative/unknown partners, 72% versus 63% borrowed a used syringe, and 94% versus 82% shared ancillary equipment in the prior 3 months. Among males with partners known to be positive for hepatitis C compared to negative/unknown partners, 70% versus 43% borrowed a used syringe, and 87% versus 73% shared ancillary equipment in the prior 3 months.

Females were more likely than males to report that they did not always use a condom during vaginal and anal sex (data not shown). The proportion who reported engaging in casual sex and/or sex in exchange for money were the same for young female and male IDUs.

Multivariate Results

Three injecting behaviors that are considered risk factors for viral infections that were more prevalent among young female and male IDUs were (1) borrowing a used needle, (2) sharing ancillary equipment used to prepare drugs, and (3) being injected by someone else. The crude odds ratios for gender (female vs. male) for each of these behaviors were 1.6, 1.7, and 3.1 ($P < .01$ for each), respectively (Table 3).

TABLE 3. Crude and adjusted odds ratios for gender for three outcomes

Explaining variable	Outcome = shared needles	Outcome = shared drug preparation equipment	Outcome = injected by someone else
None	1.6 (<0.01)	1.7 (<0.01)	3.1 (<0.01)
Years injecting	1.6 (0.01)	1.7 (<0.01)	2.7 (<0.01)
Age	1.5 (0.01)	1.5 (0.04)	2.5 (<0.01)
Duration in San Francisco	1.5 (<0.01)	1.6 (<0.01)	3.1 (<0.01)
Homeless	1.6 (<0.01)	1.7 (<0.01)	3.1 (<0.01)
Recent incarceration	1.6 (<0.01)	1.6 (0.01)	3.0 (<0.01)
Education level	1.5 (<0.01)	1.7 (<0.01)	3.1 (<0.01)
Neighborhood of recruitment	1.6 (<0.01)	1.7 (<0.01)	3.1 (<0.01)
Age started injecting	1.5 (<0.01)	1.6 (0.01)	3.3 (<0.01)
Who initiated into injecting	1.5 (<0.01)	1.5 (<0.01)	2.8 (<0.01)
Known HCV-positive steady sex partner	1.4 (0.05)	1.7 (0.01)	3.2 (<0.01)
Older steady sex partner	1.4 (0.05)	1.7 (0.01)	2.8 (<0.01)
Steady sex partner IDU	1.3 (0.08)	1.4 (0.10)	3.0 (<0.01)
Any sex partner IDU	1.3 (0.08)	1.3 (0.18)	2.9 (<0.01)
Injected with sex partner*	1.2 (0.27)	1.0 (0.81)	2.8 (<0.01)

HCV, hepatitis C virus; IDU, injection drug user.
*N = 546; question not available on first instrument version.

We examined several variables as potential confounders of the relationships of gender with these three outcome variables, including age, years injecting, duration in San Francisco, homeless status, recent incarceration, education level, neighborhood of recruitment, age started injecting, type of partner who initiated participant into injecting, and variables reflecting sexual partnerships, such as having a known HCV-positive sex partner, having an older steady sex partner, having an IDU steady sex partner, and injecting with a sex partner. None of these variables affected the magnitude or statistical significance of the gender odds ratio for being injected by someone else, while variables related to sexual partnerships did reduce the gender odds ratios for recent needle borrowing and sharing drug preparation equipment (Table 3). After controlling for injecting with a sexual partner in models with borrowing used needles and sharing ancillary injection equipment as outcomes, the odds ratio for gender was reduced by 25% ($P = .27$) and by 41% ($P = .81$), respectively. Having a sex partner with whom one also injects compared to having no sex partner significantly increased the odds of borrowing used needles and sharing ancillary injection equipment, with AORs (95% confidence intervals [CIs]) of 2.4 (1.5–3.9) and 3.2 (1.9–5.5), respectively. However, having a sex partner who was not an injection partner compared to having no sex partners did not increase the odds of sharing ancillary equipment or borrowing used needles, with AORs (95% CI) of 1.1 (0.6–1.8) and 1.0 (0.6–1.7), respectively.

Because data on injecting with a sex partner were not available for the full sample of 844, this subgroup (n = 546) was compared to the larger sample on demographics and risk behavior. The subsample was not different from the larger sample with respect to proportion of males and females, years injecting, needle borrowing, or equipment sharing. Analyses of confounding models were also repeated in the subsample for all potential confounders. Odds ratios comparing injec-

tion risk between females and males were reduced by a maximum of 15% with the smaller sample. The relationship between gender and ancillary equipment sharing was weaker in the smaller sample, with an odds ratio reduction from 1.7 to 1.5 and *P* value increase from less than .01 to .10.

DISCUSSION

In this study of 844 street-recruited IDUs, we found that young female injectors shared both needles and drug preparation equipment more often than males and were injected by others more often than males, which is likely to put females at higher risk for viral infections. When we looked for explanatory variables, age, years injecting, education, homelessness, and initiation into injecting did not explain why the young females had higher levels of injecting risk. However, we did find one variable that explained increased injecting risk incurred by the young female IDUs. Increased frequency of sharing needles and drug preparation equipment was related to having a sexual partner who was also an injection partner: 72% of the young women injected with sex partners and 32% borrowed needles from their sex partners, versus 43% and 16%, respectively, among the men. Not only were the females more likely than the males to share needles and equipment if they were in sexual relationships, but also they were more likely to be in a relationship with an older IDU and with an IDU known to be infected with HCV. We found no differences in risk behavior in analyses that examined whether participants with partners known to be hepatitis C positive reported a lower frequency of needle borrowing and equipment sharing.

Females were more likely to be injected by another IDU even after adjusting for years injecting, being in a relationship with another IDU, and other potential confounders. This contrasts with the results of Doherty et al.,[23] who found that young male and female drug users had similar patterns of initiation, with females more likely to be initiated by females. However, in that study, female drug users who were initiated by males had higher levels of HIV risk behavior. Females might be more likely to be injected by others throughout their injecting careers, independent of sexual partnerships, if they find it difficult to inject themselves because they have smaller surface veins than men.[24,25]

This study's findings are limited in that risk behavior data were self-reported. The gender differences found in stigmatized risk behaviors such as needle borrowing and sharing of drug preparation equipment might be explained by differential reporting by gender. However, gender differences in risk in this population have also been observed using participant observation (B. Prince, personal communication, December 2001).

We suggest that interventions specifically designed to reduce injection practices that put women at risk of hepatitis infection are needed. Given that injecting risk behaviors occur in the context of sexual relationships, interventions need to directly target risk behavior occurring at the partnership level in addition to targeting behavior at the individual level. Addressing risk within sexual partnerships, in addition to education about HIV and hepatitis risk factors and strategies to change high-risk behaviors, may be effective in reducing risky behaviors.

ACKNOWLEDGEMENT

Funding for this study was provided by the National Institutes of Health/National Institute of Drug Abuse (R01-DA-12803 and R01-DA-10164).

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