

# Methamphetamine Use and Sexual and Injection Risk Behaviors Among Out-of-Treatment Injection Drug Users

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## ABSTRACT

Our primary objective was to examine the relationship between methamphetamine use and sexual risk-taking behaviors—number of sexual partners, frequency of sexual behaviors with regular and casual partners, trading money or drugs for sex, and condom use—among male and female out-of-treatment injection drug users (OTIDUs). As a risk group for human immunodeficiency virus (HIV) transmission, we also investigated injection behaviors by methamphetamine use. Data were collected from 1392 OTIDUs within the California counties of Fresno, Sacramento, and San Diego. Excluded from this cross-sectional survey were male OTIDUs engaging in sex with only or mostly men since 1978. In bivariate analyses, we found that male OTIDUs with a history of methamphetamine use had more sex partners and participated in more acts of anal insertive intercourse with casual partners and vaginal intercourse with regular and casual partners than male OTIDUs never using methamphetamines. In addi-

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tion, a greater percentage of male OTIDUs using methamphetamines reported trading sex for money or drugs. Methamphetamine-using female OTIDUs participated in more acts of vaginal intercourse with regular male sex partners than female OTIDUs never using methamphetamines. By multivariate logistic regression, we found methamphetamine use related to consistent condom use among male OTIDUs and among male sex partners of female OTIDUs. Discriminant function analyses revealed that sexual risk taking could be differentiated by methamphetamine use among male OTIDUs. Methamphetamine use also correlated with using shared needles or syringes among male and female OTIDUs and was related to not always disinfecting used needles or syringes with bleach. Our findings suggest that methamphetamines may contribute to heterosexual HIV transmission.

*Key Words.* Condom use; Crank; HIV/AIDS; Injection drug users; Methamphetamines; Risk factors; Sexual behavior; Substance abuse

## INTRODUCTION

Up to 71% of injection drug users (injectors) claim to have altered their sexual practices as a result of the acquired immunodeficiency syndrome (AIDS) pandemic (1). However, injectors continue to participate in sexual behaviors that place themselves, their sex partners (both injectors and noninjectors), and unborn children at risk of human immunodeficiency virus (HIV) infection. Injectors claim to have an average of 12 sexual partners per year (2), only 6% to 44% always use a condom (1, 3–13), and 14% to 37% trade sex for money or drugs (2, 5, 12, 14–16). Given the high levels of sexual risk taking among injectors and the limited degree of success formal intervention programs have had in reducing such behaviors (6, 17, 18), it is extremely important to identify factors that affect injectors' sexual behaviors.

Amphetamine use has been associated with stronger sexual excitement, longer duration of intercourse, and intensified orgasms among male injectors (19). Klee (20) found greater interest in sex and frequency of intercourse among amphetamine-using female injectors than women who inject opiates. Male amphetamine injectors report more female sex partners (19) and are less inclined to use condoms (21) than opiate injectors. At least one study suggests that increased unprotected sex among amphetamine-using injectors might be related to heterosexual HIV infections. After adjusting for sexual orientation, Harris et al. (22) found HIV prevalence three times higher among amphetamine-using injectors entering drug treatment than among injectors of other drugs. However, since no needle-sharing data were available to the researchers, the relative contribution of sexual versus injection behavior to HIV infection could not be determined.

Like amphetamines, illicitly synthesized methamphetamines have stimulating effects on the central nervous system. Production of methamphetamines is rela-



tively easy and often occurs in clandestine laboratories using precursor chemicals and inexpensive equipment (23). Once the trade of motorcycle gangs, the major producers and suppliers of “crank,” “speed,” or “ice” since the late 1980s have been drug trafficking groups based in Mexico (24). Methamphetamines may be swallowed, snorted, smoked, or injected. Smoking methamphetamines parallels the effects of injecting in that the drug’s rapid absorption from the lungs produces immediate euphoria (25).

Competitively priced and widely available on the illegal drug market and with a euphoric effect similar to, but a half-life exceeding that of, cocaine by four- to eightfold (23), methamphetamines have become increasingly popular. Methamphetamine-related emergency room episodes increased 350% from 1991 to 1994 in the United States; during this time, methamphetamine-related deaths nearly tripled (24). From 1984 to 1993, methamphetamine use in California rose 366%, as determined by hospital emergency admissions (26). In some regions of California, methamphetamine-related morbidity increased over 1000% during this 10-year period (26). Although the manufacturing, trafficking, and use of methamphetamines is now recognized as a serious national problem, California is considered the hub of methamphetamine activity (24).

