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Gender Differences in the Rates and Correlates of HIV Risk Behaviors Among Drug Abusers

AUDREY BROOKS¹, CHRISTINA S. MEADE^{2,3,4}, JENNIFER SHARPE POTTER^{3,4,5}, YULIYA LOKHNYGINA⁶, DONALD A. CALSYN^{7,8}, and SHELLY F. GREENFIELD^{3,4}

¹Department of Psychology, University of Arizona, Tucson, AZ 85721

²Department of Psychiatry and Behavioral Sciences, Duke University School of Medicine, Durham, NC 27708

³Alcohol and Drug Abuse Treatment Program, McLean Hospital, Belmont, MA 02478

⁴Department of Psychiatry, Harvard Medical School, Boston, MA 02478

⁵University of Texas Health Science Center at San Antonio, San Antonio, TX 78229

⁶Duke Clinical Research Institute, Duke University, Durham, NC 27705

⁷The Department of Psychiatry and Behavioral Science, University of Washington School of Medicine, Seattle, WA 98105

⁸Alcohol and Drug Abuse Institute, University of Washington, Seattle, WA 98105

Abstract

This study examined gender differences in the rates and correlates of HIV risk behaviors among 1,429 clients participating in multi-site trials throughout the United States between 2001 and 2005 as part of the National Institute on Drug Abuse-funded Clinical Trials Network. Women engaged in higher risk sexual behaviors. Greater alcohol use and psychiatric severity were associated with higher risk behaviors for women, while impaired social relations were associated with decreased risk for men. Specific risk factors were differentially predictive of HIV risk behaviors for women and men, highlighting the need for gender-specific risk-reduction interventions. Limitations of the study are discussed.

Keywords

HIV risk behavior; gender; substance user treatment; women; sex risk

Introduction

The HIV/AIDS epidemic is a health crisis among women in the United States. Between 1985 and 2001, the proportion of HIV/AIDS cases among women more than tripled from 8% to 26% (CDC, 2005). The primary route of HIV transmission for women is heterosexual contact (CDC, 2005), and drug use plays a role in a substantial proportion of these cases. Non-injection drug use (non-IDU) contributes to the spread of HIV infection by increasing

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Address correspondence to Audrey J. Brooks, PhD, Department of Psychology, University of Arizona, PO Box 210068, Tucson, AZ 85721, 520-626-9500 office, 520-621-8421 fax. brook-saj@email.arizona.edu.

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the likelihood of engaging in sexual risk behaviors¹ including contact with multiple partners, unprotected intercourse, and sex trading (Booth, Kwiatkowski, and Chitwood, 2000; Chitwood, Comerford, and Sanchez, 2003). While both men and women drug users are at risk for HIV infection due to sexual risk behavior, there is some evidence suggesting that transmission of infection is more likely with heterosexual contact with an infected male and his female partner than an infected female and her male partner (Gilbert et al., 2003; Kramer and Shearer, 2002; Leynaert, Downs, and de Vincenzi, 1998). In addition, women may be more vulnerable to certain psychosocial risk factors, such as psychiatric symptoms, sexual/physical abuse, and poverty, than men, thereby increasing the likelihood of engaging in high-risk behaviors. In order to develop effective HIV prevention intervention strategies targeting drug-involved women and men, it is important to identify potential gender differences in the patterns of HIV risk behaviors and associated risk factors.

Prior research indicates gender differences in the frequency of HIV sexual and drug risk behaviors among drug-involved individuals. With regard to injection risk behaviors, women were less likely to report ever injecting (Kwiatkowski and Booth, 2003; Shuter et al., 1999; Wright et al., 2007). However, female injectors were more likely to share needles and paraphernalia, report being injected by another person, and have a sex partner who injects (Bennett, Velleman, Barter, and Bradbury, 2000; Evans et al., 2003; Montgomery et al., 2002). Studies on overall sexual risk behavior in drug users have yielded conflicting findings; some have found that women have higher risk (Elifson, Klein, and Sterk, 2006; Rowan-Szal, Chatham, Joe, and Simpson, 2000), and others have found that men do (Absalon et al., 2006). However, studies have consistently found that women are more likely to be sexually active (e.g., Deren, Estrada, Stark, and Goldstein, 1998; Metsch et al., 1995; Rasch et al., 2000; Tortu et al., 1998; Tyndall et al., 2002), engage in sex trade (e.g., Tyndall et al., 2002), and have higher risk partners (Absalon et al., 2006; Evans et al., 2003; Miller and Neaigus, 2002). No clear pattern of gender difference has been found in multiple partner contact; some studies have reported no gender difference in contact with multiple partners (e.g., Booth, 1995; Falck, Wang, Carlson, and Siegal, 1997; Miller and Neagus, 2002; Sanchez, Comerford, Chitwood, Fernandez, and McCoy, 2002), while other studies have found women more likely to have multiple partners (e.g., Camacho, Brown, and Simpson, 1996; Deren et al., 1998; Ross, Timpson, Williams, and Bowen, 2003; Tortu et al., 1998). In yet another study, men were more likely to have multiple partners (e.g., Kwiatkowski and Booth, 2003). Many studies have found no gender difference in unprotected intercourse (e.g., Booth, 1995; Falck et al., 1997; Inciardi, 1995; Joe and Simpson, 1995; Rasch et al., 2000; Sanchez et al., 2002).

An extensive body of research has identified multiple risk factors for HIV risk behaviors in general, such as homelessness or unstable housing (Royce et al., 2000; Somlai, Kelly, Wagstaff, and Whitson, 1998; Wenzel et al., 2004), psychological distress or co-occurring mental illness (Carey et al., 2004; McKinnon, Cournos, and Herman, 2001; Meade and Sikkema, 2005; Sterk, Thall, and Elifson, 2006), childhood abuse (Arriola, Loudon, Doldren, and Fortenberry, 2005; Cunningham, Stiffman, Dore, and Earls, 1994; Kang, Deren, and Goldstein, 2002), and recent incarceration (Tyndall et al., 2002). A growing body of research suggests that stimulant use is associated with both high-risk sexual and drug behaviors (Booth et al., 2000; Braine, Des Jarlais, Goldblatt, Zadoretsky, and Turner, 2005; Buchanan et al., 2006; Campsmith, Nakashima, and Jones, 2000; Lorvick, Martinez,

¹The reader is reminded that the concept of “risk behaviors” and/or “being at risk” is often noted in the literature, without adequately noting relevant dimensions (linear, non-linear), its “demands,” the critical necessary conditions (endogenously as well as exogenously; from a micro to a macro level), which are necessary for the posited “risk” to operate (begin, continue, become anchored and integrate, change as de facto realities change, cease, etc.) or not to operate, and whether its underpinnings are theory-driven, empirically based, individual and/or systemic stake holder-bound, based upon “principles of faith,” historical observation, or what. This is necessary to clarify and consider if the term is not to remain as yet another shibboleth in a field of many stereotypes.

Gee, and Kral, 2006; Raj, Saitz, Cheng, Winter, and Samet, 2007). Studies examining the association between alcohol use and high-risk behaviors have been mixed, with some studies finding evidence for the relationship (Matos et al., 2004; Stein et al., 2000, 2005), and others finding no association (Leigh, Ames, and Stacy, 2008; Raj et al., 2007; Rees, Saitz, Horton, and Samet, 2001).

Few studies have examined whether these relationships vary with gender, despite evidence that specific social and contextual factors may place women at greater risk for engaging in HIV sexual and drug use-associated risk behaviors (Logan, Cole, and Leukfeld, 2002). For example, in one study injection crack use was associated with increased sexual risk behavior for women but not men (Buchanan et al., 2006), while another study found that amphetamine use was associated with decreased condom use for males but not females (Leigh et al., 2008). Similarly, alcohol use was related to multiple sex partners (Bogart et al., 2005a) and high-risk sexual behaviors (Hutton, McCaul, Santora, and Erbeling, 2008; Rees et al., 2001) for women but not men. High-risk sexual activity was also found to be associated with greater psychiatric symptoms (Meade and Sikkema, 2007), greater depression (El-Bassel, Simoni, Cooper, Gilbert, and Schilling, 2001; Rees et al., 2001), and emotional distress (Serk et al., 2006) among women. Similarly, childhood physical and emotional abuse was more prevalent in women with a sex exchange history than women without a similar history; while only the relationship between childhood physical abuse and participating in sex exchange was present for men (Logan, Cole, and Leukfeld, 2003).

Inconsistent findings in the literature may be in part due to the variation in samples studied. For example, studies have examined high-risk drug use and sex behaviors in HIV-positive individuals, needle exchange program participants, sex trade workers, current street users, and substance abuse treatment² participants. In addition, the number of women in these studies was often too small to conduct gender comparisons. Other studies have examined HIV risk factors in women only samples, precluding an examination of gender differences. Further, variations in definitions of high-risk behaviors and time frames across studies make it difficult to arrive at general conclusions to inform HIV prevention interventions. Given that substance user treatment programs present an ideal setting for delivering HIV prevention interventions and HIV prevention education is often delivered as a part of substance user treatment, it is important to examine the pattern of HIV risk behaviors and associated risk factors in a large sample of substance user treatment participants.

