

# LONG-TERM PREDICTORS OF HIV RISK BEHAVIORS AMONG IDUs

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*Drug users are at high risk for disease due to injection and sex behaviors. Longitudinal research with drug users can help researchers understand reasons for continued high-risk behaviors among this vulnerable population. Data are from a follow-up study conducted from 1999 to 2003, which attempted to relocate clients who were initially recruited through street outreach in Denver, Colorado from 1990 to 1995. A total of 773 subjects were located (82% relocation rate), 578 of whom were interviewed at follow-up. Statistical analysis revealed significant improvement in most high-risk injection and sex behaviors. However, over half the sample reported having sex without a condom at follow-up. Further analysis revealed that having sex without a condom at baseline, not having previously participated in drug treatment, being of an ethnicity other than African American, smoking crack, and having sex with a drug injector were all significantly related to having sex without a condom at follow-up. These findings are discussed with regards to developing interventions in order to increase condom use in this high risk population.*

## INTRODUCTION

Twenty years into the HIV/AIDS epidemic, drug users continue to be at high risk for disease transmission due to risky sex and injection-related behaviors. This is true despite many years of prevention and education programs as well as research investigating interventions to decrease high-risk behaviors (Booth, Kwiatkowski, & Stephens, 1998; Metzger & Navaline, 2003; Auerbach & Coates 2000). In longitudinal research with drug users, it is possible to examine how high-risk behaviors have changed over time, if at all. If indicators of behavior change can be

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determined, we may be able to use this information to promote positive change in high-risk behaviors and prevent negative change.

Drug users are at extremely high risk for HIV transmission through both their injection and sex behaviors. Injection behaviors that lead to HIV transmission have been detailed in research studies since early in the epidemic (Schoenbaum et al., 1989; Des Jarlais & Friedman 1987; Celentano et al., 1991). Documented high risk injection behaviors include injecting drugs; sharing needles; sharing drug paraphernalia such as a cooker, cotton, and rinse water; and smoking crack (Booth, 1994; Chitwood et al., 1995; Koester, Booth, & Wiebel, 1990). Additionally, high-risk sex-related behaviors include having sex without a condom, having more than one sex partner, exchanging sex for money and/or drugs, and having sex with a drug user (Bulterys et al., 1993; Kwiatkowski & Booth, 1998, 2000; Strathdee et al., 2001). Stimulant users, including noninjecting crack smokers, have been found to engage in many high-risk sex behaviors, often while they are high, leading to extremely high risk situations for disease transmission (Booth, Watters, & Chitwood, 1993; Hudgins, McCusker, & Stoddard, 1995; Flom et al., 2001; Donoghoe, 1992).

Research on interventions to reduce high-risk behaviors has shown that drug users will decrease their high-risk injection behaviors (Des Jarlais et al., 2000; Stephens et al., 2000). However, high-risk sex behaviors have been found to be more difficult to change (Des Jarlais, Friedman, Goldsmith, & Hopkins, 1990; Battjes, Pickens, Amsel, & Brown, 1990; Calsyn et al., 1992; Battjes et al., 1995; Longshore et al., 1998). For example, an extensive review of published studies of the effects of HIV counseling and testing (Higgins, Galavotti, & O'Reilly, 1991) found no clear evidence that it led to significant reductions in high-risk sex behaviors. With regards to condom use, it has been suggested that risk reduction is hindered by the fact that wearing a condom is an extremely personal behavior that occurs in an intimate setting with interpersonal and social implications (Latka, 2003; Donoghoe, 1992). Researchers have found that being high when having sex, having sex with a main partner, and believing that condom use will decrease pleasure (Falck, Wang, Carlson, & Siegal, 1997) are related to the failure to use condoms, while determinants of condom use include being HIV positive, having a casual sex partner (Watkins, Metzger, Woody, & McLellan, 1993; Sherman & Latkin 2001), greater personal acceptance of condoms, and greater partner receptivity (Magura, Shapiro, Siddiqi, & Lipton, 1990).

