Published in final edited form as:
Drug Alcohol Depend. 2008 September 1; 97(1-2): 44–53. doi:10.1016/j.drugalcdep.2008.03.023.

A CLUSTER ANALYSIS OF DRUG USE AND SEXUAL HIV RISKS AND THEIR CORRELATES IN A SAMPLE OF AFRICAN-AMERICAN CRACK COCAINE SMOKERS WITH HIV INFECTION

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Abstract

The purpose of this cross-sectional study was to classify a sample of HIV seropositive African American crack cocaine smokers into homogenous HIV drug use and sexual risk groups using a two step multivariate cluster analysis. Two hundred and fifty eight crack cocaine smokers participated in the study. Cluster analysis revealed three distinct HIV risk groups. The highest risk group, the largest one, was characterized by frequent, daily crack use, multiple sex partners, trading sex, and inconsistent condom use. The consistent condom use group, the smallest group, was characterized by consistent condom use. The inconsistent condom use group, the second largest group, was distinguished by inconsistent condom use. Comparisons of the three HIV risk groups revealed that the highest risk group had a higher proportion of illegal sources of income, higher proportion of binged crack use, frequent, daily, alcohol use, same gender sex partners, and scored higher on depressive symptoms. Members of the consistent condom use group were more likely to have been HIV diagnosed for a shorter time, to have HIV serodiscordant casual sex partners, higher psychological motivation for condom use, and a lower frequency of vaginal sex. Members of the inconsistent condom use group were more likely to have a main sex partner, to be married, to be on public assistance, to know the HIV serostatus of their casual partner, and less likely to conceal their HIV serostatus. An alarming finding was that a large number of participants inconsistently used condoms with HIV serodiscordant sex partners. Interventions aiming to prevent the secondary spread of HIV infection in African American crack cocaine smokers should take this variability in account and focus on the differences.

Keywords

Crack cocaine; HIV infection; HIV risk groups; African-American; cluster analysis

1. Introduction

HIV prevalence data in the U.S. indicate that infection rates are rising at a much faster rate among African-Americans than in other racial/ethnic groups (CDC Fact Sheet, Website, June 2007). Since 1996 the number of African-Americas who have died of HIV disease exceeds the number of White Americans, despite a large disparity in population (Timpson et al., 2003). Data also show that new cases of HIV infection in African American heterosexuals continue to increase and that many of the new cases are related to use of crack cocaine (Campsmith et al., 2000; Timpson et al., 2003). Crack smoking is highly concentrated in the African American population, and there is a close link between crack smoking, especially binge use, and high-risk behaviors that increase the likelihood of HIV transmission, such as having unprotected sex with multiple partners and engaging in trading sex for money and/or drugs (Feist-Price et al., 2003; Logan & Leukefeld, 2002; Logan et al., 2003; Tortu et al., 2000). African American crack cocaine smokers are thus a growing HIV risk group in the U.S. (CDC Fact Sheet, Website, June 2007).

Despite increasing awareness that African American who smoke crack cocaine are at increased risk of HIV transmission and an increasing number of crack cocaine smokers are being diagnosed HIV-seropositive, there is a scarcity of research on the drug use and sexual behaviors of HIV-seropositive crack cocaine smokers after diagnosis. Although not a complete review, there is still an apparent consensus that HIV-seropositive crack cocaine smokers continue to engage in risky sexual behaviors (Adimora et al., 2006; Campsmith et al., 2000; Kwiatkowski and Booth 1998, Timpson et al., 2003). To fully understand the extent to which sexual risk behaviors are a potential risk of HIV transmission behaviors need to be put into a broader contextual framework. One contextual factor of importance is the HIV serostatus of sexual partners. As Latka et al. note, it is “discordant sexual encounters that propagate the sexual transmission of HIV” (2006: 225). For example, Avants et al., (2000) found that, of cocaine and opiate users in their study who reported having had unprotected sex, fewer than half was unaware of the HIV serostatus of their most recent sex partner or that their partner was serodiscordant. These findings were replicated by Timpson et al., who concluded that “except for primary partners, the majority of sexual encounters engaged in by HIV+ crack smokers are with partners whose status is unknown or who are HIV negative” (2003: 216). In addition to a partner’s HIV serostatus, the type of relationship between sex partners influences condom use. For example, Latka et al. (2006) found that condom use by HIV-seropositive injection drug-using women with HIV serodiscordant partners was greater with casual (47%) than with main sex partners (40%).