The National Institute on Drug Abuse (NIDA) Clinical Trials Network (CTN) (Hanson, Leshner, and Tai, 2002) offers a unique opportunity to study gender-related HIV transmission risk behaviors of men and women entering substance user treatment. By pooling data across protocols, a large, ethnically and geographically diverse treatment sample can be obtained. In addition, combining data across CTN protocols allows us to systematically examine multiple HIV risk factors with a sufficient sample size to examine gender differences. The purpose of this study was to examine the prevalence and correlates of sexual and drug use-related HIV risk behaviors in a large sample of treatment-seeking individuals with substance use disorders participating in five multi-site trials of the NIDA CTN. The specific aims were to (1) examine gender differences in HIV risk behaviors in this large, ethnically diverse sample of drug users, and (2) test whether multiple risk factors for

²Treatment can be briefly and usefully defined as a planned, goal-directed, temporally structured change process of necessary quality, appropriateness, and conditions (endogenous and exogenous), which is *bounded* (culture, place, time, etc.) and can be categorized into professional-based, tradition-based, mutual-help-based (AA, NA, etc.) and self-help ("natural recovery") models. There are no unique models or techniques used with substance users—of whatever types and heterogeneities—which are also not used with non-substance users. In the West, with the relatively new ideology of "harm reduction" and the even newer Quality of Life (QOL) treatment-driven model, there is now a new set of goals in addition to those derived from/associated with the older tradition of abstinence-driven models. Editor's notes.

HIV risk behaviors differ by gender. Specifically, this study examined whether gender moderates the impact of stimulant use, alcohol use, psychiatric symptoms, abuse history, family/social relations, housing stability, drug use severity, and legal status on HIV risk behaviors.

We hypothesized that women would engage in higher rates of risky sexual behavior overall. Further, we expected that psychiatric symptoms, sexual/physical abuse history, and drug use severity would be associated with greater sexual risk behavior for women but not men. In the context of multiple stressors such as these, women may focus on immediate survival at the expense of safety (Logan and Leukefeld, 2000; Logan et al., 2002). For this reason, women may experience greater difficulty negotiating HIV prevention behaviors in high-risk situations. Based on prior research, we hypothesized that men would be more likely to inject drugs and that women would be more likely to engage in high-risk drug use-related behaviors. For both men and women, we hypothesized that stimulant use would be associated with higher sexual risk compared to opiate use. Current research indicates that the culture surrounding the current stimulant use epidemic will affect women and men equally (Logan et al., 2002).

Methods

Participants and Procedures

The NIDA CTN is a network of universities and community treatment programs that conduct multi-site effectiveness trials of promising evidence-based drug user treatments throughout the United States (Hanson et al., 2002). Consistent with National Institute of Health (NIH) data-sharing policy, archived CTN data sets are available for secondary analysis (www.ctndatashare.org). Accompanying the data sets are guidelines and recommendations for appropriate use of the data sets.

In the present analysis, randomized participants in five CTN multi-site-controlled clinical trials were included (data downloaded May 2007). Table 1 provides a brief summary of the trials and number of participating sites. Participants in four of the five trials were recruited into the CTN trial upon treatment entry (CTN-001, CTN-002, CTN-005, and CTN-006). In the fifth protocol (CTN-007) the sample was recruited from treatment-seeking methadone maintenance clients with an active stimulant use problem evidenced by stimulant positive urine toxicology. Detailed reports of the five trials are also available from the CTN dissemination library (<http://ctndisseminationlibrary.org>). The five trials utilized common assessment measures, affording an opportunity to examine HIV risk behaviors in treatment-enrolled individuals across geographic locales in a large and demographically diverse sample. A comparison of demographic characteristics between protocols is presented in Table 2. As expected, there was some variation in participant profiles between protocols, and these differences were controlled for as needed in subsequent analyses. However, the goal of the present study was to obtain a large, heterogeneous sample of treatment-enrolled individuals in order to examine the hypothesized relationships between risk factors and HIV risk behavior by gender.

All participants with complete data (1,429 out of 1,627, 88%) were included in the secondary analyses. A majority of the 198 participants excluded from the analyses were missing the primary drug or sex risk-dependent variable ($N = 190$). In addition, three participants were missing gender and 12 were missing age.

Measures

HIV risk behaviors were assessed using the HIV Risk Behavior Scale (HRBS; Darke, 1998; Darke, Hall, Heather, Ward, and Wodak, 1991). This 12-item instrument assesses the extent

to which respondents have engaged in drug risk behaviors (six items) and sex risk behaviors (six items) during the prior 30 days. Items are rated on a 6-point scale with higher scores indicating higher risk. The HRBS composite scores with demonstrated reliability and validity (Petry, 2001) may be calculated by summing the individual drug and sex risk items. Drug use-related risk behaviors assessed are frequency of injection drug use, needle sharing, and needle cleaning. Sexual risk behaviors assessed are number of partners, trading sex, anal sex, and condom use. In addition to sex and drug composite scores, the HRBS was used to examine gender differences in specific HIV risk behaviors: (1) needle sharing, (2) needle cleaning, (3) sex with two or more partners, and (4) any unprotected sex.

Potential predictors of HIV risk behaviors and sociodemographic variables were obtained using the Addiction Severity Index-Lite (ASI-L; McLellan et al., 1992). The ASI-L is a standardized, multidimensional, semi-structured, comprehensive clinical interview that provides sociodemographic and substance use histories, as well as the following ASI composite scores for six functional domains commonly affected in substance users: alcohol and drug use severity, medical, psychiatric, legal, family/social, and employment/support. Sociodemographic variables included were gender, age, years of education, ethnicity (White, African-American, Hispanic, and others), employment status (full-time, part-time, and others), and living arrangement (with sexual partner or not).

Based on the available evidence and our research questions, the ASI-L composite scores for alcohol severity, drug severity, family/social relationships (a measure of current conflicts and seriousness of interpersonal problems with both family and social network members), psychiatric symptom severity, and legal problems (a measure of current legal system involvement and engagement in illegal activities) were examined for association with HIV drug use-related risk and sexual risk behaviors. Opioid and stimulant use was of particular interest in the analysis. Thus, participants who used opioids and/or stimulants were identified as follows: opioid users with no stimulant use, stimulant users with no opioid use, and users of both opioids and stimulants. A final category included substance users who had used neither opioids nor stimulants. Lifetime trauma was defined as lifetime physical abuse only, lifetime sexual abuse only, and both lifetime physical and sexual abuse. Housing stability was a continuous variable defined as length of stay at present address.

Statistical Analyses

First, gender differences in sociodemographic characteristics and HIV risk behaviors were examined using chi-square tests for categorical variables and the Wilcoxon two-sample tests for continuous variables. Second, a series of models were conducted to identify variables associated with each of the two dependent variables: HIV drug risk and HIV sex risk (HRBS composite scores). Eight predictor variables were considered: (1) ASI alcohol use severity composite, (2) ASI drug use severity composite, (3) ASI family/social relationships composite, (4) ASI psychiatric symptoms severity composite, (5) ASI legal involvement severity composite, (6) stimulant use (reference category: opiates only or other drugs), (7) trauma history, and (8) housing stability. The ASI composites are scored on a scale from 0–1. In the present analysis, the ASI composite results are described using a clinically meaningful difference unit (0.1) as the measurement unit. In each model, both the main effect of the variable and its interaction with gender were considered. When interaction between gender and the variable was not statistically significant, it was omitted from the model. All models were adjusted for age, gender, years of education, ethnicity, employment status, and living arrangements as covariates known to be associated with HIV drug risk and HIV sex risk. All statistical tests were two-sided. A p -value $<.05$ was considered statistically significant.

The frequency distribution of the HRBS sex risk composite was non-normal. Therefore, for the analyses, three categories of risk were created: (1) low risk—score less than six (28.9% of the sample), (2) medium risk—score equal to six (53.6% of the sample), and (3) high risk—score greater than six (17.5% of the sample). Ordinal logistic regression analysis using partial proportional odds model was conducted to identify variables associated with sexual risk. Models of this type consider two or more logistic regression models simultaneously. In this case, the first model examined high versus medium/low risk, and the second model examined high/medium versus low risk. For each variable, the proportional odds assumption (i.e., whether the model coefficients were equal in both logistic regression models) was first tested. When this assumption was met, odds ratios were the same in both models. When this assumption was not met, separate odds ratios were estimated for each of the two models. Odds ratios greater than one indicate a positive association between the variable and increased sex risk behavior, while odds ratios less than one indicate a negative association. 95% confidence intervals (95% CI) were also computed. The HRBS drug use risk-associated behavior composite was normally distributed approximately. Therefore, for this series of analyses, linear regression models were used to identify variables associated with drug risk.

