

# HIV Risk-Related Sex Behaviors among Injection Drug Users, Crack Smokers, and Injection Drug Users Who Smoke Crack

## ABSTRACT

**Objectives.** This study was designed to assess and compare sex risk behaviors for human immunodeficiency virus (HIV) transmission of three drug user groups: injectors who do not smoke crack, crack smokers who do not inject, and injectors who also smoke crack.

**Methods.** Sexual risk behaviors for HIV were assessed among 246 drug users from Denver, Miami, and San Francisco. Respondents were classified into the three drug groups based on self-report and verified through urinalysis and physical inspection.

**Results.** An increased risk for HIV through sexual transmission was associated with crack cocaine use, particularly among those who also injected. Crack smoking injectors were more likely to report sex with an injector, exchanging sex for drugs and/or money, drug use before or during sex, and unprotected sexual intercourse. They also injected more than injectors only, smoked crack as often as smokers only, and reported higher overall frequencies of drug use.

**Conclusions.** These findings, together with the higher rates of gonorrhea and syphilis reported by smokers and injectors/smokers, are indicators of the risk crack poses for the heterosexual transmission of HIV. (*Am J Public Health*. 1993;83:1144-1148)

Robert E. Booth, PhD, John K. Watters, PhD, and Dale D. Chitwood, PhD

### Introduction

Injection drug users, the second largest risk group for the human immunodeficiency virus (HIV) in the United States, are of major importance in the epidemic of HIV-related diseases. The association between the injection of drugs and the seroprevalence of HIV is well established.<sup>1</sup> HIV is transmitted by injection when drug users share unsterile injection paraphernalia that have been contaminated with small amounts of infected blood.<sup>2</sup> Studies in Chicago, San Francisco, New York, and New Jersey have found a direct relationship between HIV seropositivity and the frequency of injection, number of partners with whom injection equipment has been shared, frequency of needle sharing, and frequency of injection in "shooting galleries."<sup>3-8</sup>

While high risk injection behavior by drug users has dominated the attention of researchers, the sexual transmission of HIV among drug users has received considerably less attention. The importance of sexual transmission is underscored by the fact that injection drug users constitute the leading source for heterosexual and perinatal transmission of HIV to non-injection drug users in the United States.<sup>9-15</sup> Furthermore, male injection drug users typically report more noninjecting sex partners than injecting partners, while female injection drug users are more likely to report that the majority of their sex partners are other injectors.<sup>16-18</sup> HIV infection has been associated with the number of injecting sex partners and was the only risk factor in a study of female injection drug users who had not injected drugs within the past 3 years.<sup>8,15</sup>

The use of crack cocaine also appears to play a key role in the sexual transmission of HIV and the transmission of other sexually transmitted diseases. Crack, a

smokable form of cocaine that became immensely popular during the mid-1980s,<sup>19,20</sup> has been associated with high risk sex behaviors and with HIV infection. Exchanging sex for money or drugs, having sex with injection drug users, and testing positive for a sexually transmitted disease were found in a three-city study of crack smokers.<sup>21</sup> From 1986 to 1988, the crack epidemic coincided with the epidemic of syphilis in New York City,<sup>22,23</sup> and a case-control study of delivering mothers found crack use to be a risk factor for syphilis.<sup>24</sup> HIV also has been associated with crack use among patients who presented at a sexually transmitted disease clinic in Brooklyn.<sup>25</sup> In a recent study, injection drug users who smoked crack were 50% more likely to be HIV positive than were other injection drug users.<sup>26</sup> HIV was independently associated with crack use and prostitution in women and with a history of syphilis and crack use in men.<sup>27</sup>

Many injection drug users now smoke crack and inject drugs.<sup>28,29</sup> However, little has been reported on the relative impact of injection and crack use on high risk sex behavior. The purpose of this study was to compare the high risk sex

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Robert E. Booth is with the Department of Psychiatry, University of Colorado Health Sciences Center, Denver. John K. Watters is with the Department of Family and Community Medicine and the Institute for Health Policy Studies, University of California, San Francisco. Dale D. Chitwood is with the Department of Sociology and the Comprehensive Drug Research Center, University of Miami, Miami, Fla.