There is a void in our knowledge about factors contributing to sexual risk taking in crack cocaine smokers with HIV infection. Studies of non-drug using individuals with HIV-infection provide, however, an indication of what these factors might be. Poverty (Kalichman et al., 1997), lower income (Reilly and Woo, 2001), younger age (Reilly and Woo, 2001; Rosser et al., 1999), and less education (Heckman et al., 1998) have been found to be associated with higher levels of sexual risk-taking. Some studies (Avants et al., 2000; Carey et al., 2001; Dolezal et al., 1997; Kalichman, 2000; Kalichman et al. 1997; Latka et al., 2006, Ostrow et al., 1999; Purcell et al., 2005; Purcell, 2001; Stein et al., 2005) suggest that low self-esteem, depression, and drug and alcohol use are associated with increased risk of unprotected sex, whereas other studies have reported the opposite (Darrow et al., 1998; Eich-Höchli et al., 1998; Kalichman, 1999; Reilly and Woo, 2001, de Vroome et al., 1998). Based upon their meta-analytic review of associations between negative affective states and HIV sexual risk behavior, Crepaz and Marks (2001) concluded that there is no compelling evidence to suggest that negative affective states are associated with sexual risk. Negative attitudes toward condom use have also been shown to be associated with inconsistent condom use among non-drug using (Carballo-Diequez and Dolezal, 1996; Catania et al., 1994; Reilly and Woo 2001; Sheeran et

al., 1999) and drug using individuals (Latka et al., 2006). Personal responsibility, i.e. responsibility to protect others from HIV, has been found to be a motivational factor associated with increased condom use (van Kesteren et al., 2005). Yet, only a couple of studies have examined the relationship between responsibility and sexual behaviors among drug using individuals. Latka et al., (2006) found that HIV-seropositive female injection drug users who inconsistently used condoms were less likely to disclose HIV serostatus and that women with negative or HIV serostatus unknown main partners felt little responsibility for limiting HIV transmission. A study involving crack cocaine smokers found stronger feelings of responsibility for using condoms among crack cocaine smokers with HIV infection than among those who were HIV-negative (Ross et al., 2007). Williams et al (in press) found among women and men using crack cocaine an association between personal responsibility and the intention to use condoms the next sexual encounter with the recent sex partner. Some studies among male non-drug using HIV seropositive individuals (Sullivan, 2005) appear to indicate that people who have not disclosed their HIV-serostatus tend to engage in unprotected sex, in particular when partners are of unknown HIV serostatus.

It has been pointed out that as not-in treatment drug users are likely to engage in multiple drug use and sexual risk behaviors for HIV, they cannot be summarized by a single risk descriptor (Williams et al., 1998). “What is needed is a multivariate classification scheme that provides a way to reduce the heterogeneity of a ….. sample by grouping subjects into relatively “natural” clusters based on HIV risk behaviors” (Williams et al., 1998, 201). Identifying homogeneous clusters around predominant HIV risk behaviors is necessary to develop effective intervention programs and to enhance evaluation of the programs. Risk reduction intervention programs would differ for example between drug users whose primary risk is sexual and those whose primary risk is associated with binge use of crack cocaine and those who engage in high drug use and sexual risk taking. For the prevention of further HIV transmission and secondary HIV infection, data on diverse HIV risk subgroups of crack cocaine smoker living with HIV and their demographic and psychosocial characteristics are needed. To our knowledge, no study has been published on classification of African-American crack cocaine smokers with HIV infection into homogeneous groups based on HIV-related drug use and sexual risk behaviors. The purpose of this exploratory study was to classify African-American crack cocaine smokers with HIV infection into homogenous groups, based on HIV drug use and sexual risk behaviors. We hypothesized that the identified groups would differ with regard to levels of drug use and sexual risks. We also hypothesized that the characteristics would differ across HIV risk groups. Characteristics that were tested included sociodemographic characteristics, drug use and sexual risk behaviors, sexual context of the last sexual encounter, psychological motivation for condom use, HIV concealment, and psychological functioning.

2. Methods

Data for this study are derived from a larger study designed to investigate the efficacy of a risk reduction intervention targeting African-American crack cocaine smokers living with HIV infection in Houston, Texas. Data were collected between April 2004 and February, 2007. All procedures and forms used in this study were reviewed and approved by a university institutional review board for the protection of human subjects.

2.1. Procedures

The sample was recruited using modified snowball sampling. Initial contacts with HIV-seropositive crack cocaine smokers were made through HIV service agencies. Agencies were asked to post signs advertising the study in areas where they could be seen by a large number of their clienteles. In addition to recruiting from service agencies, drug users who had tested HIV-seropositive as part of a hepatitis B vaccine study were also asked to participate.

Participants in the study were asked to refer others they believed might match study criteria. In each case, individuals who saw a sign or were referred by another individual were asked to call for information and to respond to a brief phone screening survey. If the caller matched study criteria and indicated an interest in participating, s/he was asked to go to a local data collection center for further screening.

To be eligible to participate, individuals were required to be African American, 18 years or older, self-identified as heterosexual, and HIV-seropositive. Individuals were also required to: have smoked crack cocaine in the previous 48 hours; have had vaginal sex in the 30 days before screening; and have a valid state ID. HIV serostatus was confirmed by asking participants to show HIV test results, if recently tested, or HIV medication bottles if they were being treated for HIV disease. Recent use of cocaine was confirmed using OnTrak test kits. Screening was conducted by trained research assistants using a brief computer assisted survey. Responses to survey items were matched to an eligibility algorithm and the computer notified the research assistant if the individual was eligible to take part in the study.