While short-term intervention studies are numerous, research on long-term behavior change is less prevalent (Galai, Safaeian, Vlahov, Bolotin, & Celentano, 2003; Longshore, Annon, & Anglin, 1998; Celentano, Muñoz, Cohn, & Vlahov, 2001). Longitudinal research in this population is particularly problematic because follow-up is difficult in a hard-to-reach, typically transient population such as out-

of-treatment drug users. Despite research outlining systematic methods for studying drug users over time (Nurco, Bonito, Lerner, & Balter, 1975; Goldstein, Abbot, Paige, Sobel, & Soto, 1977; Cottler, Compton, Ben-Abdallah, Horne, & Claverie, 1996; Freedman, Thornton, & Camburn, 1980; Bale, Arnoldussen, & Quittner, 1984; Ribisl et al., 1996; Hser, Anglin, & Powers, 1993; Galai et al., 2003), high rates of study attrition are common, which decrease internal and external validity of results (Ribisl et al., 1993; Claus, Kindleberger, & Dugan, 2002). Drug users can be difficult to locate for follow-up research due to the sometimes chaotic and unstable circumstances in their lives (Ribisl et al., 1993; Ziek, Beardsley, Deren, & Tortu, 1996; Scott, 2004; Bale et al., 1984) and may be more likely to have moved out of the area or to have died (Galai et al., 2003). In one study, Cottler and colleagues (1996) were able to achieve a 96.6% follow-up rate after 18 months through the use of comprehensive tracking methods. Another study followed a prison-based population and was able to achieve a 94% location rate after 24 years (Hser et al., 1993). Overall, research with drug users has demonstrated that behavior change is often slow and thus more noticeable after longer periods of time, making longitudinal studies essential to understanding the multiple factors that contribute to changes in high-risk behavior (Longshore et al., 1998; Galai et al., 2003).

In the current study, we report on data from a follow-up study conducted in Denver, Colorado between 1999 and 2003 in which we located and interviewed drug injectors and crack smokers who had participated in a research study between 1990 and 1995. The earlier study was part of a cooperative agreement directed by the National Institute on Drug Abuse that examined HIV-related high-risk behaviors among drug users (henceforth referred to as the baseline study). The purpose of the research presented here is to examine changes in high-risk behaviors in order to broaden our understanding of the factors that affect behavior change over the long term.

## **METHODS**

### *SUBJECTS*

In the follow-up study, conducted between 1999 and 2003, we attempted to locate 947 subjects from the original baseline study. A total of 773 subjects were located (82% location rate), 578 of whom were interviewed for the current research (61% follow-up interview rate). Fourteen percent of the original 947 subjects were confirmed to be deceased through official death records. Of the 578 subjects who were interviewed, 17 (3%) were dropped from the analysis because they were judged as either being dishonest, not understanding the questions, unable to answer the questions, or not being accurate about their answers during the interview. At the end of each interview, the interviewer rated the interview on those criteria, which

is what the decision to drop a subject from the analysis was based on. The final number for analysis was 561.

#### *PROCEDURES*

Subjects were interviewed by staff members trained and experienced in conducting behavioral research interviews. All participants interviewed at the project site received urinalysis tests for methadone, opiates, cocaine and amphetamines, and HIV testing and counseling. All subjects received monetary compensation for their participation. Study procedures were approved by the Colorado Multiple Institute Review Board.

#### *MEASURES*

The primary interview instrument was the risk behavior assessment (RBA), developed by NIDA for the original cooperative agreement study. The RBA determines demographics, substance use, HIV drug- and sex-related high-risk behaviors, drug treatment, and health status. Reliability and validity studies of the RBA support its adequacy as a research tool for assessing drug using populations (Dowling-Guyer et al., 1994; Weatherby et al., 1994).