Given the growth of methamphetamine use and the evidence of elevated unprotected sexual activity among amphetamine injectors, continued research of the sexual behaviors of methamphetamine-using injectors is required. In this study, we investigated sexual risk-taking behaviors by methamphetamine use among out-of-treatment injection drug users (OTIDUs) in selected areas of California. By taking into account self-reported history of trading money or drugs for sex, methamphetamine use and sexual activity are examined independent of prostitution. To evaluate fully the problem of methamphetamine-using injectors as a risk group for heterosexual HIV transmission, the present study also examined injection risk-taking behaviors by methamphetamine use.

## METHODS

### Sample

A cross-sectional survey of OTIDUs was conducted from February to October 1994 in the California counties of Sacramento (northern), Fresno (central), and San Diego (southern). The methodology, informed consent form, and instrument of this survey were approved by the California Health and Welfare Agency Committee for the Protection of Human Subjects. The data were collected with the



intent of determining the prevalence of HIV infection and the association between risk behaviors and HIV serostatus among OTIDUs.

Local outreach workers trained in interviewing techniques and HIV pre- and posttest counseling located and screened potential subjects for eligibility at street sites and other venues known to be frequented by drug injectors. *Injection drug user* was defined operationally in this study as a person who injected “street” drugs or prescription drugs for nonprescribed use at least once within the previous 12 months. *Out of treatment* was defined as the absence from a drug treatment program during the past year. Furthermore, male OTIDUs who had engaged in sex with only or mostly men since 1978 were excluded from participation. An incentive payment of \$10 was offered to each eligible OTIDU for completing the questionnaire and providing a blood specimen. Finger stick was used to obtain blood specimens for HIV-antibody testing, although the results of these data are not included in the present study. The OTIDUs returning for posttest counseling at a predetermined site were given \$15. To maintain confidentiality, eligible participants were asked to initial, not sign, the informed consent form. In addition, names were not associated with the survey instrument or blood specimens. The enrollment rate for requests of OTIDUs for participation in the survey was 98.7%.

## Measures

The gender, racial/ethnic background, and sexual orientation of each OTIDU were noted in the risk assessment questionnaire. Other demographic items included measures of income, employment, and education. All OTIDUs were asked their year of birth and if they were currently homeless or had recently (i.e., within the past 6 months) been in jail or prison. The survey teams also collected information from the OTIDUs regarding having had an HIV-antibody test, a perceived risk of getting HIV/AIDS (subsequently dichotomized as no, some, or half chance versus high or sure chance), a perceived ability to prevent HIV infection (yes versus no), personally knew anyone with AIDS, a history of a sexually transmitted disease or hepatitis, changed any needle/syringe practices to reduce the risk of getting HIV/AIDS, and ever used a needle-exchange program.

*Drug treatment.* Whether the OTIDUs had ever been in a drug treatment program was assessed. Among those indicating prior treatment, the number of times in treatment was recorded. In addition, OTIDUs with a history of drug treatment were asked the month and year for the last time they were in such a



program. This question allowed verification of the out-of-treatment eligibility criterion.

*Methamphetamine use.* Injection of methamphetamines was assessed for the last 30 days. Each OTIDU was also asked if he or she had ever used methamphetamines (e.g., “ice” or “crank”) regardless of mode of administration. *Methamphetamine use* for the present study includes ever injecting and/or swallowing, snorting, or smoking methamphetamines.

*Other drug use.* Self-reported injection of heroin, other opiates, cocaine, and speedballs (opiates with cocaine or methamphetamines) was recorded.

*Sexual behavior.* The OTIDUs were asked whether they had steady sex partners and, if so, the gender of the steady sex partners and whether they injected drugs. Sexual behavior questions were based on the previous 6 months. Eligible OTIDUs were asked to estimate the number of women and men with whom they had sexual contact and the frequency of vaginal intercourse, anal receptive intercourse, and anal insertive intercourse with steady and casual sex partners. Measures for both giving and receiving money or drugs for sex were also obtained.