About two and a half times as many individuals (n = 596) were screened out of the study as were eligible (n = 258). A potential participant could be declared ineligible for more than one reason. The most common reasons for ineligibility were: not having smoked crack cocaine (31%); not having had sex (31%); and self-identifying as gay (27%). Twenty percent could not provide information which would allow them to be contacted in the future. Fifteen percent were judged by intake staff to be not believable. Eight percent could not demonstrate that they had HIV infection. The only significant difference between those who were eligible and those screened out of the study was gender. Seventy-three percent of males screened were determined to be ineligible compared to 43% of females ($\chi^2 = 73.6$, df = 1, $p < .000$).

2.2. Measures

Data for the study were generated by a computer assisted survey, the Self-Efficacy Questionnaire (SEQ), and a computer administered instrument, the Texas Christian University Self-Rating Form (TCU/SRF).

Study investigators developed the SEQ using items that had been used in previous studies with drug using populations (Bowen et al., 2001, Bowen et al., 2006; Williams et al., 2005). The SEQ was designed to collect data on sociodemographic characteristics, HIV risk behaviors, medical history, antiretroviral therapy, condom use attitudes and beliefs, and HIV serostatus concealment in drug using populations. Studies using measures similar to those in the SEQ have found that drug users can reliably report their behaviors and that data are valid (Darke, 1998; Dowling-Guyer et al., 1994; Needle et al., 1995). Forty-eight hour test-retest data generated using a sample of 50 individuals similar to those in this study showed that data were reliable and valid (available from the authors). The SEQ was administered in private by trained research assistants.

Sociodemographic characteristics measured were gender, age, years of schooling, marital status (married/living as married or single), major source of income (job, public assistance, family or friends, illegal source of income [including trading], no income), and years since HIV diagnosis.

Drug use risk behaviors in the past 30 days refer to how many times participants had smoked crack cocaine, how many times participants had used alcohol; whether participants had been binging crack (yes/no response); and whether participants had used powder cocaine (yes/no response). Binging crack was defined as continually using crack until exhaustion or until the respondent could not buy any more crack.

Sexual risk behaviors in the past 30 days included: how many sex partners participants had had; whether participants had had same gender sex partners (yes/no response); how many times participants had traded sex for drugs, how many times participants had traded sex for money; and how often participants had used condoms with their sex partners. Frequency of condom use was measured as never, less than half the time, half the time, more than half the time, and always.

Sexual context of the last sexual encounter with the most recent sex partner was measured by four variables, type of sex partner, known/unknown HIV serostatus of the sex partner, HIV seroconcordance/discordance of the sex partner, and condom use during the last sexual encounter. Type of sex partner was recorded as main partner (a spouse, like a spouse, or a lover), casual partner (a friend or an acquaintance), or trade partner (either traded or received money or drugs for sex). Participants were asked about their knowledge of partner's HIV serostatus ('known' or 'unknown'). When HIV serostatuis was reported as being known, the participants stated the status as either HIV seropositive or HIV seronegative. HIV seroconcordance was reported when partner status was HIV seropositive and HIV serodiscordance when partner status was HIV negative or serostatus unknown. It should be noted that that there was no confirmation of the sex partner's HIV serostatus. Condom use during the last sexual encounter was recorded using a yes/no response. Participants were also asked how many times they had had vaginal sex in the last 30 days.

Three scales of *psychological motivation for condom use* based on the integrated model of condom use (Fishbein, 2000) and the theory of interpersonal behavior (Triandis, 1994) were used. Participants scored items in each scale using a ten-point Likert measure that ranged from one, "strongly disagree," to ten, "strongly agree." Scale scores are the means of summed scale items. Confirmatory factor analysis was used to assess items in each scale. The attitudes towards condom use scale was composed of nine items ($\alpha = 0.95$): "Using a male condom: is a lot of trouble; makes a man loose his erection; makes sex less exciting; makes sex take longer; ruins the mood; makes sex less fun; gets in the way of romance; taking time to put on a male condom interrupts sex"; and "I can't feel as much with a male condom". Higher scores indicate more negative attitudes towards condom use. The condom use Emotional self-efficacy scale consisted of seven items ($\alpha = 0.91$): "You can make sex with a condom intimate"; "If you did not have a condom, you could refuse to have sex"; "You could make sex with a condom exciting"; "You could enjoy sex without having vaginal sex"; "You can make sex with a condom fun"; "You can feel close without having vaginal sex"; and "You could make sex romantic with a condom". Higher scores reflect greater feelings of condom use self-efficacy. The condom use responsibility scale was composed of three items ($\alpha = 0.91$), "I think we should use a condom when we have sex"; "I think it is (partner's) responsibility to be sure we use a condom"; and "I think it is my responsibility to be sure we use a condom." Higher scores reflect greater feelings of condom use responsibility.

The HIV concealment scale was developed using a measure of concealed homosexuality developed by Cole (1997) as a guide. The scale consisted of five items ($\alpha = 0.76$): "Most people know I am HIV+"; "My family knows that I am HIV+"; "Most of my sex partners know that I am HIV+"; "Most people that I hang out with know that I am HIV+"; and "Other than my associates, most people do not know I am HIV+." Items were scored using a ten-point Likert scale that ranged from "strongly disagree" to "strongly agree". Scale score is the means of item scores. Item scores were reverse so that higher scale scores indicated greater concealment.