Results

Participant Characteristics

The sample included 790 men (55%) and 639 women (45%). Participant characteristics by gender are presented in Table 3. Women were more likely than men to be White (51% versus 47%) or African-American (39% versus 36%), and men were more likely than women to be Hispanic (9% versus 2%; $\chi^2(3) = 30.96, p = .0001$). Women were less likely than men to be employed full-time than men (42% versus 55%; $\chi^2(2) = 22.87, p = .0001$). They were also more likely than men to use stimulants as their primary drug (25% versus 18%; $\chi^2(3) = 11.16, p = .01$). Age, education, and living arrangements were comparable between men and women.

HIV Sexual and Drug Use-Related Risk Behavior by Gender

Table 4 presents the frequency of HIV sex and drug use-related risk behaviors during the past 30 days by gender. Almost two-thirds (62%) of the sample was sexually active in the past 30 days. Women were more likely to report multiple partners (20% versus 13%; $\chi^2(1) = 6.95, p = .008$) and unprotected sex with regular partners (82% versus 75%; $\chi^2(1) = 5.83, p = .016$). Women also had a higher sex risk composite score compared to men (mean (SD) 6.1 (3.0) found = versus 5.8 (3.0), $Z = 2.03, p = .043$). However, no gender differences were found for unprotected sex with a casual partner during trading sex, or anal intercourse.

Overall, 28% of participants reported injection drug use in the past 30 days. Among injectors, 66% were daily users, 57% inconsistently cleaned needles before using, and 34% shared needles. Men were more likely than women to report injection drug use (32% versus 24%; $\chi^2(1) = 11.24, p = .0008$); however, no gender differences were found in needle sharing, needle cleaning, or overall drug risk.

Correlates of Sexual Risk Behavior

The analysis of the HRBS sexual risk behavior composite score included the 892 participants who reported sexual activity in the past 30 days. Table 5 presents the results of the ordinal logistic regression analyses of the two outcomes: high-risk versus low/medium-risk and high/medium-risk versus low-risk. Separate odds ratios for the two outcomes are presented only if the proportional odds assumption was not met; otherwise, the odds ratios are the same in both models. Significant gender interactions were found for alcohol use

severity ($p = .018$), psychiatric severity ($p = .003$), and family/social relations' severity ($p = .015$). Greater alcohol use severity was associated with higher sexual risk for women but not men ($\chi^2(1) = 7.71, p = .005$ for women versus $\chi^2(1) = 0.32, p = .57$ for men). Women who had greater alcohol use severity had 1.11 times higher odds (per 0.1 unit increase in the ASI alcohol use composite; 95% CI = 1.03–1.20) of reporting higher sexual risk. Psychiatric severity was also associated with sexual risk for women but not men ($\chi^2(1) = 11.45, p = .0007$ for women versus $\chi^2(1) = 0.84, p = .36$ for men). Women who had greater psychiatric severity had 1.14 times higher odds (per 0.1 unit increase in the ASI psychiatric composite; 95% CI = 1.06–1.23) of reporting higher sexual risk. In contrast, family/social impairment was associated with sexual risk for men but not women ($\chi^2(2) = 11.1, p = .004$ for men versus $\chi^2(2) = 0.23, p = .89$ for women). Men with higher family/social impairment had 0.80 times lower odds (per 0.1 unit increase in the ASI family/social composite; 95% CI = 0.70–0.93) of reporting high sexual risk compared to moderate/low sexual risk.

Additional variables associated with higher sexual risk that did not differ by gender were stimulant use, drug use severity, sexual abuse history or sexual and physical abuse history, and legal involvement severity. Participants whose primary drug was stimulant (with or without opiates) use (compared to opiates alone or other drugs) had 1.57 times higher odds (95% CI = 1.06–2.31) of reporting high sexual risk compared to moderate/low sexual risk ($\chi^2(2) = 9.23, p = .01$). Participants with greater drug use severity had 1.30 times higher odds (per 0.1 unit increase in the ASI drug use composite; 95% CI 1.15–1.47) of reporting high risk versus medium/low risk ($\chi^2(2) = 18.02, p = .0001$). Participants who reported sexual abuse only (compared to no abuse) had 4.10 times higher odds (95% CI 2.07–8.15) of reporting high sexual risk versus medium/low risk ($\chi^2(2) = 9.99, p = .007$). Participants who reported sexual and physical abuse histories (compared to no abuse) had 1.82 times higher odds (95% CI = 1.21–2.75) of reporting higher sexual risk ($\chi^2(1) = 8.14, p = .004$). Finally, participants with higher legal involvement severity had 1.11 times higher odds (per 0.1 unit increase in the ASI legal status composite; 95% CI 1.03–1.18) of reporting higher sexual risk ($\chi^2(1) = 8.29, p = .004$). Housing stability was unrelated to sexual risk.

Correlates of HIV Drug Risk Behavior

The analyses of the HRBS drug use risk-associated behavior composite score included the 401 participants who reported any IDU in the past 30 days. Table 6 presents the results of the linear regression models for HIV drug risk behavior. A significant gender interaction was found only for alcohol use severity ($p = .023$). Women with greater alcohol use severity had higher HIV drug use risk-associated behavior ($\beta = 0.56$ per 0.1 unit increase in alcohol use composite, $p = .045$). For men, alcohol use severity was unrelated to HIV drug use risk-associated behavior ($p = .26$).

Variables associated with greater HIV drug use risk-associated behavior that did not differ by gender were drug use severity and sexual abuse history. Greater drug use severity was associated with higher drug use risk-associated behavior ($\beta = 0.67$ per 0.1 unit increase in drug use composite, $p = .009$). Participants with history of sexual abuse only (compared to no abuse) had lower drug use risk-associated behavior ($\beta = -2.37, p = .046$). All other variables (stimulant use as primary drug, psychiatric severity, family/social severity, housing stability, and legal involvement severity) were unrelated to HIV drug use-associated risk behavior.

Discussion

This study examined gender differences in the rates and correlates of HIV drug and sex risk behaviors in a large, multi-site sample of men and women seeking treatment for drug abuse. As hypothesized, we found that women had higher overall sexual risk than men, due in large

part to having multiple partners and unprotected sex with regular partners. Similarly, as hypothesized, men were more likely to inject drugs than women. An important finding of this study was that certain HIV risk factors differed among men and women. Specifically, we found significant gender interactions for alcohol use and psychiatric severity. Alcohol use was associated with increased engagement in both sex and drug use-associated risk behaviors for women but not men. Psychiatric severity was associated with engagement in higher sex risk behaviors in women. In contrast, we had an unexpected finding that greater impairment in family/social relations was related to less engagement in sex risk behaviors for men but not for women.

It was hypothesized that the presence of HIV risk factors would have a greater impact on a woman's HIV risk behaviors. As hypothesized alcohol use was associated with engagement in higher risk sex and drug use-associated behaviors for women but not men in this study. Although findings in the HIV risk behavior literature have reported mixed findings for the link between alcohol and HIV risk behaviors, studies incorporating gender into the analyses have found a similar relationship between alcohol use and HIV high-risk behavior for women (Bogart et al., 2005a; Hutton et al., 2008; Rees et al., 2001). Laboratory studies have consistently found a link between alcohol use and intent to engage in unsafe sex (see Hendershot and George, 2007) and poor condom negotiation skills (Gordon, Carey, and Carey, 1997). Alcohol expectancies have also been shown to predict risky sexual behaviors (Fromme, D'Amico, and Katz, 1999; Gordon et al., 1997; Kalichman, Weinhardt, DiFonzo, Austin, and Luke, 2002; Maisto, Carey, Carey, Gordon, and Schum, 2004). Thus, it is possible that alcohol use might have a greater impact on a woman's decision-making and negotiation skills during high-risk sexual and drug use-associated activities (Logan and Leukefeld, 2000; Logan et al., 2002). Future studies are needed to determine whether the consumption of alcohol with the expectation of social activity or to enhance sexual performance or pleasure influences HIV prevention negotiation skills differently for women than men.

The presence of psychiatric symptoms in women may impact decision-making and negotiation skills in a similar manner. In general, persons with co-occurring mental illness and substance use are more likely to engage in high-risk sexual activity (Dausey and Desai, 2003; Meade and Weiss, 2007). Relief from loneliness often experienced by individuals with psychiatric symptoms has been hypothesized to be one factor driving engagement in high-risk sexual activity for these persons (Meade, 2006; Meade and Weiss, 2007). Engaging in high-risk sexual behaviors may reflect the social affiliation needs of vulnerable women. In contrast, greater impairment in family/social relations was related to less engagement in sex risk behaviors for men but not for women. Men with social impairments may be less able to develop sexual relationships and, therefore, less likely to engage in high-risk sexual behaviors. Relationship theories of women's development posit that women may approach sexual activity as a bonding mechanism (Logan et al., 2002; Miller, 1987); thus, level of social and interpersonal skills may have less impact on women's sexual behavior. On the other hand men may need a minimal level of interpersonal skills in order to initiate and engage in sexual behaviors.