*Condom use.* Each male OTIDU was asked if he used condoms (“always,” “more than half the time,” “about half the time,” “less than half the time,” or “never”) in the past 6 months. Frequency of condom use was also coded for female OTIDUs by asking how often their male sex partners used condoms in the past 6 months.\* Responses to these items were subsequently dichotomized into two categories: always using condoms versus sometimes or never using a condom.

*Injection risk behavior.* Two measures of needle sharing were obtained: lending used needles or syringes to other injectors and shooting drugs with other injectors’ used needles or syringes. Frequency of cleaning injection equipment with full-strength bleach was recorded from OTIDUs who admitted sharing needles or syringes. These injection behaviors were based on the past 6 months.

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\* Later in the questionnaire, subjects were asked about frequency of condom use during specific sexual acts. Among males, Cronbach alphas for the general measure of condom use and for vaginal intercourse with steady and casual partners were .80 and .91, respectively. Among females, the measures of reliability for condom use were .74 for steady partners and .81 for casual partners.



### Statistical Analysis

Significant differences ( $P < .05$ ) on demographic variables among methamphetamine users and between methamphetamine users and nonusers for the sexual behavior data were determined via chi-square tests for categorical data and two-tailed  $t$  tests for ratio-level data. Factors found to be associated significantly with condom use by male OTIDUs in bivariate analyses were entered into multivariate logistic regression models. Independent predictors of condom use by male sex partners of female OTIDUs were determined following the same procedures. Discriminant function analyses were then performed for the sexual risk-taking behaviors by methamphetamine use. Bivariate and multivariate logistic regression analyses were conducted between methamphetamine use and needle sharing and disinfecting. These findings are also presented separately for male and female OTIDUs. SAS version 6.10 (27) was used for the statistical analyses, except for the discriminant function analyses, which were performed using SPSS (28).

## RESULTS

### Demographics of Sample

A total of 1392 OTIDUs participated in the survey from three California counties: 497 (35.7%) from Sacramento, 426 (30.6%) from Fresno, and 469 (33.7%) from San Diego. Males represented the majority (73.9%) of OTIDUs (Table 1). Two-fifths (39.9%) were Hispanic, 28.6% were white, and 26.4% were black/African-American. The majority (94.5%) were self-identified as heterosexual. The median age for the sample was 37.0 years (range 17–72). Only 18.5% of the OTIDUs were employed, half (50.5%) earned under \$500 in the previous month, and 53.0% had graduated from high school. Most (59.7%) OTIDUs had never been in a drug treatment program. Of those reporting prior treatment, the median number of times in treatment was 2; 43.5% had not been in a drug treatment program during the previous 3 years. Table 1 also shows that 23.0% of OTIDUs were in jail or prison in the past 6 months. Nearly 40% (38.2%) were homeless at the time the survey was conducted.

### Demographics by Methamphetamine Use

Of the OTIDUs, 41% reported a history of ever using methamphetamines. Among the OTIDUs using methamphetamines, 83.9% had injected the drug within the previous 30 days. Table 1 shows that no significant difference was



**Table 1.** Demographic Characteristics of Out-of-Treatment Injection Drug Users and of Those Having Ever Used Methamphetamines

	Sample ( <i>n</i> = 1392), % of column ( <i>n</i> <sup>a</sup> )	Methamphetamine users ( <i>n</i> = 571), % of row ( <i>n</i> <sup>a</sup> )	<i>P</i> <sup>b</sup>
Gender			
Male	73.9 (1029)	40.9 (417/1020)	.530
Female	25.9 (360)	43.0 (153/356)	
Race			
Hispanic	39.9 (556)	31.5 (174/553)	<.001
White	28.6 (398)	55.1 (217/394)	
Black	26.4 (367)	41.2 (149/362)	
Other	4.9 (68)	46.3 (31/67)	
Sexual orientation			
Heterosexual	94.5 (1316)	41.0 (536/1306)	.21
Gay/lesbian/bisexual	4.5 (62)	50.0 (31/62)	
Age in years			
17–37	50.5 (703)	45.8 (320/699)	<.001
38–72	49.2 (685)	36.8 (249/676)	
Employment			
Unemployed	80.6 (1122)	41.1 (457/1112)	.55
Full- or part-time work	18.5 (258)	43.4 (111/256)	
Income (last month)			
<\$500	50.5 (703)	40.9 (285/696)	.75
≥\$500	49.0 (682)	41.9 (284/677)	
Education			
Less than high school degree	46.9 (653)	37.1 (240/647)	.003
High school degree or greater	53.0 (738)	45.2 (331/732)	
Ever been in drug treatment			
Yes	39.5 (550)	47.3 (258/545)	<.001
No	59.7 (831)	37.4 (309/826)	
In jail or prison past 6 months			
Yes	23.0 (320)	50.5 (159/315)	<.001
No	72.1 (1004)	38.3 (382/998)	
Homeless			
Yes	38.2 (532)	43.5 (229/527)	.24
No	61.1 (850)	40.1 (338/843)	