Psychological functioning. After completion of the SEQ, participants were administered the Texas Christian University Self-Rating Form (TCU SRF) (Knight et al., 1994). The TCU/SRF measures psychological functioning, social functioning, and treatment motivation. In this study

we focused solely on psychological functioning as measured by depressive symptoms, anxiety symptoms, and self-esteem.

Depressive symptoms were measured by the six-item Depression scale (α = 0.71 in this sample) of the TCU/SRF. The scale consists of six statements each of them reflecting a problem/concern. The statements are: "You feel sad or depressed"; "You have thoughts about committing suicide"; "You feel lonely"; "You feel interested in your life ®"; "You feel extra tired or run down"; and "You worry or broad a lot". Items indicated by '®' are reversed before scoring.

Anxiety symptoms were measured by the seven-item Anxiety Scale (α = 0.74 in this sample). The statements are: "You have trouble sitting still for long"; "You have trouble sleeping"; "You feel anxious or nervous"; "You have trouble concentrating or remembering things"; "You feel afraid of certain things, like elevators, crowds, or going out alone"; "You feel tense or keyed-up"; and "You feel tightness or tension in your muscles".

Self-esteem (α = 0.74 in this sample) was measured by means of the following six statements: "You have much to be proud of"; "In general, you are satisfied with yourself"; "You feel like a failure ®"; "You feel you are basically no good ®"; "You wish you had more respect for yourself ®"; and "You feel you are unimportant to others ®".

To compile scores for each scale, participants were asked how often they felt like what was described in the statement using a five-point response scale ranging from "never" to "almost always." Scale score is the mean of items included in the scale. Higher scores on the Depression and Anxiety scales reflect more often experiencing depressive and anxiety symptoms. Higher scores on the Self-esteem scale indicate higher self-esteem.

2.3. Analysis

All analyses were done using SPSS. To identify distinct groups of crack cocaine smokers with HIV infection a cluster analysis was performed using the TwoStep algorithm, a method suited to the use of categorical variables. Similarity between clusters was determined using the log-likelihood distance method. Determination of the optimal number of clusters was performed automatically using the Bayesian Information Criterion (Norusis, 2004). Measures for inclusion in the cluster analysis were selected based on three criteria. First, measures had to be current behaviors. Second, all measures were related to HIV risk. Third, only those HIV risk behaviors that were generally distributed among the participants were included. For example, very few participants (n = 17) reported injecting drugs, so this variable was not used to generate clusters. To generate the clusters we used five dichotomized variables: daily or less than daily crack cocaine use; more than two sex partners (yes/no response); whether participants had traded sex for money (yes/no response), whether participants had traded sex for drugs (yes/no response); and consistent (always) or inconsistent (less than always) condom use. Differences in proportions across clusters were assessed using chi-square tests. The clusters were then compared, using one-way analysis of variance with Scheffe's post-hoc test and chi-square tests as appropriate, with regard to sociodemographics, drug use and sexual risk behaviors, sexual context of the last sexual encounter, psychological motivation for condom use, HIV concealment, and psychological functioning. The level of significance for analyses was set at $p \leq .05$.

3. Results

Two hundred and fifty-eight individuals participated in the study, of whom 120 (47%) were male and 138 (53%) female. The average age was 43 years (range 22 – 63, sd = 7.6; median = 44.0). Fifty percent had less than twelve years schooling. Seventy-four percent were single

at the time of the interview. Fifty-six percent reported some form of public assistance as their major source of income. The average time since participants were diagnosed with HIV infection was 9.1 years.

3.1. HIV risk cluster solution

The cluster analysis produced three distinct groups based on five HIV drug use and sexual risk behaviors (Table 1). Ratio of BIC changes was .597 and ratio of distance measures was 1.822. Comparisons of centroid confirmed a 3 cluster solution. Based on the most salient characteristics of each cluster, they were named the highest risk group, the consistent condom use group, and the inconsistent condom use group.

The largest cluster, the highest risk group, consisted of 43% of participants, and roughly equivalent numbers of males (52) and females (59). As the name of the cluster implies, larger proportions of this group engaged in HIV-related drug use and sexual risk behaviors than the other two clusters. As shown in Table 1, one half of the members in this risk group smoked crack cocaine more than once a day and the vast majority had had multiple partners in the past month. Two-thirds had traded sex for money and more than half had traded sex for drugs. All members of the highest risk group inconsistently used condoms.

The second cluster, the consistent condom use group, was the smallest, with 21% of participants. The cluster was essentially evenly distributed across genders with 29 males and 25 females. As their name implies, the distinguishing feature of this cluster was that all members consistently used condoms. Some nevertheless engaged in drug use and sexual risk behaviors. More than one third reported having smoked crack daily and almost one third had had multiple partners in the past 30 days. One fifth had traded sex for drugs or money respectively.