Requests for reprints should be sent to Robert E. Booth, PhD, Campus Box C-251, Department of Psychiatry, University of Colorado Health Sciences Center, 4200 E 9th Ave, Denver, CO 80262.

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behaviors of three groups of drug users: injection drug users who do not smoke crack (injectors), crack smokers who do not inject drugs (smokers), and injection drug users who also use crack (smoking injectors).

## Methods

As part of a multisite study, 246 drug users were recruited in three US cities (83 from Denver, 76 from Miami, and 87 from San Francisco) during May and June of 1991. Sampling was conducted in inner-city neighborhoods in each location. Selected neighborhoods contained high concentrations of injection drug users and crack cocaine users, determined through analysis of drug treatment admissions and arrest data and direct observations of drug trade and/or use activities in each targeted neighborhood.<sup>30</sup> Active injection drug users and crack smokers were designated for interviews by adapting targeted sampling methods.<sup>31</sup> As such, we studied social circles of drug users and enumerated and characterized their members in terms of age, gender, ethnicity, sexual orientation, drug preferences, and modes of injection. Recruitment was directed to cut across social circles of drug users referenced in the ethnographic phase of the study. The result was a nonrandom, purposefully selected sample of drug injectors and smokers distinguished by diversities in drug-intake frequencies for both injected and noninjected drugs, age, gender, ethnicity, and risk behavior participation.

Eligibility criteria included having reached the 18th birthday, not currently enrolled in a treatment program, not intoxicated or otherwise dysfunctional to respond to screening questions, and self-reported use of injected drugs in the 30 days before the interview and/or use of crack cocaine in the previous 2 days. Verification of drug use included visual examination for signs of recent venipuncture in injection drug users, and urinalysis for crack smokers (using Abuscreen ONTRAK for cocaine; Roche Diagnostic Systems, Montclair, NJ). The 48-hour time frame for crack use was necessary because of the relatively brief period following drug ingestion that the metabolite of cocaine can be detected in urine. Informed consent was obtained prior to the interview, and respondents were compensated for their participation.

The questionnaire surveyed demographics, drug use, sex behaviors, medical history, participation in risk activities, and HIV status. The independent variable

used in the analyses was membership in one of the three drug use groups. Chi-square tests for differences in proportions, with the Yates correction, or Fisher's exact tests (two-tailed) served to evaluate differences between groups for categorical data. The one-way analysis of variance was used to assess age and arrest differences. In addition to the dependent variables from the questionnaire, four composite variables were created. These included overall drug use (an aggregate of the number of times per day each drug was used multiplied by the number of days used); unsafe sex (oral, vaginal, and anal sex without a condom); total exchanges of sex, drugs, and money (a combination of sex for drugs, drugs for sex, sex for money, and money for sex); and drug use before or during sex (including heroin, cocaine, speedball [a combination of heroin and cocaine mixed together], and crack). When tests for homogeneity of variance (Cochran's C and Bartlett Box F) produced significant results with these continuous variables, nonparametric techniques were used to aid in the interpretation of group differences.

The targeted sampling design yielded a sample of 246 verified drug users (81 injectors, 57 smokers, and 108 smoking injectors). The mean age of the sample was 39 years (range = 19 to 66). Two thirds were male, 62% were African American and 22% were Hispanic; and 42% reported less than a 12th-grade education, 33% had graduated from high school or received a graduate equivalency diploma, and 26% had attended college or trade school. Forty-five percent had never married, 16% were married, and 39% were divorced, separated, or widowed. At the time of the interview, 7% were employed full time and 66% were unemployed. A history of arrest was mentioned by 85%. Previous medical histories for the following conditions were reported: gonorrhea (49%), syphilis (17%), hepatitis B (23%), pneumonia (28%), and HIV seropositivity (15%).