<sup>a</sup> Number of subjects for whom data were available.

<sup>b</sup> Comparisons are of demographic characteristics for methamphetamine users by  $\chi^2$  test.

found between gender and methamphetamine use. Among racial/ethnic groups, white OTIDUs were most likely to report using methamphetamines. Younger OTIDUs and those who graduated from high school, had ever been in drug treatment, and had spent time in jail or prison within the past 6 months were more likely to use methamphetamines. History of methamphetamine use was not related to sexual orientation, employment, income, or homelessness.



### Sexual Behavior of Sample

The mean number of sex partners for the past 6 months was 11.1 for the complete sample; during the past 6 months, 142 (12.3%) of 1151 OTIDUs did not have any sex. Half (198/391) of male OTIDUs who reported regular female sex partners said such partners did not shoot drugs; 41.4% (149/360) of female OTIDUs had steady male sex partners who injected drugs. Of the male OTIDUs, 35 (3.4%) claimed to have had sex with another man; 40 (11.1%) female OTIDUs reported a female sex partner. In the 6 months prior to the study, 155 (18.1%) of 856 male and 8.1% (27/335) of female OTIDUs gave money or drugs in return for sex; 78 (9.0%) of 862 male and 34.3% (115/335) of female OTIDUs received money or drugs for sex.

### Bivariate Analyses: Sexual Behavior by Methamphetamine Use

Compared with males who never used methamphetamines, male OTIDUs with a history of methamphetamine use had more sex partners and participated in significantly more acts of vaginal intercourse with both regular and casual partners (Table 2). Male methamphetamine users also reported a higher frequency of anal insertive intercourse with casual partners. The number of acts of insertive anal intercourse remained significant for male OTIDUs having sex with females only ( $P < .05$ ), but no significant difference was found for the bisexual OTIDUs ( $P = .35$ ; data not shown). A greater percentage of male OTIDUs using methamphetamines gave and received money or drugs in return for sex compared with male OTIDUs who reported no methamphetamine use.

Table 2 also shows that female methamphetamine-using OTIDUs engaged in more acts of vaginal intercourse with regular sex partners compared with female OTIDUs who never used methamphetamines. Methamphetamine use was unrelated to prostitution among female OTIDUs. As such, when having sex with regular partners, female OTIDUs using methamphetamines participated in more acts of vaginal intercourse whether they did ( $\bar{x} = 225.0$  versus 102.5;  $P < .05$ ) or did not ( $\bar{x} = 91.3$  versus 63.3;  $P < .05$ ) receive money or drugs for sex. Methamphetamine-using female OTIDUs who did not give money or drugs for sex reported more acts of vaginal intercourse than nonusers ( $\bar{x} = 128.4$  versus 70.7;  $P < .05$ ). The statistical power of the data for females who did give money or drugs for sex is limited given the small number of observations ( $n = 21$ ). Although the results are not significant ( $P = .28$ ), the difference of the means



**Table 2.** Number of Sexual Partners, Sexual Behaviors by Type of Partner, and Trading Money or Drugs for Sex in Past Six Months by Gender and Methamphetamine Use

	Males <sup>a</sup>		<i>P</i> <sup>b</sup>	Females		<i>P</i> <sup>b</sup>
	Metham- phetamine use	No metham- phetamine use		Metham- phetamine use	No metham- phetamine use	
Mean number of sex partners	8.9	5.9	.039	23.9	16.0	.371
Mean number of sexual acts with regular partners	98.2	70.0	.002	130.0	71.6	.003
Vaginal intercourse	6.3	6.7	.925	7.4	4.5	.485
Anal receptive intercourse	4.4	7.3	.384	—	—	—
Anal insertive intercourse	—	—	—	—	—	—
Mean number of sexual acts with casual partners	50.3	28.3	.002	63.3	54.3	.662
Vaginal intercourse	1.8	1.4	.542	1.4	1.3	.860
Anal receptive intercourse	5.0	1.8	.004	—	—	—
Anal insertive intercourse	22.6	14.8	.005	9.0	7.5	.790
Gave money or drugs for sex (%)	12.7	6.5	.003	36.3	33.5	.680
Received money or drugs for sex (%)	—	—	—	—	—	—

<sup>a</sup> Includes the sexual behaviors of 35 bisexual men.