The third cluster, the inconsistent condom use group, was the second largest cluster consisting of 36% of participants. Unlike the other two clusters, genders were less evenly distributed, being 39 males and 54 females. HIV risk in this group was related to sexual behavior, as the name of the cluster implies, all members inconsistently reported using condom during vaginal sex. In addition, risk was low on other measures. Participants reported having smoked crack cocaine less than once a day. None had sex partners outside of their relationship or had traded sex for drugs and/or money.

3.2. Comparisons across the HIV risk groups

Sociodemographic charactersitics—There were significant differences in marital status, source of income, and years since HIV diagnosis across the HIV risk groups as shown in Table 2. In comparison to the other two groups, a significantly higher proportion of members in the inconsistent condom use group were married or lived as being married and had public assistance as their source of income. The highest risk group, in comparison to the other two groups, had a higher proportion of members whose source of income was illegal (including trading). Members of the consistent condom use group were more likely than the inconsistent condom use group to have been diagnosed with HIV more recently

Drug use risk behaviors—As shown in Table 2, there were significant differences in drug use risk behaviors across the three HIV risk groups. Members of the highest risk group reported having smoked crack cocaine two times more than those in the inconsistent condom use group. Compared to the other two risk groups, the highest risk group drank alcohol more often, on average almost twice a day. Close to two-thirds had binge used crack cocaine and a fifth had used powder cocaine.

Sexual risk behaviors—Members of the highest risk group, as compared to the other two risk groups had higher average numbers of sexual partners and higher average times been trading sex for drugs and trading sex for money. Greater proportion of the highest risk group also had same gender sex partners.

Sexual context of the most recent sex partner—As shown in Table 3, there were significant differences across HIV risk groups by type of the most recent sex partner, partner's HIV serostatus known, proportion of recent sex partners that were HIV serodiscordant, condom use with the most recent sex partner, and condom use with partner whose HIV serostatus was known/unknown. Compared to the other two groups, a significantly higher proportion of the most recent sex partners of members of the inconsistent condom use group were main partner. While almost all participants reported knowing the HIV serostatus of their main partner, a significantly higher proportion of the inconsistent condom use group compared to the other two groups knew the status of their casual partner. There was no apparent variation across groups in the proportion of main and trade sex partners who were HIV-serodiscordant. However, almost all of the casual sex partners of the consistent condom use group were HIV serodiscordant. Members of this group used condoms with their most recent sex partner regardless of his/her HIV-status or whether the HIV serostatus was known to the participant. Members of the consistent condom use group reported less than half the frequency of vaginal sex encounters in the past month compared to the other two groups ($F = 9.619$, $p < .001$).

Psychological motivation for condom use, HIV concealment, and psychological functioning—While there were significant interrelationships among the three scales measuring psychological motivation for condom use, there were no associations between the motivational scales, HIV concealment, and psychological functioning. There were statistically significant differences in psychological motivation for condom use, HIV concealment, and psychological functioning across the three groups. As shown in Table 4, members of the consistent condom use group had significantly higher level of condom use responsibility and condom use emotional self-efficacy, and less negative attitudes towards condom use. Members of the inconsistent condom use group were significantly more open about their HIV serostatus than was the highest risk group. While the overall ANOVA of the Depression Scale was statistically significant, pair-wise comparisons did not show significant differences. Yet, the highest risk group showed a tendency to report more often experiencing depressive symptoms.

4. Discussion

Consistent with the literature (Adimora et al., 2006; Avants et al., 2000, Campsmith et al., 2000; Kwiatkowski and Booth 1998, Timpson et al., 2003), findings from this study strongly support a conclusion that African-American crack cocaine smokers with HIV infection engage in high-risk drug use and sexual behaviors that increase the risk of HIV transmission, including smoking crack cocaine, inconsistent condom use, unprotected sex with HIV serodiscordant partners, sex with multiple partners, and trading sex for money or drugs. However, we hypothesized that crack cocaine smokers with HIV infection are not homogeneous, but differ with regard to levels of drug use and sexual risks. We also hypothesized that the characteristics would differ across clusters.

Results of the cluster analysis support the first hypothesis. Three homogeneous clusters of HIV-seropositive crack cocaine smokers were identified: the highest risk group; the consistent condom use group; and the inconsistent condom use group. The most salient features of the highest risk group were daily crack cocaine smoking, multiple sex partners, trading sex for money and/or drugs, and inconsistent condom use. The distinguishing feature of the consistent condom use group was that all members consistently used condoms. The significant attribute

of the inconsistent condom use group was, as the name implies, inconsistent condom use among all its members.

The second hypothesis was also supported as characteristics of those in the clusters differed. The highest risk group presented an HIV risk profile that was in many ways consistent with the risk profile most commonly associated with crack cocaine smoking; that is, individuals in the group presented numerous drug use and sexual risk behaviors. The majority of the individuals in the highest risk group used crack to the degree of binging, some also used powder cocaine, and alcohol was frequently used. In addition to multiple sex partners and trading sex for money and/or drugs, some of the men in the highest risk group had sex with same gender partners. Given that members in the highest risk group reported inconsistent condom use when having heterosexual sex, it could be assumed that it is the same for homosexual contacts although data were not available.