#### *STATISTICAL ANALYSES*

Variables used in the analyses included demographics, AIDS related measures, drug treatment participation, drug related behaviors in the prior 30 days, and sex related behaviors in the prior 30 days. In order to assess the impact of attrition in this sample, chi-square and independent sample t-tests were run to determine which variables were significantly different between participants who received a follow-up interview (578) and those who did not (369). Following this, changes from baseline to follow-up were calculated for all variables. Because many participants continued to engage in the high-risk behavior of sex without a condom, this variable was chosen for further study. For univariate comparisons, odds ratios and 95% confidence intervals were calculated for categorical variables, and independent and paired-sample t-tests were used to compare continuous variables. Forward stepwise logistic regression was used to determine which of the many baseline variables made the strongest independent contribution to the outcome variable, "Had sex without a condom in the 30 days prior to the follow-up interview." Each baseline variable was evaluated for entry into the overall model using an entry criteria of  $p < .10$ . The most significant candidate was entered into the model at each step and variables already in the model were tested for possible removal ( $p < .10$ ). The final model resulted when no more variables meet the criteria for entry or removal. Adjusted odds ratios and confidence intervals are presented for each independent variable in the final model.

RESULTS

ATTRITION ANALYSIS

Comparisons of baseline data between the 578 participants who were interviewed at follow-up and the 369 who were not revealed several significant differences. Those who were followed were significantly more likely to be female ( $\chi^2=9.0, p=.003$ ), younger ( $t(943)=2.7, p=.007$ ), married ( $\chi^2=10.0, p=.002$ ), HIV negative ( $\chi^2=5.8, p=.016$ ), non-IDU ( $\chi^2=8.1, p=.004$ ) crack smokers ( $\chi^2=13.4, p<.001$ ) who reported having unprotected sex ( $\chi^2=11.1, p=.001$ ) and/or exchanged sex for drugs or money ( $\chi^2=5.0, p=.025$ ).

CHANGES FROM BASELINE TO FOLLOW-UP

For those who received follow-up interviews, the amount of time that passed between the baseline and follow-up interviews was, on average, 7.64 years ( $SD=1.10$ ). The minimum number of years was 5.12 and the maximum was 10.41 years. Of the 561 participants who received a follow-up interview, 40.6% were female, 40.3% were Hispanic, 37.8% were Black, 15.3% were White, 2.1% were Native American, and 4.5% reported another ethnicity. The average age of participants at follow-up was 43 years, with a minimum age of 26 and a maximum of 75. Table 1 presents changes from baseline to follow-up for all the variables of interest in this study.

Participants were much more likely to have been married at baseline than at the follow-up. The percentage who perceived themselves at high risk for acquiring HIV at follow-up was less than half of what it had been at the baseline interview. The number who had ever participated in drug treatment increased by 50% at follow-up. The percentage who injected drugs was cut in half. Injection-related HIV high-risk

TABLE 1  
CHANGES FROM BASELINE TO FOLLOW-UP

Variable	n	Total % at Baseline	Total % at Follow-Up	Odds Ratio	95% CI
Married or living with sex partner	558	38.0	32.4	2.54	1.77-3.66
Perceived chance of HIV>50%	535	29.2	13.1	2.48	1.49-4.14
Ever in drug treatment	559	42.8	65.3	6.97	4.50-10.78
<i>Drug related risks in past 30 days</i>					
Injected drugs in past month	561	54.2	25.5	8.63	5.13-14.52
Used dirty needle	553	20.1	3.3	6.84	2.59-18.07
Shared cotton/cooker/water	559	40.1	7.7	2.73	1.44-5.20
Smoked crack	558	68.5	34.6	4.02	2.56-6.32
<i>Sex related risks in past 30 days</i>					
Had sex without a condom	556	75.9	51.1	2.27	1.52-3.40
More than one sex partner	554	21.1	9.0	5.40	2.96-9.85
Exchanged sex for money or drugs	561	15.2	4.6	2.64	1.11-6.29
Had sex with a drug injector	544	32.9	14.0	4.41	2.65-7.33

behaviors, including use of a dirty needle and/or dirty drug paraphernalia were reduced to a small fraction of what they had been at baseline. The percentage of subjects who reported smoking crack also decreased by half. Similar results were found for sex-related high-risk behaviors. The percentage of participants reporting sex without a condom, more than one sex partner, exchanging sex for drugs or money, and/or having sex with a drug injector were all substantially reduced at follow-up.

