



Published in final edited form as:

Am J Addict. 2014 ; 23(1): 27–33. doi:10.1111/j.1521-0391.2013.12057.x.

Concurrent substance abuse is associated with sexual risk behavior among adults seeking treatment for prescription opioid dependence

Christina S. Meade, PhD^{1,2}, Lisa A. Bevilacqua, BS², Elizabeth D. Moore, BSN, MSc³, Margaret L. Griffin, PhD^{4,5}, John G. Gardin II, PhD, ACS^{6,7}, Jennifer S. Potter, PhD⁸, Mary Hatch-Maillette, PhD^{9,10}, and Roger D. Weiss, MD^{4,5}

¹Duke University School of Medicine, Department of Psychiatry & Behavioral Sciences, Durham, NC

²Duke Global Health Institute, Durham, NC

³Duke University School of Nursing, Durham, NC

⁴McLean Hospital, Belmont, MA

⁵Harvard Medical School, Department of Psychiatry, Boston, MA

⁶Oregon Health & Science University School of Medicine, Portland, OR

⁷ADAPT, Inc., Roseburg, OR

⁸University of Texas Health Science Center San Antonio, Department of Psychiatry, San Antonio, TX

⁹University of Washington Alcohol & Drug Abuse Institute, Seattle, WA

¹⁰University of Washington, Department of Psychiatry & Behavioral Sciences, Seattle, WA

Abstract

Background—Increasingly, new HIV infections among people who use drugs are attributed to sexual risk behavior. However, HIV prevention research targeting persons with opioid dependence continues to focus on drug injection practices. Moreover, despite the rising prevalence of prescription opioid dependence in the United States, little is known about HIV risk in this population.

Methods—This study examined the prevalence of sexual risk behavior among patients with opioid dependence who primarily use prescription opioids for non-medical purposes. As part of a multi-site clinical trial, participants (N=653) completed a baseline assessment that included the Risk Behavior Survey.

Results—In the past month, 74% were sexually active. Of these, most had opposite sex partners (97.3%) and vaginal intercourse (97.1%); anal intercourse was uncommon (3.1%). The majority reported unprotected intercourse (76.5%), but few had multiple partners (11.3%). Unprotected intercourse was associated with history of other substance dependence (AOR=1.73), and having multiple partners was associated with concurrent cocaine use (AOR=2.54). Injection drug use in the past month was rare (2.5%).

Corresponding author: Christina S. Meade, PhD, Duke University, Box 90519, Durham, NC 27708, christina.meade@duke.edu, t. 919.613.6549, f. 919.613.6215 .

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

Conclusions—While the majority of sexually active participants engaged in unprotected intercourse, the proportion with multiple sex partners was low relative to other samples of persons who use illicit drugs. Among persons with non-medical prescription opioid dependence, those who concurrently use other substances may be at elevated risk for HIV infection. Comprehensive assessment of substance abuse history among individuals dependent upon prescription opioids is critical for identifying patients who may require additional clinical interventions to reduce HIV sexual risk behavior.

Keywords

prescription opioid dependence; HIV risk; sexual risk behavior; cocaine; substance use disorders

Introduction

Since the beginning of the HIV/AIDS epidemic in the United States, dependence on opioids such as heroin has been an important risk factor for HIV infection. Many opioids can be injected, and sharing of injection equipment is a highly efficient mode of HIV transmission. While the number of new HIV infections attributable to injection drug use declined from 32% in 1994 to 9% in 2009,¹ there is mounting evidence that individuals who use drugs by other routes of administration (e.g., smoking, inhalation) are increasingly affected by HIV.² Studies have documented comparable HIV prevalence among persons who use injection and non-injection drugs in New York (13% vs. 12%, respectively)³ and Baltimore (4.4% vs. 3.6%, respectively).⁴ One interpretation of these results is that sexual risk behavior plays a significant role in HIV transmission among both types of drug users. The present study examines sexual risk behavior among an emerging population of drug users who primarily use prescription opioids for non-medical purposes. Prescription opioid abuse is rapidly becoming a major public health problem in the United States.⁵ In 2010, there were 2 million new cases of non-medical prescription opioid use,⁵ with 13% showing signs of abuse or dependence.⁶

While there is extensive literature documenting the high prevalence of sexual risk behavior among persons who use non-injection substances such as alcohol,⁷ crack cocaine,^{8,9} and smoked methamphetamine,¹⁰ there has been limited HIV prevention research on persons who use non-injection opioids. In a study of sexually active persons who used non-injection heroin, 27% had multiple partners and 75% had unprotected intercourse in the past month.¹¹ In a similar study of sexually active persons who used intranasal heroin and had never injected drugs, 40% reported multiple partners and 60% had unprotected intercourse in the past month.¹² Recent data suggest that persons who use non-medical prescription opioids, like persons who use non-injection heroin, also have elevated sexual risk behavior. In a sample of 91 adolescents seeking treatment for opioid dependence, both prescription opioid users and heroin users reported a high prevalence of multiple partners (47% vs. 31%, respectively) and unprotected intercourse (both 59%) in the past month.¹³ In a sample of 50 adults seeking inpatient opioid detoxification, oxycodone users were more likely than heroin users to report multiple partners (39% vs. 6%) but were less likely to have unprotected intercourse (55% vs. 73%) in the past month.¹⁴ These studies had small samples recruited from single treatment programs, and it is unclear if results generalize to the broader population of individuals who are dependent on non-medical prescription opioids.