Members of this cluster not only engaged in high-risk sex, but smoked crack frequently. Sexual risk behaviors presented by those in the highest risk group were significantly associated with frequent crack cocaine smoking (data not shown). High risk sexual behaviors may be a function of frequent crack cocaine smoking, but it is equally plausible that frequent crack cocaine smoking may be a consequence of high risk sexual behaviors, especially among those trading sex for money or drugs. The majority of those in the highest risk group had HIV serodiscordant casual and trade partners. The relatively high rates of HIV serodiscordant sex partners suggests that, among those who engage in high risk behaviors, including inconsistent condom use, the lack of condom use may be the norm rather than the exception. This conclusion is supported by the relatively high proportion of no condom use regardless of partner's HIV serostatus or whether partner's HIV serostatus was known. At the very least, the data indicate that there is a great potential for sexual transmission of HIV.

Members of highest risk group tended to report more often experiencing depressive symptoms. This suggests that condom use or motivations to use condoms may not be associated with depressive symptoms. Rather, it would seem that depressive symptoms are a function of stress related to using and procuring crack. On the other hand, crack cocaine smokers who are distressed may engage in HIV sexual risk behaviors as a compensation strategy in their efforts to re-stabilize psychological equilibrium. Within such a context sex plays the role of a psychological stabilizer or as a distracting mechanism (Schorsch, 1989).

The consistent condom use group contradicts earlier studies (Cottler et al., 1998; Deren et al., 1998) and common assumptions about drug users. Findings showed that a subgroup of crack cocaine smokers with HIV infection consistently and perhaps purposefully practice safer sex. The majority of those in the consistent condom use group had HIV serodiscordant main, casual and trade partners. Slight inconsistencies in reporting condom use the last time a participant had sex by a very small number of this group suggests that condom use may not be as consistent as members professed. It is also possible that the inconsistencies between condom use reports are due to reporting error. Still, condom use in this group appeared to be remarkably consistent regardless of partner type, partner's HIV serostatus, and whether or not partner's HIVserostatus was known. Findings suggest that condom use in this group may not be situationally oriented. The consistent condom use group had higher scores on measures of psychological motivation for condom use. However, it is impossible to tell if members of this group have accepted condom use as means of limiting the risk of HIV transmission because they found condom use acceptable or because they made the effort to make condom use acceptable. It is also of note, similar to Latka et al.'s (2006) and Wolitski et al.´s (2004) findings, that consistent condom users had a strong sense of responsibility for using condoms. Another characteristic of the members in the consistent condom use group was that they had, on average, been aware of their HIV diagnosis for a shorter period of time. This finding may support other studies

suggesting that the longer a person lives with HIV infection the more likely they feel condom use fatigue and taken less sexual precaution.

As the name of the inconsistent condom use risk group suggests, the primary risk behavior that distinguished this group was inconsistent condom use. It is possible that members of this group were attempting to limit the risk of HIV transmission by restricting the number of sex partners and not exchanging sex for money or drugs. The vast majority of the members in the inconsistent condom use group had a main partner and almost all knew the HIV serostatus of this partner. A large proportion of the main partners had a HIV serodiscordant status and there was a high proportion of lack of condoms when having sex with a serodiscordant main partner. Thus, there is within such a context a potential for sexual transmission of HIV. Almost all members in the inconsistent condom use group were aware of the HIV status of their casual partners and the majority used condoms with these partners. In those few cases when HIV serostatus of casual partner was unknown condoms were not used. While the inconsistent condom use group was less likely to conceal their HIV serostatus in general, we do not know to what extent participants disclosed their HIV serostatus to their sex partners. In some cases, it is possible that the partner may have been informed about a participant's HIV seropositive status and the partner agreed to have sex without condom.

This study has several limitations. Data were not drawn from a random sample. This limits the degree to which results can be generalized to other groups of not-in treatment heterosexual adult crack cocaine smokers with HIV infection. While limiting the sample to African American crack cocaine smokers controlled for the effects of race/ethnicity and drug use, it also limits the ability to draw conclusions about heterosexuals who may use other drugs or about crack cocaine smokers in other racial/ethnic groups. However, the latter concern is attenuated somewhat because, at least in the United States, crack is predominantly located in African American inner city communities. Study results are also limited because data were self-reported, which may be affected by recall and social desirability. The cluster solution may also be limited by the selection of variables used in generating the cluster solution. On the other hand, the cluster solution chosen is empirically sound and reflects significant variations in risk behaviors among crack cocaine smokers with HIV infection. Finally, as the design of the study was cross-sectional, causal associations can be inferred but not established.

In summary, the findings of this study support the variability of HIV sexual and drug use risk behaviors, sociodemographic characteristics, psychological motivation for condom use, HIV concealment, and psychological functioning in African-American crack cocaine smokers living with HIV infection. While members in the highest risk group presented numerous drug use and sexual risk behaviors, those in the consistent and inconsistent condom use groups, the majority of those in the sample, displayed much different, generally lower, HIV risk profiles. From this alone it appears that substantial numbers of HIV-seropositive crack cocaine smokers are attempting to limit the risk of HIV transmission, but may be using different and not necessarily recommended strategies for doing so. The findings presented by these two groups suggest that additional research is needed on the strategies that crack cocaine smokers with HIV infection may develop to address risk, and how they accept and adapt condom use as a prevention strategy. An important question to address in future research is whether consistent condom use is a permanent or temporary behavioral adaptation. Future research should also address how feelings of personal condom use responsibility interact with social relationships, peer norms, social environment, and sociodemographic characteristics to increase or inhibit condom use. Other areas for future research are the impact of HIV disclosure on sexual risk taking, whether disclosure differs by partner type, partner HIV serostatus, and unknown HIV serostatus, and the partner's condom use behaviors and attitudes.