<sup>b</sup> *P* for means calculated using *t* test; for proportions, calculated using  $\chi^2$  test.



for acts of vaginal intercourse for methamphetamine users versus nonusers is in the direction similar to that presented above (157.5 versus 83.1).

### **Bivariate Analyses: Methamphetamine Use by Condom Use**

Of the OTIDUs having at least one sex partner in the last 6 months, 99 (14.2%) of the 699 men always used a condom; 22 (9.5%) of the 232 women reported male partners who always used condoms during sex. Table 3 presents significant bivariate analyses of condom use by male OTIDUs and male partners of female OTIDUs. Methamphetamine-using male and female OTIDUs were less likely to report always using a condom. In addition, nonwhite race, unemployment, not having a steady sex partner who injects drugs, and not shooting drugs with used needles or syringes were correlates of always using a condom among male OTIDUs. The male sex partners of female OTIDUs were more likely always to use condoms if the female OTIDU received money or drugs in return for sex. Not having a steady sex partner and not sharing used needles or syringes with other injectors were related to condom use for both male and female OTIDUs.

### **Multivariate Analyses: Methamphetamine Use by Condom Use**

It can be seen in Table 4 that no history of methamphetamine use independently predicted always using condoms among both male OTIDUs and the male sex partners of female OTIDUs. Male OTIDUs who had used methamphetamines were one-third as likely always to wear a condom (odds ratio [OR] = 0.30, 95% confidence interval [CI] = 0.10, 0.85); methamphetamine-using female OTIDUs were one-fourth as likely to have a male sex partner who always wears a condom (OR = 0.25, 95% CI = 0.08, 0.82). In addition, unemployment remained a significant predictor of condom use among male OTIDUs when controlling for the effects of the other variables (OR = 4.7, 95% CI = 1.05, 20.85). Among female OTIDUs, receiving money or drugs for sex (OR = 3.8, 95% CI = 1.33, 10.93), not having a steady male sex partner (OR = 3.2, 95% CI = 1.13, 9.22), and not sharing needles and syringes with others (OR = 3.6, 95% CI = 1.19, 10.73) were independently related to condom use. No significant interactions were found for the variables related to condom use in these analyses.



**Table 3.** Selected Bivariate Logistic Regression Analyses of Condom Use by Gender Among Subjects Having at Least One Sex Partner in Past Six Months

	Males		Females	
	% always using condoms	Odds ratio (95% CI)	% of male partners always using condoms	Odds ratio (95% CI)
<b>Methamphetamine use</b>				
Yes	8.2	0.39 (0.24, 0.64)	5.0	0.34 (0.12, 0.96)
No	18.6	1.0	13.3	1.0
<b>Race</b>				
Black	19.0	2.7 (1.43, 5.00)	n.s.	
Hispanic	15.9	2.1 (1.18, 3.93)	n.s.	
White	8.1	1.0		
<b>Employment</b>				
Unemployed	16.4	2.8 (1.43, 5.60)	n.s.	
Full- or part-time work	6.5	1.0		
<b>Steady sex partner(s) is/are injectors</b>				
No	15.8	2.6 (1.22, 5.54)	n.s.	
Yes	6.7	1.0		
<b>Injected drugs with used needle/syringe</b>				
No	27.7	4.0 (2.56, 6.19)	n.s.	
Yes	8.8	1.0		
<b>Received money/drugs for sex</b>				
Yes	ns		18.8	4.7 (1.83, 12.12)
No			4.7	1.0
<b>Has steady sex partner(s)</b>				
No	16.7	1.6 (1.04, 2.56)	16.1	3.28 (1.32, 8.19)
Yes	10.9	1.0	5.5	1.0
<b>Shared own used needle/syringe</b>				
No	30.4	4.5 (2.87, 6.99)	17.6	2.7 (1.10, 6.87)
Yes	8.8	1.0	7.2	1.0

CI = confidence interval; n.s. = not significant ( $P > .05$ ).