In the present study, women were more likely to report unprotected sex with regular partners but not with casual partners or in sex trading situations. In general, studies have found that being in a long-term relationship and involvement with a partner who is perceived as not at risk are the primary reasons given for lack of condom use (Bogart et al., 2005a, 2005b; Tortu, McMahon, Hamid, and Neaigus, 2000). However, other studies have found that condom use in a long-term relationship is discouraged or refused by the male partner (Libbus, 1995; Tortu et al., 2000; Weiss, Weston, and Quirinale, 1993). Similarly, there is a greater likelihood of female condom use in relationships with partner approval for condom

use and better AIDS communication (St. Lawrence et al., 1998). The inability to discuss condom use in a long-term relationship may be compromised if a woman has experienced intimate partner violence in her relationship (El-Bassel et al., 1998; Kalichman, Williams, Cherry, Belcher, and Nachimson, 1998; Wingood and DiClemente, 1997). Incorporating relationship status and behaviors into HIV risk-reduction interventions has been suggested as a means for educating substance users on the behavioral outcomes for casual and primary partners (van Empelen et al., 2003). As an example, a recent study demonstrated the feasibility of teaching safe sex negotiation skills to women with current or past abusive partners (Melendez et al., 2003).

Consistent with other studies, stimulant use, drug use severity, greater legal involvement, a history of both sexual and physical abuse, and sexual abuse history were associated with HIV sex risk behaviors for women and men. Greater drug use severity was also associated with engagement in higher risk drug use-associated behavior, while sexual abuse history was associated with lower engagement in drug use-associated risk behaviors. These findings are consistent with research on HIV risk factors conducted in other samples, thus confirming these associations in persons enrolled in substance user treatment and suggesting that interventions for both genders must address these risk factors.

Clinical Implications

The findings from the present study suggest that there is a context or culture in which HIV risk behaviors occur as well as individual differences in the presence of risk factors associated with engaging in HIV risk behaviors. Therefore, an understanding of these contextual and individual factors needs to be incorporated into the assessment of HIV risk behaviors and subsequent risk-reduction interventions. Providing comprehensive assessment and treatment of HIV risk behaviors as an integral part of substance user treatment is consistent with the recent characterization of substance abuse as a chronic, relapsing disorder (McLellan, Lewis, O'Brien, and Kleber, 2000) and advocacy for concurrent recovery monitoring (McLellan, McKay, Forman, Cacciola, and Kemp, 2005). Furthermore, while drug treatment itself is associated with HIV risk reduction (Sorensen and Copeland, 2000), targeted HIV prevention interventions delivered within drug user treatment programs lead to even greater HIV risk reduction (Prendergast, Urada, and Podus, 2001).

HIV risk-reduction efforts therefore need to expand beyond condom distribution, needle exchange programs, and basic HIV education in treatment programs to include comprehensive risk assessment and targeted interventions for sub-groups of women and men most vulnerable to HIV infection. Studies examining the characteristics of HIV assessment and intervention practices in community substance user treatment programs participating in the CTN found that while a majority of clinics provided some form of HIV education to clients, this was frequently a single session focused on providing basic information about HIV and risk behaviors associated with its transmission (Brown et al., 2006; Shoptaw et al., 2002). Recent meta-analyses and reviews of HIV risk-reduction interventions also support a more comprehensive approach to HIV risk reduction in substance user treatment programs. These reviews have found that interventions incorporating behavioral skills training, a greater number of interventions, multiple theories and methods, more intense emotional impact, and inclusion of peers or social networks were associated with better outcomes (Albarracin et al., 2005; Copenhaver et al., 2006; Prendergast et al., 2001; van Empelen et al., 2003). Two CTN sexual risk-reduction intervention protocols specifically targeting men and women in substance user treatment employed such a comprehensive approach and were able to demonstrate sexual risk reduction with both the women and men-targeted interventions (Calsyn et al., 2009; Tross et al., 2008). Therefore, in addition to targeting women and men separately, the content of the intervention may need to reflect the unique risk factors.

Limitations

The results of this study should be interpreted in light of the following limitations. The present study examined high-risk behaviors in the past 30 days in a sample of substance users entering treatment. It is possible that engaging in high-risk behaviors decreases prior to initiating treatment resulting in the lower incidence of high-risk behaviors found in the present study. In addition, some study participants had been receiving treatment services prior to enrolling in the study, e.g., methadone maintenance clinic sites, thus engagement in high-risk behaviors may be lower for these clients. The lower incidence of HIV risk behaviors due to the short recall period (30 days) may have limited the statistical power necessary to detect additional gender differences. Future studies of treatment-seeking individuals need to examine HIV risk behaviors over a longer time frame.

The cross-sectional design of the present study limits inferences of causality. Prospective longitudinal studies are needed to determine whether improvements in substance use, psychological distress, and family and social relationships as a result of substance user treatment are associated with decreased sexual risk. The use of a convenience sample of individuals who volunteered to participate in clinical trials may limit the generalizability of results. Furthermore, each of the five CTN protocols included in our analysis targeted a specific sub-sample of substance abusers with varying eligibility criteria. However, this limitation was addressed by the approach adopted in the present study. Combining samples across protocols and sites increased the heterogeneity of the sample, thereby increasing generalizability across treatment-seeking individuals.

This study also had a number of noteworthy strengths. Rising rates of HIV in women highlight the need to identify factors associated with risk behaviors in women. To that end, the present study adds to the existing literature with a systematic examination of potential gender differences in the relationship between psychosocial risk factors and HIV risk behaviors. The present study also highlighted specific gender differences in prevalence and correlates of HIV risk behaviors in persons entering treatment. In addition, the relationship between multiple risk factors and HIV risk behaviors was confirmed in a large, ethnically and geographically diverse sample of drug user treatment participants.

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Biographies

Audrey J. Brooks, Ph.D., is a research psychologist in the Department of Psychology at the University of Arizona. Dr. Brooks has been involved in program evaluation, clinical trials, and basic science research for over 20 years. During that time she has served as the

methodologist/statistician on several NIH-funded projects across a wide range of topics including substance abuse prevention and treatment, complementary and alternative medicine, and cancer prevention. She is a co-investigator with NIDA National Drug Abuse Treatment clinical trials network. Her research interests include gender and co-occurring disorders.

Christina S. Meade, Ph.D., is an assistant professor of psychiatry and behavioral sciences at Duke University School of Medicine and a member of the Duke Global Health Institute, the Duke Institute for Brain Sciences, and the Duke Center for AIDS Research. Dr. Meade has been funded by the NIDA, NIMH, and NIAID and the American Foundation for AIDS Research to conduct a series of studies examining predictors of HIV risk behavior in adults with substance use and psychiatric disorders, and the relationship between mental health and continued risk behavior in HIV-positive adults. She has a particular interest in the effects of gender and poverty on health outcomes.

Jennifer Sharpe Potter, Ph.D., M.P.H., is an assistant professor of psychiatry at the University of Texas Health Science Center at San Antonio and holds appointments in the Department of Psychiatry at Harvard Medical School and the Alcohol and Drug Abuse Treatment Program at McLean Hospital. She has a NIDA career development award focusing on developing treatments for co-occurring opioid dependence and chronic pain. She is a co-investigator with NIDA national drug abuse treatment clinical trials network.

Yuliya Lokhnygina, Ph.D. After receiving PhD in statistics from North Carolina State University in 2004, Dr. Lokhnygina joined the Department of Biostatistics and Bioinformatics at Duke University and Duke Clinical Research Institute as an assistant professor in biostatistics. She has been involved in design, development, and co-ordination of multiple clinical trials in cardiology, drug abuse, and pediatric rheumatology. Dr. Lokhnygina's research has been published in leading statistical and medical journals, such as *Biometrics*, *Circulation*, and *Journal of the American College of Cardiology*. Her primary

areas of expertise include statistical methods in clinical trials, survival analysis, causal inference, and adaptive designs.

Donald A. Calsyn, Ph.D., counseling psychologist, is a professor of psychiatry and behavioral science at the University of Washington School of Medicine and a research affiliate at the Alcohol and Drug Abuse Institute at the University of Washington. Prior to July 2004 he served as the director of outpatient services in the Addiction Treatment Center at the Department of Veterans Affairs, Puget Sound Health Care System. For nearly 25 years, Dr. Calsyn devoted his career to providing direct care treatment services to veterans with substance abuse disorders as well as evaluating the effectiveness of treatment interventions. For the last 18 years much of his research activities have focused on the prevention of HIV among drug-dependent individuals in treatment.

Dr. Shelly F. Greenfield, M.D., M.P.H., is an associate professor of psychiatry at Harvard Medical School, chief academic officer of McLean Hospital, and director, clinical and health services research and education, division of alcohol and drug abuse, McLean Hospital in Belmont, MA. Dr. Greenfield serves as principal investigator and co-investigator on federally funded research focusing on treatment for substance use disorders, gender differences in substance disorders, and health services for substance disorders. She is a current recipient of a career award in patient-oriented research from National Institute on Drug Abuse (NIDA) and a past recipient of a NIDA-funded early career award. Dr. Greenfield serves as the director of the Harvard Medical School/Partners Addiction Psychiatry Fellowship. She is a member of the board of directors of the American Academy of Addiction Psychiatry and is the editor-in-chief of the *Harvard Review of Psychiatry*. Dr. Greenfield serves on the addiction psychiatry committee of the American Board of Psychiatry and Neurology. She has been elected to the American College of Psychiatrists and is a distinguished fellow of the American Psychiatric Association.