Despite these large reductions in high-risk behavior after nearly eight years, at the follow-up interview, over half of the sample was still reporting having sex without a condom. Other than abstinence, using latex barrier protection during sex is the single most important protective behavior one can take to avoid acquiring HIV and other sexually transmitted diseases. It is also the behavior that has proved to be the most difficult to change in high-risk populations. Therefore, we chose to analyze this behavior further to determine what characteristics or behaviors (including all of those listed in the statistical analysis section) were associated with unprotected sex in this high-risk sample of drug users (Table 2). As shown in Table 2, those having sex without a condom were more likely to be female, to be Hispanic, to not be African American, to have been married, and to never have been in drug treatment. With regards to drug related behaviors, they were more likely to smoke crack and to have shared drug paraphernalia. Associations between injecting drugs and using dirty needles with having sex without a condom were minimal. Having sex without a condom at baseline was a strong predictor of that behavior at follow-up. Having more than one sex partner and having had sex with a drug injector in the prior month were also associated with having sex without a condom at follow-up. In addition, independent sample t-tests indicated that the average age of those having sex without a condom was 34.7, which was significantly younger than those not having sex without a condom ( $M=36.5$ ,  $t(554)=2.74$ ,  $p=.006$ ).

All of the variables in Table 2 and the continuous variable of age of the participant at baseline were entered into a logistic regression analysis to determine their independent contributions to the outcome variable (condom use). We created dummy variables to reflect the three highest categories of ethnicity, and we included the number of months between the baseline and follow-up interviews as a control variable. Table 3 presents the variables in the final logistic model in the order in which they were accepted into the model. The strongest predictor of having sex without a condom at follow-up was doing so at baseline. Additional predictors of this high-risk sex behavior included having never been in drug treatment, being of an ethnicity other than African American, smoking crack at baseline, and having had sex with a drug injector at baseline.

**TABLE 2**  
**ASSOCIATIONS BETWEEN BASELINE VARIABLES AND SEX WITHOUT A CONDOM AT FOLLOW-UP**

Baseline Variable	% Having Sex Without a Condom	Odds Ratio	95% CI
Gender		1.25	0.89-1.76
Male	48.8		
Female	54.4		
Ethnicity			
Hispanic		1.20	0.85-1.68
Yes	53.7		
No	49.2		
African American		0.74	0.53-1.05
Yes	46.5		
No	54.0		
White		1.05	0.68-1.64
Yes	52.1		
No	50.9		
Marital status		1.54	1.09-2.17
Married or living with sex partner	57.6		
Single, div., separated or widowed	47.0		
Perceived chance of HIV infection		1.05	0.73-1.51
Less than 50%	50.6		
50% or greater	51.8		
Ever in drug treatment		0.47	0.33-0.66
Yes	40.3		
No	59.1		
<i>Drug related risks in past 30 days</i>			
Injected drugs		0.87	0.62-1.21
Yes	49.3		
No	52.9		
Smoked crack		1.57	1.09-2.25
Yes	54.6		
No	43.4		
Used dirty needle		1.13	0.75-1.72
Yes	53.6		
No	50.5		
Shared cotton/cooker/water		0.83	0.59-1.17
Yes	48.4		
No	53.0		
<i>Sex related risks in past 30 days</i>			
Had sex without a condom		2.27	1.52-3.40
Yes	55.9		
No	35.8		
Had more than one sex partner		1.49	0.98-2.26
Yes	58.6		
No	48.7		
Exchanged sex for drugs or money		1.01	0.64-1.61
Yes	51.2		
No	51.0		
Had sex with a drug injector		1.61	1.12-2.31
Yes	58.6		
No	46.7		

**TABLE 3**  
**LOGISTIC REGRESSION RESULTS OF PREDICTORS OF SEX WITHOUT A CONDOM AT FOLLOW-UP**

Baseline Variable	Adjusted Odds Ratio	95% CI	p-value
Had sex without a condom	0.51	0.32-0.80	0.004
No previous drug treatment experience	1.98	1.36-2.87	<0.001
Not of African American ethnicity	1.66	1.10-2.52	0.016
Smoked crack in prior 30 days	0.56	0.36-0.88	0.011
Had sex with a drug injector	0.64	0.41-0.99	0.046