**Discriminant Function Analyses: Methamphetamine Use by Sexual Risk-Taking Behaviors**

Among male OTIDUs, the sexual risk-taking behaviors resulted in a significant discrimination by methamphetamine use [ $\chi^2(10) = 54.50, P = 0.000$ ]. The mean discriminant score for male OTIDUs using methamphetamines was 0.336,

**Table 4.** Multivariate Logistic Regression Analyses of Condom Use by Gender

	Males	Females
	Odds ratio (95% CI)	Odds ratio (95% CI)
Methamphetamine use		
Yes	0.30 (0.10, 0.85)	0.25 (0.08, 0.82)
No	1.0	1.0
Employment		
Unemployed	4.7 (1.05, 20.85)	n.s.
Full- or part-time work	1.0	
Received money/drugs for sex		
Yes	n.s.	3.8 (1.33, 10.93)
No		1.0
Has steady sex partner(s)		
No	n.s.	3.2 (1.13, 9.22)
Yes		1.0
Shared own used needle/syringe		
No	n.s.	3.6 (1.19, 10.73)
Yes		1.0

CI = confidence interval; n.s. = not significant ( $P > .05$ ).

and for those never using methamphetamines was  $-0.247$ . The standardized discriminant coefficients for the sexual variables as a function of methamphetamine use are presented in Table 5. The third column of Table 5 shows that anal receptive intercourse with regular partners ( $r = .51$ ) and condom use ( $r = -.50$ ) had the largest correlations with the discriminant function. Variables with loadings of .40 or greater also included anal insertive intercourse with regular partners and providing money or drugs in exchange for sex. When controlling for the effects of the sexual risk-behavior variables assessed in the present study, male OTIDUs using methamphetamine also had more sexual partners, participated in more of receptive and insertive anal intercourse with regular partners, and were more likely to give or receive money or drugs for sex (positive coefficients), but were less likely to report condom use. Table 5 also shows that these variables—those with loadings exceeding .20—were significant in bivariate analyses. As such, methamphetamine use contributed significantly to heightened unprotected sexual activity regardless of prostitution among male OTIDUs. Methamphetamine use did not distinguish sexual risk-taking behaviors among female OTIDUs [ $\chi^2(8) = 8.39, P = 0.40$ ].

**Table 5.** Discriminant Function Statistics for Sexual Risk-Taking Behaviors Distinguishing Methamphetamine Use from Non-Use Among Male Out-of-Treatment Injection Drug Users

	SDFC <sup>a</sup>	r <sup>b</sup>	F	P
Number of sex partners	0.21	.26	3.79	.05
Number of sexual acts with regular partners				
Vaginal intercourse	-0.47	.09	0.48	.49
Anal receptive intercourse	0.29	.51	14.67	.000
Anal insertive intercourse	0.36	.42	10.06	.002
Number of sexual acts with casual partners				
Vaginal intercourse	0.34	-.04	0.90	.77
Anal receptive intercourse	0.91	.12	0.87	.35
Anal insertive intercourse	-1.45	-.15	1.21	.27
Giving money or drugs for sex	0.17	.41	9.47	.002
Receiving money or drugs for sex	0.27	.35	7.00	.008
Condom use	-0.44	-.50	14.01	.000

<sup>a</sup> Standardized discriminant function coefficient.

<sup>b</sup> Correlation between variable and discriminant function.

### Methamphetamine Use by Injection Behaviors

Of the OTIDUs, 68% (950/1392) had shot drugs with used needles or syringes; only 18.1% (172/950) always performed the procedures most often advocated by health educators to reduce the chance of HIV infection (rinsing used needles and syringes with full-strength bleach prior to use). Male and female OTIDUs who had used methamphetamines were more likely in bivariate models to inject drugs with used needles or syringes, let other injectors shoot drugs with their used needles or syringes, and not always disinfect previously used needles or syringes with full-strength bleach (Table 6). In multivariate analyses, injecting drugs with used needles or syringes (OR = 3.3, 95% CI = 1.23, 8.86) and not always cleaning injection equipment with bleach (OR = 2.2, 95% CI = 1.08, 4.58) were related to methamphetamine use among female OTIDUs.