## Results

The demographic characteristics and medical histories of the three drug user groups are compared in Table 1. Significant differences were observed on age, ethnicity, marital status, and a history of two health problems, gonorrhea and pneumonia. Smokers were younger and less likely to be married than either injectors or smoking injectors. Injectors were more likely than the other user groups to be His-

panic and less likely to be African American. Gonorrhea and pneumonia were more likely to have occurred among crack smokers and smoking injectors than among injectors. Although not statistically significant, more injectors reported a history of hepatitis B than did respondents in the other drug categories.

Frequencies of drug use among the three user groups are presented in Table 2. Smoking injectors reported more days of drug use, more use per day, and a higher overall frequency of use than either injectors or smokers only. Crack smokers indicated fewer days of drug use than injectors but a higher frequency on a typical day of use. To test the possible confounding pharmacological effects of cocaine, a similar analysis was performed looking only at the use of this substance. Findings were similar: smoking injectors reported more days of cocaine use ( $\chi^2 = 27.52$ ,  $P < .0000$ ), more times of use per occasion ( $\chi^2 = 23.73$ ,  $P < .0001$ ), and a higher total frequency of use ( $\chi^2 = 33.79$ ,  $P < .0000$ ) than either cocaine injectors or crack smokers alone.

Next, injectors and smoking injectors were compared on differences in overall drug injection and use of the three most frequently mentioned injected substances (cocaine, heroin, and speedball). Smoking injectors reported more injecting in the 30 days prior to their interview than injectors only, irrespective of the particular drug ( $\chi^2 = 6.58$ ,  $P < .05$ ), and were more likely to have injected cocaine during this period ( $\chi^2 = 21.89$ ,  $P < .0000$ ). No significant differences were observed on injecting heroin or speedball.

Finally, differences in crack smoking were assessed by comparing smokers with smoking injectors. Findings showed the frequency of smoking to be equivalent between groups.

Most of the study population was sexually active. Among the 71% who had sex during the 30 days before the interview, respondents averaged 9.2 days of sex and 6.2 partners (range = 1 to 300, median = 1), with 44% of those who had sex reporting multiple sex partners. Women averaged more sex partners (11.5) than men (3.3) and more sex days (11 vs 8.1). The results of the analyses of sexual behaviors according to drug group are presented in Table 3.

Crack smokers and smoking injectors, both men and women, were at least four times more likely than injectors to report they had two or more sex partners in the 30 days prior to their interview. One half (52%) of the female smokers reported

TABLE 1—Sample's Demographic Characteristics and Medical History, by Drug Group Affiliation

	Drug Group Affiliation			Statistic
	Injector (n = 81)	Smoker (n = 57)	Smoking Injector (n = 108)	
Age, mean	38.9	35.6	40.1	5.83 <sup>a**</sup>
No. of arrests, mean	9.6	8.7	10.2	0.15 <sup>a</sup>
Sex, %				
Male	66.7	61.4	68.5	...
Female	33.5	38.6	31.5	0.65 <sup>b</sup>
Ethnicity, %				
Black	34.2	75.9	73.6	...
White	23.7	11.1	15.1	...
Hispanic	42.1	13.0	11.3	38.73 <sup>b***</sup>
Education, %				
<12 y	44.4	36.8	41.7	...
High school graduate	35.8	36.8	28.7	...
>12 y	19.8	26.3	29.6	3.30 <sup>b</sup>
Marital status, %				
Single	40.7	54.4	44.4	...
Married	23.5	3.5	16.7	...
Divorced/separated/widowed	35.8	42.1	38.8	10.24 <sup>b*</sup>
Employment, %				
Full time	7.4	7.3	6.5	0.06 <sup>b</sup>
Unemployed	67.9	65.5	55.4	0.15 <sup>b</sup>
Criminal history, %				
Previous jail time	55.9	35.6	55.9	5.83 <sup>b</sup>
Medical history, %				
Gonorrhea	35.8	61.8	53.3	10.03 <sup>b**</sup>
Syphilis	12.3	21.8	18.7	2.32 <sup>b</sup>
Hepatitis	30.9	14.8	21.9	4.88 <sup>b</sup>
Pneumonia	17.3	29.1	35.5	7.65 <sup>b*</sup>
HIV positive	18.8	10.3	13.2	1.73 <sup>b</sup>

<sup>a</sup>F.  
<sup>b</sup> $\chi^2$ .  
<sup>\*</sup> $P < .05$ ; <sup>\*\*</sup> $P < .01$ ; <sup>\*\*\*</sup> $P < .001$ .