## DISCUSSION

Over the course of eight years, the participants in this study demonstrated substantial risk reduction in both injection and sex behaviors. Although a quarter of the sample continued to inject drugs and over one third smoked crack, using dirty needles was nearly eliminated and sharing of other drug paraphernalia was at a minimum. Similarly, having multiple sex partners and exchanging sex for drugs or money were reduced to fewer than 10%. Des Jarlais and colleagues (2000) described similar results among IDUs in New York City, showing that high-risk behaviors are in fact declining in this population. The finding that participants in the present study were less likely to feel that they were at high risk is probably an accurate reflection of their reduced risk behaviors. Unfortunately, one of the riskiest sex-related behaviors, having sex without a condom, was still reported by over half of the participants in this study. Given the amount of HIV prevention education that has saturated this community in the past 20 years, the problem is in failing to increase condom use on the same scale as the decrease in needle sharing. Injection drug use (including the categories IDU and MSM/IDU) accounts for 10% of Colorado's HIV/AIDS cases through June 2004 (Colorado Department of Public Health and Environment [CDPHE], 2004).

More in-depth analysis of the variables associated with having sex without a condom revealed that, not surprisingly, those who did not use condoms at baseline continued not to use them at follow-up. Given the wealth of public information on the benefits of condoms in preventing disease as well as pregnancy, it seems unlikely that they are unaware of the importance of condoms. A stronger supposition may be that they lack the means or the ability to use them. Research has shown that some women report that lack of condom use has more to do with fear of being suspected of infidelity and lack of communication than lack of knowledge about HIV transmission (Hebling & Guimaraes, 2004). Gender inequality and power have been shown to be determinants in lack of condom use (Barnett & Parkhurst, 2005; Thomas, 2005; Sinding, 2005). In other populations, such as African-American men, lack of condom use is related to substance use, lack of income to purchase condoms,

and lack of knowledge (Essien, Meshack, Peters, Ogungbade, & Osemene, 2005; Absalon, Della-Latta, Wu, & El-Sadr, 2005). In other words, there are many issues surrounding the use of condoms that need to be directed at specific populations in order to affect change.

The finding that associated unprotected sex with no prior drug treatment is relatively unique. While research has shown the effect of drug treatment, specifically methadone maintenance treatment (MMT) in reducing injection behaviors (Sorenson & Copeland 2000; Corsi, Kwiatkowski, & Booth, 2002; Longshore, Hsieh, Danila, & Anglin, 1993), sex-related high-risk behaviors, and condom use in particular, have not been found to be as affected by drug treatment (Sorenson & Copeland, 2000). Several studies have found some association between increased condom use and entry into treatment (Magura et al., 1990) and decreases over time in sex-related high-risk behaviors while in drug treatment (Gossop, Marsden, Stewart, & Treacy, 2002; Sorenson & Copeland, 2000). Also, one study that looked at subjects 12 months after leaving treatment found decreased rates of unprotected sex, possibly indicating sustained behavior change, including use of condoms (Camacho, Bartholomew, Joe, & Simpson, 1997). However, Battjes and colleagues (1995) found that sex-related high-risk behaviors among users in drug treatment remained high in eight cities that were studied. An examination of women in treatment found little change in condom use frequency (Grella, Anglin, & Annon, 1996). In this and other studies, treatment has been shown to affect other sex-related behaviors, such as reducing the number of sex partners, but it does not appear to have an effect on condom use (Longshore, Hsieh, & Anglin, 1994). Additionally, a study that compared in and out of treatment IDUs found no differences in condom use between these groups, further indicating that the use of condoms may not be as affected by treatment as other sex-related behaviors (Watkins, Metzger, Woody, & McLellan, 1992). In sum, research has found mixed results on the impact of drug treatment on high-risk sexual behaviors. Clearly more research is needed to clarify this issue. If drug treatment can impact this high-risk behavior, one that has proven extremely difficult to change, it should be capitalized on as an important intervention resource. Alternatively, our data also support the hypothesis that a third factor, such as general health concerns, promotes both entrance into drug treatment and future condom use. While this possibility needs substantiation through further research, it also offers the hope that interventions designed to address the commonalities between factors driving treatment participation and condom use could be used to decrease high-risk behaviors in this population.