Glossary terms

HIV risk behaviors

are those behaviors that carry a high risk of contracting HIV infection and are related to known modes of HIV transmission, e.g., blood, semen, vaginal fluids

HIV sexual risk behaviors

are sexual activities that increase a person's risk of being exposed to and possibly contracting HIV infection. For example, during unprotected sex HIV can infect mucous membranes directly or through cuts

HIV drug risk behaviors	are drug use activities that increase a person's risk of being exposed to and possibly contracting HIV infection. For example, sharing unclean needles can pass infected blood from one person to another
Multi-site trial	A multi-site trial involves multiple sites implementing the same intervention (protocol) while utilizing the same recruitment strategies and assessments. Study oversight and data analysis are centralized in a multi-site trial. The advantages of multi-site trials are larger samples, greater statistical power, and improved generalizability of findings
Secondary data analysis	Analysis conducted by researchers on data collected for another purpose. The questions addressed in a secondary analysis are not the same questions the study was originally designed to answer.

References

- Absalon J, Fuller CM, Ompad DC, Blaney S, Koblin B, Galea S, et al. Gender differences in sexual behaviors, sexual partnerships, and HIV among drug users in New York City. *AIDS and Behavior*. 2006; 10:707–715. [PubMed: 16676223]
- Albarracin D, Gillette JC, Earl AN, Glasman LR, Durantini MR, Ho M. A test of major assumptions about behavior change: a comprehensive look at the effects of passive and active HIV-prevention interventions since the beginning of the epidemic. *Psychological Bulletin*. 2005; 31:856–897. [PubMed: 16351327]
- Arriola KRJ, Loudon T, Doldren MA, Fortenberry RM. A meta-analysis of the relationship of child sexual abuse to HIV risk behavior among women. *Child Abuse & Neglect*. 2005; 29:725–746. [PubMed: 15979712]
- Bennett GA, Velleman RD, Barter G, Bradbury C. Gender differences in sharing injecting equipment by drug users in England. *AIDS Care*. 2000; 12(1):77–87. [PubMed: 10716020]
- Bogart LM, Kral AH, Scott A, Anderson R, Flynn N, Gilbert ML, et al. Sexual risk among injection drug users recruited from needle syringe programs in California. *Sexually Transmitted Diseases*. 2005a; 32:27–34. [PubMed: 15614118]
- Bogart LM, Kral AH, Scott A, Anderson R, Flynn N, Gilbert ML, et al. Condom attitudes and behaviors among injection drug users participating in California syringe exchange programs. *AIDS and Behavior*. 2005b; 9:423–432. [PubMed: 16249946]
- Booth RE. Gender differences in high-risk sex behaviors among heterosexual drug injectors and crack smokers. *American Journal of Drug and Alcohol Abuse*. 1995; 21:419–432. [PubMed: 8561095]
- Booth RE, Kwiatkowski CF, Chitwood DD. Sex-related HIV risk behaviors: differential risks among injection drug users, crack smokers, and injection drug users who smoke crack. *Drug and Alcohol Dependence*. 2000; 58:219–226. [PubMed: 10759032]
- Braine N, Des Jarlais DC, Goldblatt C, Zadoretzky C, Turner C. HIV risk behavior among amphetamine injectors at U.S. syringe exchange programs. *AIDS Education and Prevention*. 2005; 17:515–524. [PubMed: 16398574]
- Brown LS Jr, Kritz SA, Goldsmith RJ, Bini EJ, Rotrosen J, Baker S, et al. Characteristics of substance abuse treatment programs providing services for HIV/AIDS, hepatitis C virus infection, and sexually transmitted infections: the National Drug Abuse Treatment Clinical Trials Network. *Journal of Substance Abuse Treatment*. 2006; 30:315–321. [PubMed: 16716846]
- Buchanan D, Toozé JA, Shaw S, Kinzly M, Heimer R, Singer M. Demographic, HIV risk behavior, and health status characteristics of “crack” cocaine injectors compared to other injection drug users in three New England cities. *Drug and Alcohol Dependence*. 2006; 81:221–229. [PubMed: 16171952]
- Calsyn DA, Hatch-Maillette M, Tross T, Doyle SR, Crits-Christoph P, Song YS, et al. Motivational and skills training HIV/STI sexual risk reduction groups for men. *Journal of Substance Abuse Treatment*. 2009; 37:138–150. [PubMed: 19150206]

- Camacho LM, Brown BS, Simpson DD. Psychological dysfunction and HIV/AIDS risk behavior. *Journal of Acquired Immune Deficiency Syndromes*. 1996; 11:198–202.
- Campsmith ML, Nakashima AK, Jones JL. Association between crack cocaine use and high-risk sexual behaviors after HIV diagnosis. *Journal of Acquired Immune Deficiency Syndromes*. 2000; 25:192–198. [PubMed: 11103051]
- Carey MP, Carey KB, Maisto SA, Schroder KE, Venable PA, Gordon CM. HIV risk behavior among psychiatric outpatients: association with psychiatric disorder, substance use disorder, and gender. *Journal of Nervous and Mental Disease*. 2004; 192:289–296. [PubMed: 15060403]
- Carroll KM, Ball SA, Nich C, Martino S, Frankforter TL, Farentinos C, et al. Motivational interviewing to improve treatment engagement and outcome in individuals seeking treatment for substance abuse: a multisite effectiveness study. *Drug and Alcohol Dependence*. 2006; 81:301–312. [PubMed: 16169159]
- CDC. HIV/AIDS surveillance report, 2005. Rev ed. 2007. Vol. Vol. 17. US Department of Health and Human Services, CDC; Atlanta, GA: 2005. p. 1-46.
- Chitwood DD, Comerford M, Sanchez J. Prevalence and risk factors for HIV among sniffers, short-term injectors, and long-term injectors of heroin. *Journal of Psychoactive Drugs*. 2003; 35:445–453. [PubMed: 14986873]
- Copenhaver MM, Johnson BT, Lee I, Harman JJ, Carey MP, SHARP Research Team. Behavioral HIV risk reduction among people who inject drugs: meta-analytic evidence of efficacy. *Journal of Substance Abuse Treatment*. 2006; 31:163–171. [PubMed: 16919744]
- Cunningham RM, Stiffman AR, Dore P, Earls F. The association of physical and sexual abuse with HIV risk behaviors in adolescence and young adulthood: implications for public health. *Child Abuse & Neglect*. 1994; 18:233–245. [PubMed: 8199905]
- Darke S. Self-report among injecting drug users: a review. *Drug and Alcohol Dependence*. 1998; 51:253–263. [PubMed: 9787998]
- Darke S, Hall W, Heather N, Ward J, Wodak A. The reliability and validity of a scale to measure HIV risk-taking behavior among intravenous drug users. *AIDS*. 1991;181–185. [PubMed: 2031690]
- Dausey DJ, Desai RA. Psychiatric comorbidity and the prevalence of HIV infection in a sample of patients in treatment for substance abuse. *Journal of Nervous and Mental Disease*. 2003; 191:10–17. [PubMed: 12544594]
- Deren S, Estrada AL, Stark M, Goldstein M. Sexual orientation and HIV risk behaviors in a national sample of injection drug users and crack smokers. *Drugs & Society*. 1998; 9:97–108.
- El-Bassel N, Gilbert L, Krishnan S, Schilling RF, Gaeta T, Purpura S, et al. Partner violence and sexual HIV-risk behaviors among women in an inner-city emergency department. *Violence and Victims*. 1998; 13:377–393. [PubMed: 10328445]
- El-Bassel N, Simoni JM, Cooper DK, Gilbert L, Schilling RF. Sex trading and psychological distress among women on methadone. *Psychology of Addictive Behaviors*. 2001; 15:177–184. [PubMed: 11563794]
- Elifson KW, Klein H, Sterk CE. Predictors of sexual risk-taking among new drug users. *Journal of Sex Research*. 2006; 43:318–327. [PubMed: 17599253]
- Evans JL, Hahn JA, Page-Shafer K, Lum PJ, Stein ES, Davidson PJ, et al. Gender differences in sexual and injection risk behavior among active young injection drug users in San Francisco (the UFO study). *Journal of Urban Health*. 2003; 80:137–146. [PubMed: 12612103]
- Falck RS, Wang J, Carlson RG, Siegal HA. Factors influencing condom use among heterosexual users of injection drugs and crack cocaine. *Sexually Transmitted Diseases*. 1997; 24:204–210. [PubMed: 9101631]
- Fromme K, D'Amico EJ, Katz EC. Intoxicated sexual risk taking: an expectancy or cognitive impairment explanation? *Journal of Studies on Alcohol*. 1999; 24:313–319.
- Gilbert PB, McKeague IW, Eisen G, Mullins C, Gueye-NDiaye A, Mboup S, et al. Comparison of HIV-1 and HIV-2 infectivity from a prospective cohort study in Senegal. *Statistics in Medicine*. 2003; 22:573–593. [PubMed: 12590415]
- Gordon CM, Carey MP, Carey KB. Effects of a drinking event on behavioral skills and condom attitudes in men: implications for HIV risk from a controlled experiment. *Health Psychology*. 1997; 16:490–495. [PubMed: 9302547]