### DISCUSSION

Our findings highlight the importance of recognizing methamphetamine users as a distinct subpopulation of injectors at greater risk for contracting and transmitting HIV through sexual and injection behaviors. We found that methamphetamine use is related to increased sexual activity (in terms of both number of



**Table 6.** Bivariate Logistic Regression Analyses of Needle or Syringe Sharing and Always Cleaning Used Injection Equipment with Bleach in Past Six Months by Gender and Methamphetamine Use

	Methamphetamine use (%)	No methamphetamine use (%)	Bivariate odds ratio (95% CI)	Multivariate odds ratio (95% CI)
<b>Males</b>				
Shared own used needles or syringes	81.0	69.1	1.9 (1.41, 2.56)	1.5 (0.78, 2.86)
Injected drugs with used needles or syringes	76.9	62.9	2.0 (1.48, 2.61)	1.7 (0.42, 6.83)
Did not always clean used needles or syringes with bleach	85.6	79.6	1.5 (1.02, 2.28)	1.3 (0.78, 2.36)
<b>Females</b>				
Shared own used needles or syringes	83.6	69.3	2.2 (1.33, 3.79)	1.5 (0.72, 3.21)
Injected drugs with used needles or syringes	77.1	61.9	2.1 (1.29, 3.33)	3.3 (1.23, 8.86)
Did not always clean used needles or syringes with bleach	87.3	75.2	2.3 (1.15, 4.44)	2.2 (1.08, 4.58)

CI = confidence interval.

partners and types of sexual behaviors) and prostitution behaviors and decreased condom use among male OTIDUs. Among female OTIDUs, methamphetamine use was an independent predictor of condom use and unsafe injection practices.

In bivariate analyses, methamphetamine-using male OTIDUs engaged in more acts of vaginal intercourse with regular partners, half of whom did not inject drugs. When having sex with casual female partners, methamphetamine-using male OTIDUs participated in almost twice as many acts of vaginal intercourse and more acts of anal insertive intercourse compared with male OTIDUs who never used methamphetamines. Discriminant function analyses suggest that these differences are a result of prostitution behaviors. That is, when measures for giving and receiving money or drugs for sex were included in a model of sexual risk taking, no significant differences were found for these behaviors by methamphetamine use. Instead, methamphetamine-using male OTIDUs were more likely than nonusers to engage in receptive and insertive anal intercourse with regular partners.

Among male OTIDUs, methamphetamine use appears to promote anal sex with females and sex for drugs or money. In one study, having sex was the most popular activity reported by male methamphetamine injectors when asked what they prefer to do while under the influence of the drug (29). Injectors have also reported participating in certain sexual activities only when under the influence of methamphetamines (29). Thus, methamphetamine-using male OTIDUs may demand more uncommon, and riskier, sexual acts of their female sex partners to satisfy their elevated sexual excitement. Methamphetamine use may also increase arousal to such an extent that the need of male OTIDUs for sexual gratification becomes so urgent that it is obtained in exchange for money or drugs. Conversely, methamphetamine-using male OTIDUs receiving money or drugs for sex may do so to support their drug habit.

Male OTIDUs using methamphetamines claimed to have more sex partners than non users. Moreover, methamphetamine use was also found to be an independent predictor of decreased condom use. Thus, more females—both injectors and noninjectors—are potentially exposed to HIV by methamphetamine-using male OTIDUs, who are at greater risk of HIV infection through needle and syringe sharing. In addition, the risk of infection is greater for the regular female sex partners of male OTIDUs who use methamphetamines compared with female partners of non methamphetamine-using male OTIDUs due to increased and repeated exposure during intercourse.

Female OTIDUs using methamphetamines, compared with nonusers, reported significantly more acts of vaginal intercourse with regular male partners, regardless of prostitution. In other words, methamphetamine-using female OTIDUs



were no more likely to give or receive money or drugs for sex; however, use of the drug was related to increased acts of vaginal intercourse among females both participating and not participating in prostitution. This finding suggests that, similar to male OTIDUs, methamphetamines increase sexual arousal and energy among female OTIDUs. Unlike their male counterparts, female OTIDUs using methamphetamines do not require additional partners or trading money or drugs to satisfy their enhanced sexual needs. We also found methamphetamine use inversely related to condom use among male sex partners of female OTIDUs. Furthermore, multiple logistic regression analyses found methamphetamine-using females more likely to inject drugs with used needles or syringes and more likely not to clean used needles or syringes with bleach prior to use. For both male and female OTIDUs, then, methamphetamines appear to impair judgment as to the potential negative consequences of unsafe sexual and injection activities.