The third variable strongly associated with failure to use condoms was ethnicity. Participants who were White, Hispanic, or of another ethnicity were 1.4 times more likely than African Americans not to use condoms. Interestingly, in 1998 we

conducted a study of unprotected sex in a sample of HIV positive drug users in five cities, including Denver (Kwiatkowski & Booth, 1998). The strongest predictor of having unprotected sex was being of an ethnicity other than African American. Prior research specifically focusing on ethnicity and condom use has indicated that African Americans may be more comfortable using condoms than Hispanic Americans (O'Donnell, San Doval, Vornfett, & O'Donnell, 1994) and may have a greater fear of threat of AIDS than White Americans (Klepinger, Billy, Tanfer, & Grady, 1993). If these findings have relevance for potential intervention strategies, then the question becomes how to increase drug users' comfort with condom use and how to stress that the threat of AIDS is not a thing of the past. While changing cultural norms is not a task to be taken lightly, the attitudes and behaviors of African Americans on this subject would be worth exploring further to help develop effective intervention approaches.

The finding that those who smoked crack were more likely not to use condoms is discouraging but not surprising. Prior studies also indicate that drug use, particularly crack use, is often interrelated with engaging in unsafe sex behavior (Calsyn, Saxon, Wells, & Greenberg, 1992; Hudgins et al., 1995; Donoghoe, 1992; Booth et al., 1993; Booth, Kwiatkowski, & Chitwood, 2000). Unfortunately, to our knowledge there are few interventions known to promote safer sex practices among crack smokers. Similar concerns are raised by studies showing that stimulant injectors engage in unsafe sexual practices more than heroin injectors (Zule & Desmond, 1999; Molitor et al., 1999; Gibson, Leamon, & Flynn, 2002). Given the recent increase in the use of drugs that, like crack cocaine, promote unsafe sex (e.g., methamphetamines, ecstasy), the call for research into effective interventions is reiterated by the findings in this study.

Another finding that supports the urgency for effective interventions is that having sex with a drug injector is associated with having unprotected sex. Given that both individuals in such a situation are at risk for acquiring HIV through drug injecting practices, the threat of one acquiring HIV and transmitting it to the other is that much greater. It should be noted, however, that with the exception of this variable, this study did not evaluate the status of the person with whom the unprotected sex was occurring. In other words, if both partners in a relationship are monogamous, HIV negative, and at no risk of acquiring HIV through injecting practices, then failure to use a condom presents little, if any, risk of HIV transmission.

In this study, as in most longitudinal research, subject attrition may affect the validity of results (Scott, 2004). We were able to locate and reinterview 61% of the original baseline subjects; however, they were significantly different than the baseline sample on many variables, both demographic and behavioral. Similar to our findings, other research has found that those who complete follow-up interviews tend to be

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female (Claus et al., 2002; Calsyn et al., 1992; Ziek et al., 1996), crack users (Ziek et al., 1996), and married (Claus et al., 2002; Calsyn et al., 1992). Unfortunately, in a long-term follow-up study such as this one, it is difficult to avoid attrition problems. The consequence is that our research may not generalize to the entire population that we originally set out to study. Further investigation into the long-term predictors of unprotected sex, particularly with regards to the impact of drug treatment, is necessary to determine if these findings extend to all street-recruited IDU and crack smokers willing to participate in research, or if they are unique to the subset of our original population that returned for follow-up interviews. The validity of these findings, however, is less questionable to the extent that they are supported by prior research. It should also be noted that this research was based entirely on self-report data, in which inaccurate recall and socially desirable responding may have been factors. However, prior research has indicated adequate validity in drug users self reports (Booth et al., 1996; Magura, et al., 1987; Maisto et al., 1990)

One of the important accomplishments of this study is that we were able to follow a nontraditional population over an extended period of time and achieve a desirable follow-up rate. It is encouraging to find that, after such a long time period, drug users are reporting large reductions in high-risk behaviors, although it is clear that more work still needs to be done to increase the use of condoms, particularly among those who were shown to be less likely to use them. Perhaps, as has been suggested by others, HIV prevention messages targeting IDUs have not focused enough on decreasing sex risk (Strathdee & Sherman, 2003; Battjes et al., 1995). In any event, it is clear that there is room for improvement in efforts to decrease sex-related risk behaviors among drug users.

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