- Hanson GR, Leshner AI, Tai B. Putting drug abuse research to use in real-life settings. *Journal of Substance Abuse Treatment*. 2002; 23:69–70. [PubMed: 12220602]
- Hendershot CS, George W. Alcohol and sexuality research in the AIDS era: trends in publication activity, target populations and research design. *AIDS and Behavior*. 2007; 11:217–226. [PubMed: 16897352]
- Hutton HE, McCaul ME, Santora PB, Erbeling EJ. The relationship between recent alcohol use and sexual behaviors: gender differences among sexually transmitted disease clinic patients. *Alcoholism, Clinical and Experimental Research*. 2008; 32:1–8.
- Inciardi JA. Crack, crack house sex, and HIV risk. *Archives of Sexual Behavior*. 1995; 24:249–269. [PubMed: 7611845]
- Joe GW, Simpson DD. HIV risks, gender, and cocaine use among opiate users. *Drug and Alcohol Dependence*. 1995; 37:23–28. [PubMed: 7882870]
- Kalichman SC, Weinhardt LS, DiFonzo K, Austin J, Luke W. Sensation seeking and alcohol use as markers of sexual transmission risk behavior in HIVpositive men. *Annals of Behavioral Medicine*. 2002; 24:229–235. [PubMed: 12173680]
- Kalichman SC, Williams EA, Cherry C, Belcher L, Nachimson D. Sexual coercion, domestic violence, and negotiating condom use among low-income African-American women. *Journal of Women's Health*. 1998; 7:371–378.
- Kang S, Deren S, Goldstein MF. Relationship between childhood abuse and neglect experience and HIV risk behaviors among methadone treatment drop-outs. *Child Abuse & Neglect*. 2002; 26:1275–1289. [PubMed: 12464301]
- Kramer I, Shearer GM. Quantifying the strength and durability of induced immunity to HIV infection in women engaging in unprotected sexual contacts with infected men. *Mathematical and Computer Modelling*. 2002; 36:1435–1458.
- Kwiatkowski CF, Booth RE. HIV risk behaviors among older American drug users. *Journal of Acquired Immune Deficiency Syndromes*. 2003; 33:S131–S137. [PubMed: 12853862]
- Leigh BC, Ames SL, Stacy AW. Alcohol, drugs, and condom use among drug offenders: an event-based analysis. *Drug and Alcohol Dependence*. 2008; 93:38–42. [PubMed: 17928167]
- Leynaert B, Downs AM, de Vincenzi I. Heterosexual transmission of human immunodeficiency virus: variability of infectivity throughout the course of infection. *European Study Group on Heterosexual Transmission of HIV. American Journal of Epidemiology*. 1998; 148:88–96. [PubMed: 9663408]
- Libbus K. Women's beliefs concerning condom acquisition and use. *Public Health Nursing*. 1995; 12:341–347. [PubMed: 7479543]
- Ling W, Amass L, Shoptaw S, Annon JJ, Hillhouse M, Babcock D, et al. A multi-center randomized trial of buprenorphine–naloxone versus clonidine for opioid detoxification: findings from the national institute on drug abuse clinical trials network. *Addiction*. 2005; 100:1090–1100. [PubMed: 16042639]
- Logan TK, Cole J, Leukfeld C. Women, sex, and HIV: social and contextual factors, meta-analysis of published interventions, and implications for practice and research. *Psychological Bulletin*. 2002; 128:851–885. [PubMed: 12405135]
- Logan TK, Cole J, Leukfeld C. Gender differences in the context of sex exchange among individuals with a history of crack use. *AIDS Education and Prevention*. 2003; 15:448–464. [PubMed: 14626466]
- Logan TK, Leukfeld C. Sexual and drug use behaviors among female crack users: a multi-site sample. *Drug and Alcohol Dependence*. 2000; 58:237–245. [PubMed: 10759034]
- Lorvick J, Martinez A, Gee L, Kral AH. Sexual and injection risk among women who inject methamphetamine in San Francisco. *Journal of Urban Health*. 2006; 83:497–505. [PubMed: 16739050]
- Maisto SA, Carey MP, Carey KB, Gordon CM, Schum JL. Effects of alcohol and expectancies on HIV-related risk perception and behavioral skills in heterosexual women. *Experimental and Clinical Psychopharmacology*. 2004; 12:288–297. [PubMed: 15571446]

- Matos TD, Robles RR, Sahai H, Colón HM, Reyes JC, Marrero CA, et al. HIV risk behaviors and alcohol intoxication among injection drug users in Puerto Rico. *Drug and Alcohol Dependence*. 2004; 76:229–234. [PubMed: 15561474]
- McKinnon K, Cournois F, Herman R. A lifetime alcohol or other drug use disorder and specific psychiatric symptoms predict sexual risk and HIV infection among people with severe mental illness. *AIDS and Behavior*. 2001; 5:233–240.
- McLellan A, Cacciola J, Kushner H, Peters F, Smith L, Pettinati H. The fifth edition of the Addiction Severity Index. *Journal of Substance Abuse Treatment*. 1992; 9:199–213. [PubMed: 1334156]
- McLellan AT, Lewis DC, O'Brien CP, Kleber HD. Drug dependence, a chronic medical illness. *Journal of the American Medical Association (JAMA)*. 2000; 284:1689–1695.
- McLellan AT, McKay JR, Forman R, Cacciola J, Kemp J. Reconsidering the evaluation of addiction treatment: from retrospective follow-up to concurrent recovery monitoring. *Addiction*. 2005; 100:447–458. [PubMed: 15784059]
- Meade CS. Sexual risk behavior among persons dually diagnosed with severe mental illness and substance use disorder. *Journal of Substance Abuse Treatment*. 2006; 30:147–157. [PubMed: 16490678]
- Meade CS, Sikkema KJ. HIV risk behavior among adults with severe mental illness: a systematic review. *Clinical Psychology Review*. 2005; 25:433–457. [PubMed: 15914265]
- Meade CS, Sikkema KJ. Psychiatric and psychosocial correlates of sexual risk behavior among adults with severe mental illness. *Community Mental Health Journal*. 2007; 43:153–169. [PubMed: 17143728]
- Meade CS, Weiss RD. Substance abuse as a risk factor for HIV sexual risk behavior among persons with severe mental illness: review of the evidence and exploration of mechanisms. *Clinical Psychology: Science and Practice*. 2007; 14:23–33.
- Melendez RM, Hoffman S, Exner T, Leu C, Ehrhardt AA. Intimate partner violence and safer sex negotiation: effects of a gender-specific intervention. *Archives of Sexual Behavior*. 2003; 32:499–511. [PubMed: 14574094]
- Metsch LR, McCoy CB, McCoy V, Shultz JM, Lai S, Weatherby NL, et al. HIV-related risk behaviors and seropositivity among homeless drug-abusing women in Miami, Florida. *Journal of Psychoactive Drugs*. 1995; 27:435–446. [PubMed: 8788698]
- Miller, JB. *Toward a new psychology of women*. Beacon Press; Boston, MA: 1987.
- Miller M, Neaigus A. Sex partner support, drug use and sex risk among HIV-negative non-injecting heroin users. *AIDS Care*. 2002; 14:801–813. [PubMed: 12511213]
- Montgomery SB, Hyde J, De Rosa CJ, Ennet S, Harvey SM, Clatts M, et al. Gender differences in HIV risk behaviors among young injectors and their social network members. *American Journal of Drug and Alcohol Abuse*. 2002; 28:453–475. [PubMed: 12211360]
- Petry NM. Reliability of drug users' self-reported HIV risk behaviors using a brief 11-item scale. *Substance Use & Misuse*. 2001; 3:1731–1747. [PubMed: 11758820]
- Petry NM, Pierce JM, Stitzer ML, Blaine J, Roll JM, Cohen AJ, et al. Effect of prize-based incentives on outcomes in stimulant abusers in outpatient psychosocial treatment programs. *Archives of General Psychiatry*. 2005; 63:1148–1156. [PubMed: 16203960]
- Pierce JM, Petry NM, Stitzer ML, Blaine J, Kellog S, Satterfield M, et al. Effects of lower-cost incentives on stimulant abstinence in methadone maintenance treatment. *Archives of General Psychiatry*. 2006; 63:201–208. [PubMed: 16461864]
- Prendergast ML, Urada D, Podus D. Meta-analysis of HIV risk-reduction interventions within drug abuse treatment programs. *Journal of Consulting and Clinical Psychology*. 2001; 69:389–405. [PubMed: 11495169]
- Raj A, Saitz R, Cheng DM, Winter M, Samet JH. Associations between alcohol, heroin, and cocaine use and high-risk sexual behaviors among detoxification patients. *American Journal of Drug and Alcohol Abuse*. 2007; 33:169–178. [PubMed: 17366258]
- Rasch RFR, Weisen CA, MacDonald B, Wechsberg WM, Perritt R, Dennis ML. Patterns of HIV risk and alcohol use among African-American crack abusers. *Drug and Alcohol Dependence*. 2000; 58:259–266. [PubMed: 10759036]