TABLE 2—Substance Use by Drug Group Affiliation: Last 30 Days

	Drug Group Affiliation, %			$\chi^2$
	Injector (n = 81)	Smoker (n = 57)	Smoking Injector (n = 108)	
No. of days of drug use in last 30 days				
1-7	37	30	9	...
8-29	24	46	25	...
30	40	25	66	38.59 <sup>*</sup>
No. of times used per day				
1-2	37	30	4	...
3-9	51	45	43	...
10 or more	12	25	54	53.73 <sup>*</sup>
Total use frequency (days × times)				
1-50	49	45	11	...
51-250	41	43	40	...
251 or more	10	13	49	57.40 <sup>*</sup>

Note. Means on the variables, according to the injector, smoker, and smoking injector groups, respectively, are as follows: days used, 16.37, 16.40, and 24.94; times used, 4.64, 7.52, and 12.68; total use, 88.57, 112.17, and 331.06. Because of a lack of homogeneity of variance on these variables, nonparametric statistical techniques were used for analysis.  
<sup>\*</sup> $P < .001$ .

multiple sex partners in the previous month. Conversely, sex with a partner who was known to be an injection drug user was least prevalent among smokers. Sex without use of condoms or other barriers was reported more often by smoking injectors and smokers. These two drug use groups also had a much higher prevalence of exchanging drugs for sex and/or money and using drugs before or during sex than did the injectors. The lowest figures on all of the sex risk variables, with the exception of sex with an injection drug user, were recorded by the injector group.

The association of prostitution, drug use, and sex with multiple partners was independently assessed within each of the drug groups. No significance was observed on the use of drugs before or during sex relative to having multiple sex partners. However, in all three drug groups, exchanging sex, drugs, and/or money was significantly related to whether or not the respondent reported sex with two or more partners in the 30 days prior to the interview (injectors:  $\chi^2 = 5.81$ ,  $P < .01$ ; smokers:  $\chi^2 = 7.41$ ,  $P < .01$ ; smoking injectors:  $\chi^2 = 22.98$ ,  $P < .0000$ ).

To further assess the relationship of high risk sex behaviors to substance use, the frequency of drug use was categorized into low (1 through 50 times), medium (51 through 250 times), and high (251 or more times; see Table 2) and cross tabulated with the five sex behavior risk factors. These categories were derived from the drug use distribution and a desire to maintain fairly equal cell sizes (i.e., 32%, 41%, and 27% of the total cohort, respectively, used 1 through 50, 51 through 250, and 251 or more times).

A direct relationship was observed between frequency of drug use and all five of the variables displayed in Table 4. Respondents in the high frequency category were the most likely, and those in the low frequency group the least likely, to report two or more sex partners, sex with an injection drug user, unprotected sex, exchanging sex for drugs and/or money, and using drugs before or during sex.

A possible confounder in these analyses was the relationship of recruitment city to drug and sex risk behaviors. To assess whether the aggregate findings reported above were consistent within each site, separate  $\chi^2$  tests were performed with the variables displayed in Tables 2 and 3. In addition, logistic regressions, with the total data set, were used to determine the individual association between drug group and risk behaviors after adjustments for city. The findings from both series of analyses

supported those reported earlier: in each city, differences between drug groups were nearly identical to the aggregate, and, in the total sample controlling for location, drug group differences were in the same direction and statistically significant.

## Discussion

Because of the unknown parameters of the universe of drug injectors and crack smokers, this study could not be based on a random sample and does not purport to generalize these findings to all drug users. The "true" size and composition of the injection drug using and/or crack smoking populations are impossible to enumerate because of the clandestine nature of illicit drug use. Nevertheless, the findings reported here provide a description of sex risk behaviors in relation to drug consumption patterns that is consistent across the three study cities and in agreement with other research.