It is noteworthy that the highest proportions of HIV serodiscordant sex partners in all clusters were casual or trade sex partners. This suggests that highest risk context may not involve main partners, as has been suggested for men who have sex with men, but might be a context involving sex between friends or trade partners. Yet, some members of the inconsistent condom use group do not use condoms with main partners, suggesting variability in condom use with different types of partners. It does not seem that this variability is associated with depressive symptoms, which appeared to be with overall risk behavior, but not condom use.

Our results suggest two major public health concerns related to the behaviors of crack cocaine smokers with HIV infection. The first concerns is that a large number of participants in the study inconsistently used condoms with serodiscordant main, casual, and trade sex partners. The second public health concern is directly a result of the first, the health of the participants and their sex partner is at continued risk. Engaging in unprotected sex, regardless of partner HIV serostatus, may lead to exposition to sexually transmitted infections and, if partner is HIV seroconcordant, there is the potential for transmitting and contracting different and possibly drug-resistant HIV strains. These public health concerns underscore that continued research priority must be on the underlying psychological, cognitive, contextual, and social dynamics of high HIV risk behaviors but also of low risk behaviors, including partner type and partner HIV serostatus.

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Table 1

Distribution of participants on measures used to generate clusters

	Highest risk group N = 111	Consistent condom use group N = 54	Inconsistent condom use group N = 93	χ^2 test
More than daily crack cocaine smoking	50 %	39 %	30 %	8.01*
More than two sex partners	88 %	30 %	0 %	165.81***
Traded sex for money	68 %	19 %	0 %	111.01***
Traded sex for drugs	56 %	20 %	0 %	79.93***
Inconsistent condom use	100 %	0 %	100 %	258.00***

* $p < .05$

*** $p < .001$

Table 2

Differences by HIV risk groups to drug use behaviors, sexual behaviors, and sociodemographic characteristics

	Highest risk group N = 111	Consistent condom use group N = 54	Inconsistent condom use group N = 93	Test statistics	
				F	χ^2 test
Drug use behaviors					
Mean times used crack, past 30 days	56.77[1–3]	44.63	27.47	5.83**	
Range	1 – 300	1 – 300	2 – 300		
Mean times used alcohol, past 30 days	54.17 [1–2, 1–3]	23.18	36.40	4.43**	
Range	1 – 240	2 – 180	1 – 300		
Binge crack use, past 30 days	62 % (69)	33 % (18)	41 % (38)		15.44*
Powder cocaine, past 30 days	19 % (21)	4 % (2)	7 % (6)		11.77*
Sexual behaviors					
Mean number of sex partner, past 30 days	6.31[1–2, 1–3]	2.26	1.00	23.25***	
Range	1 – 55	1 – 25	1 - 1		
Same gender sex	14 % (16)	7 % (4)	1 % (1)		12.09*
Mean times traded sex for drugs, past 30 days	5.49[1–2, 1–3]	.37	.00	16.22***	
Range	0 – 75	0 – 16	0 - 0		
Mean times traded sex for money, past 30 days	7.21[1–2, 1–3]	.61	.00	18.08***	
Range	0 – 100	0 – 16	0 - 0		
Frequency of condom use					293.46***
Never	16 % (18)	0 %	47 % (44)		
Less than half the time	27 % (30)	0 %	8 % (7)		
Half the time	37 % (41)	0 %	29 % (26)		
More than half the time	20 % (22)	0 %	16 % (15)		
Always	0 % (0)	100 % (54)	< 1 % (1)		
Sociodemographic characteristics					
Gender					1.91
Females	53 % (59)	47 % (25)	58 % (54)		
Males	47 % (52)	53 % (29)	42 % (39)		
Mean age	43.60	43.04	43.45	0.10	
Range	23 – 58	24 – 63	22 – 63		
Marital status					12.94**
Married	21 % (23)	15 % (8)	39 % (36)		
Single	79 % (88)	85 % (46)	61 % (57)		
Mean years schooling	11.22	11.09	11.38	0.31	
Range of years	5 – 18	5 – 17	7 – 16		
Major source of income					25.69*
Job	17 % (19)	22 % (12)	16 % (15)		
Public assistance	51 % (57)	48 % (26)	67 % (62)		
Family, friend	9 % (10)	15 % (8)	5 % (5)		
Illegal sources	13 % (15)	4 % (2)	3 % (3)		
No income	9 % (10)	11 % (6)	9 % (8)		
Mean years since HIV diagnosis	9.25	7.37 [2–3]	9.80	3.37*	
Range of years	0 – 22	0 – 22	0 – 23		