- Rees V, Saitz R, Horton NJ, Samet J. Association of alcohol consumption with HIV sex- and drug-risk behaviors among drug users. *Journal of Substance Abuse Treatment*. 2001; 21:129–134. [PubMed: 11728786]
- Ross MW, Timpson SC, Williams ML, Bowen AM. Situational correlates of condom use in a sample of African-American drug users who are primarily crack cocaine users. *AIDS and Behavior*. 2003; 7:55–60. [PubMed: 14534390]
- Rowan-Szal GA, Chatham LR, Joe GW, Simpson DD. Services provided during methadone treatment. *Journal of Substance Abuse Treatment*. 2000; 19:7–14. [PubMed: 10867295]
- Royce D, Leukefeld C, Logan TK, Dennis M, Wechsberg W, Hoffman J. Homelessness and gender in out-of-treatment drug users. *American Journal of Drug and Alcohol Abuse*. 2000; 26:283–296. [PubMed: 10852361]
- Sanchez J, Comerford M, Chitwood DD, Fernandez MI, McCoy CB. High-risk sexual behaviors among heroin sniffers who have no history of injection drug use: implications for HIV risk reduction. *AIDS Care*. 2002; 14:391–398. [PubMed: 12042084]
- Shoptaw S, Tross S, Stephens MA, Tai B, NIDA CTN HIV/AIDS Workgroup; Friends Research Institute/UCLA. et al. A snapshot of HIV/AIDS-related services in the clinical treatment providers for NIDA's clinical trials network. *Drug and Alcohol Dependence*. 2002; 66:S163.
- Shuter J, Alpert PL, Deshaw MG, Greenberg B, Chang CJ, Klein RS. Gender differences in HIV risk behaviors in an adult emergency department in New York City. *Journal of Urban Health*. 1999; 76:237–246. [PubMed: 10924033]
- Somlai AM, Kelly JA, Wagstaff DA, Whitson DP. Patterns, predictors, and situational contexts of HIV risk behaviors among homeless men and women. *Social Work*. 1998; 43:7–20. [PubMed: 9465788]
- Sorensen JL, Copeland AL. Drug abuse treatment as an HIV prevention strategy: a review. *Drug and Alcohol Dependence*. 2000; 59:17–31. [PubMed: 10706972]
- Stein MD, Hanna L, Natarajan R, Clarke J, Marisi M, Sobota M, et al. Alcohol use patterns predict high-risk HIV behaviors among active injection drug users. *Journal of Substance Abuse Treatment*. 2000; 18:359–63. [PubMed: 10812309]
- Stein M, Herman DS, Trisvan E, Pirraglia P, Engler P, Anderson BJ. Alcohol use and sexual risk behavior among human immunodeficiency virus-positive persons. *Alcoholism, Clinical and Experimental Research*. 2005; 29:837–843.
- Sterk CE, Thall KP, Elifson KW. The impact of emotional distress on HIV risk reduction among women. *Substance Use & Misuse*. 2006; 41:157–173. [PubMed: 16393740]
- St. Lawrence JS, Eldridge GD, Reitman D, Little CE, Shelby MC, Brasfield TL. Factors influencing condom use among African-American women: implication for risk-reduction interventions. *American Journal of Community Psychology*. 1998; 26:7–28. [PubMed: 9574496]
- Tortu S, Goldstein M, Deren S, Beardsley M, Hamid R, Ziek K. Urban crack users: gender differences in drug use, HIV risk and health status. *Women & Health*. 1998; 27:177–189.
- Tortu S, McMahon J, Hamid R, Neaigus A. Drug-using women's sexual risk: an event analysis. *AIDS and Behavior*. 2000; 4:329–340.
- Tross S, Campbell ANC, Cohen LR, Calsyn DA, Pavlicova M, Miele G, et al. Effectiveness of HIV/STD sexual risk reduction groups for women in substance abuse treatment programs: results of a NIDA clinical trials network trial. *Journal of Acquired Immune Deficiency Syndromes*. 2008; 48:581–589. [PubMed: 18645513]
- Tyndall MW, Patrick D, Spittal P, Li K, O'Shaughnessy MV, Schecter MT. Risky sexual behaviors among injection drugs users with high HIV prevalence: implications for STD control. *Sexually Transmitted Infections*. 2002; 78(Supplement I):i170–i175. [PubMed: 12083439]
- Van Empelen P, Kok G, van Kesteren NMC, van den Borne B, Bos AER, Schaalma HP. Effective methods to change sex-risk among drug users: a review of psychosocial interventions. *Social Science & Medicine*. 2003; 57:1593–1608. [PubMed: 12948569]
- Weiss SH, Weston CB, Quirinale J. Safe sex misconceptions, gender differences and barriers among injection drug users: a focus group approach. *AIDS Education and Prevention*. 1993; 5:279–293. [PubMed: 8297708]

- Wenzel SL, Tucker JS, Elliott MN, Hambarsoomians K, Perlman J, Becker K, et al. Prevalence and co-occurrence of violence, substance use and disorder, and HIV risk behavior: a comparison of sheltered and low-income housed women in Los Angeles. *Preventive Medicine: An International Journal Devoted to Practice and Theory*. 2004; 39:617–624.
- Wingood GM, DiClemente RJ. The effects of an abusive primary partner on the condom use and sexual negotiation practices of African-American women. *American Journal of Public Health*. 1997; 87:1016–1018. [PubMed: 9224187]
- Wright PB, Stewart KE, Fischer EP, Carlson RG, Falck R, Wang J, et al. HIV risk behaviors among rural stimulant users: variation by gender and race/ethnicity. *AIDS Education and Prevention*. 2007; 19:137–150. [PubMed: 17411416]

Table 1

Description of studies included in analyses

Study title	Study description	Eligibility criteria	Sample size (sites)
• CTN-001 Buprenorphine/naloxone vs. clonidine for inpatient opiate detoxification.	• Compared the effectiveness of buprenorphine/naloxone vs. clonidine in a 13-day detoxification intervention (Ling et al., 2005).	• Inpatients meeting DSM-IV opioid dependent criteria.	112 (6)
• CTN-002 Buprenorphine/naloxone vs. clonidine for outpatient opiate detoxification.	• Replicated the design of CTN-001 in an outpatient sample (Ling et al., 2005).	• Outpatients meeting DSM-IV opioid dependent criteria.	195 (6)
• CTN-005 Motivational interviewing to improve treatment engagement and outcome in outpatient substance users.	• Compared standard intake procedures with standard intake procedures plus motivational interviewing in individuals seeking treatment at outpatient substance abuse treatment programs for any substance (Carroll et al., 2006).	• Outpatients who had used alcohol or any illicit drug in the past 28 days.	422 (5)
• CTN-006 Motivational incentives for enhanced recovery in stimulant users in drug free clinics.	• Compared usual care with usual care plus abstinence-based incentives in stimulant users seeking outpatient substance abuse treatment (Petty et al., 2005).	• Outpatients with self-reported stimulant use in the past 2 weeks or have a stimulant-positive urine sample.	363 (8)
• CTN-007 Motivational incentives for enhanced recovery in stimulant users in methadone maintenance clinics.	• Compared usual care with usual care plus low-cost, prize-based incentives in stimulant users at methadone maintenance clinics (Pierce et al., 2006).	• Enrolled in methadone maintenance clinic between 30 days and 3 years and have a stimulant-positive urine sample.	337 (6)

Table 2

Participant characteristics by protocol

Variable	CTN-001 N = 112 (7.8%)	CTN-002 N = 195 (13.7%)	CTN-005 N = 422 (29.5%)	CTN-006 N = 363 (25.4%)	CTN-007 N = 337 (23.6%)	Test statistic χ^2 (df) *	p-value
Age	Range Mean $\pm$ SD	18.9–65.0 38.3 $\pm$ 10.2	18.1–73.2 33.3 $\pm$ 10.1	18.8–62.6 37.0 $\pm$ 10.2	19.8–63.5 41.8 $\pm$ 8.47	147.7 (4)	<.001
Gender							
Male	N (%)	137 (70.3%)	244 (57.8%)	158 (43.5%)	184 (54.6%)	40.1 (4)	<.001
Female	N (%)	58 (29.7%)	178 (42.2%)	205 (56.5%)	153 (45.4%)		
Education (years)	Range Mean $\pm$ SD	7–20 12.6 $\pm$ 2.2	6–19 12.2 $\pm$ 1.9	4–18 11.8 $\pm$ 2.0	5–20 11.8 $\pm$ 2.0	41.4 (4)	<.001
Ethnicity						-	<.001
White	N (%)	84 (43.1%)	350 (82.9%)	116 (32.0%)	80 (23.7%)		
African-American	N (%)	64 (32.8%)	42 (10.0%)	199 (54.8%)	198 (58.8%)		
Hispanic	N (%)	45 (23.1%)	16 (3.8%)	0 (0%)	0 (0%)		
Others	N (%)	2 (1.0%)	14 (3.3%)	48 (13.2%)	59 (17.5%)	78.7 (8)	<.001
Employment							
Full-time	N (%)	104 (53.3%)	246 (58.3%)	172 (47.4%)	111 (32.9%)		
Part-time	N (%)	35 (17.9%)	61 (14.5%)	45 (12.4%)	65 (19.3%)		
Others	N (%)	56 (28.7%)	115 (27.3%)	146 (40.2%)	161 (47.8%)		
Living with sexual partner	N (%)	74 (37.9%)	162 (38.4%)	143 (39.4%)	109 (32.3%)	19.0 (4)	.0008
Primary drug							
Heroin/other opiates	N (%)	108 (55.4%)	45 (10.7%)	6 (1.7%)	19 (5.6%)	-	<.001
Stimulant	N (%)	0 (0%)	118 (28.0%)	187 (51.5%)	0 (0%)		
Heroin/opiates, stimulants	N (%)	86 (44.1%)	40 (9.5%)	71 (19.6%)	318 (94.4%)		
Others	N (%)	1 (0.5%)	219 (51.9%)	99 (27.3%)	0 (0%)		

Note.