Four major observations emerged from this study. First, the data indicate that an increased potential risk for HIV infection through sexual transmission is associated with the use of crack cocaine, particularly among those who also injected. High risk sex behaviors were reported far more frequently among smoking injectors and smokers only than among injectors who did not smoke. Crack smokers, both injection drug users and non-injection drug users, reported more sex partners and more acts of unprotected sex; they also were more likely to have exchanged sex for drugs and/or money and to have used drugs more often before or during sex. Women may be at greater risk than men because of the higher numbers of sex partners they report.

Second, we found an association between crack smoking and sexually transmitted diseases. Approximately half (49%) of all drug users indicated that they previously had been diagnosed with gonorrhea, and 17% reported a history of syphilis. These percentages increased to 62% and 22%, respectively, among crack smokers and to 53% and 19% among those who were smoking injectors. This reinforces the findings of others who have reported an association between crack smoking and sexually transmitted diseases<sup>22,23,26,32</sup> and between sexually transmitted diseases and HIV seroprevalence.<sup>15,32,33</sup>

Third, smoking injectors were more likely than the other groups to report frequent drug use and drug use in association with high risk sex behavior. Smoking injectors reported more days of use and more use per occasion than either smok-

	Drug Group Affiliation, %			$\chi^2$
	Injector (n = 81)	Smoker (n = 57)	Smoking Injector (n = 108)	
Men: 2+ sex partners	9	37	35	14.85**
Women: 2+ sex partners	7	52	36	12.74*
Injection-drug—using sex partner	32	8	38	15.50***
Unprotected sex	44	56	67	9.34**
Exchanging sex, drugs, and money	15	37	41	15.53***
Sex with drugs	37	58	60	10.96**

\*P < .05; \*\*P < .01; \*\*\*P < .001.

	Total Frequency of Use in Last 30 Days, %			$\chi^2$
	1–50 (n = 77)	51–250 (n = 100)	251 or more (n = 68)	
2+ sex partners	17	30	46	17.03*
Injection-drug—using sex partner	16	31	42	10.93*
Unprotected sex	49	51	74	10.86*
Exchanging sex, drugs, and money	15	30	52	23.42**
Sex with drugs	36	47	77	24.85**

\*P < .01; \*\*P < .001.

ers or injectors. Those injection drug users who also used crack reported more injection risk behavior than did injectors only, and they smoked as often as those who only smoked. Consequently, one of our central findings is that the addition of crack use does not reduce injection behavior but may increase the user's overall risk behavior.

Our findings also suggest a strong connection between the frequency of substance use and participation in risky sexual activities. Respondents in the high frequency of drug use category reported significantly greater risk on every sex behavior indicator that was assessed. These data confirm other studies that have reported a relationship between the use of psychoactive substances, sexual disinhibition, and high risk sex behavior.<sup>34–40</sup>

Fourth, rather than reducing the risk of HIV among injection drug users,<sup>41</sup> the use of crack may increase the potential risk of infection. As we have reported here, crack smokers, including both smoking injectors and smokers only, participated in more risky sex activities than their nonsmoking injection counterparts. The higher rates of sexually transmitted

diseases among smokers and smoking injectors underscore the potential threat these sex behaviors represent for the transmission of HIV. These data suggest that the sexual transmission of HIV among smokers of crack cocaine may compete with contaminated drug paraphernalia as a principal risk for infection in this population.

Previous research has noted a relationship between the injection of cocaine and HIV infection, presumably transmitted through contaminated needles or other drug paraphernalia.<sup>42,43</sup> Cocaine injectors have been observed to be less consistent in the use of bleach as a disinfectant.<sup>44</sup> HIV also has been associated with the number of sex partners and with sex partners who are injection drug users.<sup>4,5</sup> More recently, crack smokers have been found to have levels of HIV infection as high as those among drug injectors, reportedly due to both the number of sexual encounters and the frequency of participation in high risk sex behaviors.<sup>45</sup> Our findings are consistent with these studies and point to the urgent public health need for technologies that can address sexual transmission of HIV among cocaine smokers. □

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