Regardless of methamphetamine use, female OTIDUs had an average of 19 different sexual partners during the past 6 months, and over one-third had engaged in prostitution, but only 1 in 10 reported male partners who always used condoms. In addition, two-fifths had sex with at least one steady male partner who injects drugs, and reporting a steady male sex partner was an independent predictor of decreased condom use among female OTIDUs. These findings strongly suggest that, compared with male OTIDUs, female OTIDUs are at much greater risk of sexual and injection HIV exposure, and methamphetamine use even further amplifies these risks.

As mentioned above, methamphetamine-using male and female OTIDUs were one-third as likely to report always using a condom. The importance of methamphetamines as a predictor of condom use is evident in the following observations: (a) methamphetamine use was the only independent predictor of condom use found for both male and female OTIDUs, (b) methamphetamine use appears to affect condom use among male and female injectors to a similar extent, and (c) methamphetamine use was a significant predictor of condom use in multivariate logistic models that included variables previously reported (4, 5, 13, 30) to be independently associated with using condoms.

Methamphetamine-using injectors can be characterized as young, white, and better educated males or females; the relationships between methamphetamine use and age and race concur with the data reported from hospital admissions within California (25). The stimulating effects of methamphetamines may also cause users to participate more often in activities that elicit the attention of law enforcement (i.e., users are more likely to have spent time in jail or prison). As a result of contact with the correctional system or through other mechanisms, we found methamphetamine users more likely than nonusers to have been to a drug



treatment facility. In fact, the most common reason methamphetamine users in California (both injectors and noninjectors) enter treatment is trouble with police (31). Drug treatment facilities may serve as the best setting for reaching methamphetamine users with HIV prevention messages.

Our survey is not without limitations. Data were collected using a convenience sample within three California counties. Methamphetamine activity across the United States is said to be concentrated in the western states and Hawaii, specifically within California (31). Furthermore, morbidity data suggest that only two other California counties (San Francisco and Los Angeles) are affected by methamphetamines to a similar extent as two of our sampled sites—Sacramento and San Diego. Thus, levels of methamphetamine use would likely be lower in other communities; however, there is no reason to believe that the relationships between use of the drug and the reported HIV risk behaviors would not apply to injectors outside our selected sites.

Our findings are subject to the biases of self-reported data, which may have been influenced by, among other factors, the rapport the outreach worker established with the eligible participants and the environment in which the interview occurred. Unfortunately, our predictor variable from which all analyses were based cannot be validated by other measures. Reports of lifetime methamphetamine use are certainly subject to recall error. However, within the context of responding to numerous questions regarding unlawful and risky drug-using practices and personal, explicit inquiries of sexual behaviors, we suspect our participants would have no reason to provide false information regarding having ever used one type of drug—methamphetamines.

Finally, by recruiting injectors who had not been in a drug treatment program in the past year, we may have excluded persons less likely to share needles and have unsafe sex. This same shortcoming may be applicable to conducting the study with a street sample of injectors, which by definition will overrepresent those more visible. It could follow, for example, that the sexual and drug behaviors of employed injectors differ quite substantially from those of the unemployed. In fact, unemployment was independently related to increased condom use in the multivariate model for male OTIDUs.

Nevertheless, the results of our study suggest that establishing use of methamphetamines could serve as a means of assessing risk for HIV infection when health educators counsel injection drug users unable or unwilling to reveal information about their specific injection and sexual behaviors. Similarly, if levels of unsafe injection and sexual activity are unavailable when developing a community-level epidemiologic profile, data on methamphetamine prevalence might be used as a basis for setting priorities for HIV prevention resources. In the absence



of sex and drug use data, prevention specialists should focus efforts on interventions aimed at reducing unsafe sex behaviors among female injectors. Reaching the noninjecting female sex partners of male injectors with such messages may pose the greatest challenge to health educators, but these women could represent the most important link in the spread of HIV from the injection communities to the nongay, noninjecting population.

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