	Highest risk group N = 111	Consistent condom use group N = 54	Inconsistent condom use group N = 93	Test statistics

* p < .05

** p < .01

*** p < .001

Table 3

Differences in sexual context of the most recent sex partner across HIV risk groups

	Highest risk group N = 111 % (n)	Consistent condom use group N = 54 % (n)	Inconsistent condom use group N = 93 % (n)	χ^2 test
Partner type				50.89***
Main partner	44 % (49)	41 % (22)	86 % (80)	
Casual partner	45 % (50)	56 % (30)	14 % (13)	
Trade partner	11 % (12)	4 % (2)	0 %	
Main partner				2.74
HIV seroconcordant	51 % (25)	36 % (8)	56 % (45)	
HIV serodiscordant	49 % (24)	64 % (14)	44 % (35)	
HIV seroconcordant				16.04***
Condom use – yes	16 % (4)	88 % (7)	24 % (11)	
Condom use - no	84 % (21)	12 % (1)	76 % (34)	
HIV serodiscordant				15.27***
Condom use – yes	54 % (13)	93 % (13)	31 % (11)	
Condom use - no	46 % (11)	7 % (1)	69 % (24)	
Casual partner				7.12*
HIV seroconcordant	36 % (18)	10 % (3)	38 % (5)	
HIV serodiscordant	64 % (32)	90 % (27)	62 % (8)	
HIV seroconcordant				5.08
Condom use – yes	33 % (6)	100 % (3)	60 % (3)	
Condom use - no	67 % (12)	0 %	40 % (2)	
HIV serodiscordant				18.93***
Condom use – yes	44 % (14)	96 % (26)	50 % (4)	
Condom use - no	56 % (18)	4 % (1)	50 % (4)	
Trade partner				0.63
HIV seroconcordant	25 % (3)	0 %	0 %	
HIV serodiscordant	75 % (9)	100 % (2)	0 %	
HIV seroconcordant				*a)*
Condom use – yes	0%	0 %	0 %	
Condom use - no	100 % (3)	0 %	0 %	
HIV serodiscordant				*a)*
Condom use – yes	78 % (7)	100 % (2)	0 %	
Condom use - no	22 % (2)	0 %	0 %	
Main partner				1.34
Serostatus known	90 % (44)	91 % (20)	95 % (76)	
Serostatus unknown	10 % (5)	9 % (2)	5 % (4)	
Serostatus known				28.28***
Condom use – yes	32 % (14)	90 % (18)	26 % (20)	
Condom use - no	68 % (30)	10 % (2)	74 % (56)	
Serostatus unknown				1.49
Condom use – yes	60 % (3)	100 % (2)	50 % (2)	
Condom use - no	40 % (2)	0 %	50 % (2)	
Casual partner				7.16*
Serostatus known	56 % (28)	50 % (15)	92 % (12)	
Serostatus unknown	44 % (22)	50 % (15)	8 % (1)	
Serostatus known				13.59**
Condom use – yes	43 % (12)	100 % (15)	58 % (7)	
Condom use - no	57 % (16)	0 %	42 % (5)	
Serostatus unknown				13.29**
Condom use – yes	36 % (8)	93 % (14)	0 %	
Condom use - no	64 % (14)	7 % (1)	100 % (1)	
Trade partner				0.64
Serostatus known	75 % (9)	100 % (2)	0 %	
Serostatus unknown	25 % (3)	0 %	0 %	
Serostatus known				1.40
Condom use – yes	56 % (5)	100 % (2)	0 %	
Condom use - no	44 % (4)	0 %	0 %	
Serostatus unknown				*a)*
Condom use – yes	67 % (2)	0 %	0 %	
Condom use - no	33 % (1)	0 %	0 %	

a) too few cells

* $p < .05$

** $p < .01$

*** $p < .001$

Table 4

Mean scores for psychological motivation for condom use, HIV concealment, and psychological functioning by HIV risk groups

	Highest risk group N = 111	Consistent condom use group N = 54	Inconsistent condom use group N = 93	F
Attitudes toward condom use *a)*	5.03	3.29 [2-1, 2–3]	5.05	7.41**
Condom use emotional self-efficacy *b)*	7.00	8.97 [2-1, 2–3]	6.89	14.09***
Condom use responsibility *c)*	7.91	9.64 [2-1, 2–3]	6.56	20.08***
HIV concealment *d)*	4.90	4.60	3.60 [3-1]	6.97**
Anxiety symptoms *e)*	3.18	2.96	3.20	2.33
Depressive symptoms *f)*	3.18	2.92	2.99	3.54*
Self-esteem *g)*	3.10	3.33	3.34	2.62

a) Higher score indicates more negative attitudes toward condom use

b) higher scores indicate greater feelings of condom use self-efficacy

c) higher scores indicate greater feelings of condom use responsibility

d) higher scores indicate greater HIV concealment

e) higher scores indicate more often experiencing anxiety symptoms

f) higher scores indicate more often experiencing depressive symptoms

g) higher scores indicate higher self-esteem.

* $p < .05$

** $p < .01$

*** $p < .001$