* Chi-square tests for gender, employment, and living with sexual partner; Fisher's exact tests for ethnicity and primary drug; Kruskal–Wallis tests (using normal approximation) for age and education were used.

Table 3

Gender differences in participant characteristics

Variable		Male N = 790 (55%)	Female N = 639 (45%)	Total N = 1,429	Test statistic, χ^2 (df), Z^a	p-value
Age	Range	18.2–73.2	18.1–65.0	18.1–73.2	1.72	.08
	Mean $\pm$ SD	37.6 $\pm$ 10.2	36.6 $\pm$ 9.1	37.2 $\pm$ 9.7		
Education (years)	Range	5–20	4–20	4–20	1.44	.15
	Mean $\pm$ SD	12.2 $\pm$ 1.9	12.0 $\pm$ 2.1	12.0 $\pm$ 2.0		
Ethnicity					30.96 (3)	<.0001
White	N (%)	371 (47.0%)	325 (50.9%)	696 (48.7%)		
African-American	N (%)	276 (34.9%)	251 (39.3%)	527 (36.9%)		
Hispanic	N (%)	68 (8.6%)	13 (2.0%)	81 (5.6%)		
Others	N (%)	75 (9.5%)	50 (7.8%)	125 (8.8%)		
Employment					22.87 (2)	<.0001
Full-time	N (%)	431 (54.6%)	270 (42.3%)	701 (49.1%)		
Part-time	N (%)	122 (15.4%)	110 (17.2%)	232 (16.2%)		
Others	N (%)	237 (30.0%)	259 (40.5%)	496 (34.7%)		
Living with sexual partner	N (%)	306 (38.7%)	244 (38.2%)	550 (38.5%)	0.05 (1)	.83
Primary drug					11.16 (3)	.01
Heroin/other opiates	N (%)	144 (18.2%)	99 (15.5%)	243 (17.0%)		
Stimulant	N (%)	144 (18.2%)	161 (25.2%)	305 (21.3%)		
Heroin/other opiates & stimulants	N (%)	315 (39.9%)	247 (38.6%)	562 (39.4%)		
Others	N (%)	187 (23.7%)	132 (20.7%)	319 (22.3%)		

Note.

^a Chi-square tests for categorical variables and Wilcoxon two-sample tests (using normal approximation) for age and education were used.

Table 4

Gender differences in HIV risk behaviors in the past 30 days

Variable	Male N = 790 (55%)	Female N = 639 (45%)	Total sample N = 1429	$\chi^2(1)^a$	p-value
Sexually active					
N Responding	790	639	1,429	1.43	.23
N (%) Yes	504 (63.8%)	388 (60.7%)	892 (62.4%)		
Multiple partners					
N Responding ^b	504	388	892	6.95	.008
N (%) Yes	67 (13.3%)	77 (19.9%)	144 (16.1%)		
Any unprotected sex with regular partner					
N Responding ^b	484	357	841	5.83	.016
N (%) Yes	365 (75.4%)	294 (82.4%)	659 (78.4%)		
Any unprotected sex with casual partner					
N Responding ^b	83	82	165	0.006	.94
N (%) Yes	41 (49.4%)	40 (48.8%)	81 (49.1%)		
Any unprotected sex when trading sex					
N Responding ^b	39	41	80	0.90	.34
N (%) Yes	25 (64.1%)	22 (53.7%)	47 (58.8%)		
Any unprotected anal intercourse					
N Responding ^b	31	31	62		
N (%) Yes	26 (83.9%)	24 (77.4%)	50 (80.7%)	0.41	.52
Sex risk composite					
N Responding ^b	488	379	867	2.03 ^d	.043
Min, max	1, 23	1, 18	1, 23		
Mean $\pm$ SD	5.8 $\pm$ 3.0	6.1 $\pm$ 3.0	5.9 $\pm$ 3.0		
Any IDU					
N Responding	790	639	1,429	11.24	.0008
N (%) Yes	250 (31.6%)	151 (23.6%)	401 (28.0%)		
Daily IDU					

Variable	Male N = 790 (55%)	Female N = 639 (45%)	Total sample N = 1429	$\chi^2(1)^a$	p-value
N Responding ^b	250	151	401	1.38	.24
N (%) Yes	170 (68.0%)	94 (62.3%)	264 (65.8%)		
Any needle sharing					
N Responding ^b	221	129	350	0.35	.56
N (%) Yes	72 (32.6%)	46 (35.7%)	118 (33.7%)		
Inconsistent needle cleaning before use					
N Responding ^b	227	132	359	1.10	.29
N (%) Yes	135 (59.5%)	71 (53.8%)	206 (57.4%)		
Drug risk composite					
N Responding ^b	208	124	332	0.80 ^a	.43
Min, Max	1, 26	1, 23	1, 26		
Mean $\pm$ SD	8.7 $\pm$ 4.8	8.4 $\pm$ 5.1	8.6 $\pm$ 4.9		

^aWilcoxon two-sample tests (using normal approximation) for HRBS sex risk composite and drug risk composite were used.

^bTotal sample with data for that item (i.e., excludes missing data or not applicable).

Table 5

Sex risk behavior analyses

Variable	High risk: OR (95%CI) ^a	High or moderate risk: OR (95%CI) ^b	χ^2 (df)	p-value
Alcohol use composite				
Women	1.11 (1.03–1.20)		7.71 (1)	.005
Men	0.98 (0.90–1.06)		0.32 (1)	.57
Psychiatric composite				
Women	1.14 (1.06–1.23)		11.45 (1)	.0007
Men	0.96 (0.89–1.04)		0.84 (1)	.36
Family/social composite				
Women	1.03 (0.92–1.14)	1.01 (0.91–1.11)	0.23 (2)	.89
Men	0.80 (0.70–0.93)	1.01 (0.91–1.13)	11.1 (2)	.004
Stimulant use (reference = no use)	1.57 (1.06–2.31)	0.83 (0.61–1.14)	9.23 (2)	.01
Drug use composite	1.30 (1.15–1.47)	1.05 (0.95–1.17)	18.02 (2)	.0001
Abuse history (reference = no abuse)				
Sex abuse only	4.10 (2.07–8.15)	1.29 (0.65–2.56)	9.99 (2)	.007
Physical abuse only	1.30 (0.89–1.88)		1.86 (1)	.17
Sex and physical abuse	1.82 (1.21–2.75)		8.14 (1)	.004
Legal status composite	1.11 (1.03–1.18)		8.29 (1)	.004
Housing stability (years at present address)	1.00 (0.98–1.01)		0.19 (1)	

^aFor the ASI composite scores, odds ratio indicates the magnitude of change in odds per 0.1 unit increase in the corresponding composite score. For housing stability, this is the change per 1-year increase in years at present address.

^bSeparate odds ratios for high or moderate risk sex behavior are presented only if the proportional odds assumption was not met; otherwise, odds ratios are the same in both the model of high-risk behavior and the model of high- or medium-risk behavior.

Table 6

Drug risk behavior analyses

Variable	Linear regression coefficient ^a		t	p-value
	(SD)			
Alcohol use composite				
Women	0.56 (0.28)	2.01	.045	
Men	−0.24 (0.21)	−1.14	.26	
Psychiatric composite	−0.017 (0.12)	−0.14	.89	
Family/social composite	−0.038 (0.13)	−0.30	.76	
Stimulant use	−0.73 (0.63)	−1.16	.25	
Drug use composite	0.67 (0.26)	2.63	.009	
Abuse history				
Sex abuse only	−2.37 (1.24)	−2.01	.046	
Physical abuse only	0.36 (0.84)	0.42	.67	
Sex and physical abuse	0.53 (0.79)	0.67	.50	
Legal status composite	.18 (.13)	1.38	.17	
Housing stability (years at present address)	−.004 (.032)	−.13	.89	

^aFor the ASI composite scores, linear regression coefficient is the magnitude of change in drug risk behavior score per 0.1 unit increase in the corresponding composite score. For housing stability, this is the change per 1-year increase in years at present address.