To address this gap in the literature, the present study examined the prevalence of HIV sexual risk behavior in a large, national sample of patients seeking treatment for non-medical prescription opioid dependence. Specifically, the aims were to (1) describe the proportion of patients who were sexually active, engaged in unprotected intercourse, and/or had multiple sex partners in the past month, and (2) identify correlates of sexual risk

behavior (i.e., unprotected intercourse and multiple partners). We hypothesized that sexual risk behavior would be associated with initiation of prescription opioid use for recreational, as opposed to medical, purposes. In addition, given previous findings that other types of substances are associated with HIV risk,⁷⁻¹⁰ we hypothesized that lifetime dependence on other substances and concurrent use of alcohol, cocaine, and/or methamphetamine would be associated with elevated sexual risk behavior.

Method

Participants and procedures

This study, conducted through the National Drug Abuse Treatment Clinical Trials Network, used baseline data collected from a multi-site clinical trial designed to examine different lengths of buprenorphine/naloxone treatment in combination with different intensities of drug counseling for adults with prescription opioid dependence. Details of the treatment conditions are described elsewhere.¹⁵ Adult patients who met DSM-IV diagnostic criteria for current dependence on prescription opioids with physiologic features were recruited from 10 treatment facilities that were distributed in all major regions of the United States, including urban, suburban, and rural settings. Since the intent of the trial was to study a distinct and understudied population of persons with opioid dependence who predominantly use non-medical prescription opioids, participants were excluded for lifetime opioid dependence due to heroin alone, >4 days of heroin use in the past month, history of heroin injection, ongoing pain management with opioids, a major pain event in the past 6 months, and prescribed methadone >40 mg/day for pain. The rationale for these exclusion criteria are reviewed in detail elsewhere.¹⁶ Additional exclusions were current participation in other formal substance abuse treatment, other substance dependence requiring immediate medical attention, unstable psychiatric illness, enrollment in another medication trial, liver function tests >5 times the upper limit of normal, and pregnancy or breastfeeding. This study was approved by the Institutional Review Boards at all participating sites. Participants provided written informed consent after a thorough description of study procedures. Enrollment began on June 12, 2006, and the last baseline assessment occurred on November 7, 2008. The current analysis includes all 653 randomized participants who completed a baseline assessment at treatment entry.

Measures

HIV risk behavior—The Risk Behavior Survey (RBS) is an interviewer-administered survey that is widely used in the National Drug Abuse Treatment Clinical Trials Network to assess HIV risk behavior in the past month.¹⁷ The RBS is an abbreviated version of the Risk Behavior Assessment, which was originally developed as part of a NIDA Cooperative Agreement. Reliability and validity calculations support the adequacy of the RBS as a research tool in studies of persons who use drugs.¹⁸ Participants reported the number of male and female partners; engagement in vaginal, anal, and oral sex; and frequency of condom use. Participants who reported sex partner were categorized as “sexually active.” “Multiple partners” was defined as having sex partners, and “unprotected intercourse” was defined as any vaginal or anal intercourse episodes without condoms. Participants also reported the number of days on which they had injected drugs in the past month, and indicated the number of days on which they had “injected using works that had been used by somebody else.”

Substance use—The Addiction Severity Index-Lite, also an interviewer-administered survey, assessed problems in medical, occupational, drug, alcohol, legal, social, and psychiatric domains in the past month.¹⁹ Timeline follow-back methodology was used to facilitate the assessment of number of days of opioid and other substance use in the 30 days

prior to baseline.²⁰ Urine samples were collected and analyzed for metabolites of prescription opioids (e.g., oxycodone, hydrocodone) and other drugs to corroborate self-reports. All participants had used prescription opioids for non-medical purposes in the past month. For other substances (alcohol to intoxication, cocaine, cannabis, stimulants, sedatives, and heroin), we created dichotomous variables indicating any use in the past month. In a separate questionnaire, participants reported the reason they first used prescription opioids and how they were obtained.²¹ Participants who received prescription opioids from a physician for a medical condition and did not use it to “get high/for euphoria” were categorized as having initiated use for medical purposes. All others were categorized as having initiated use for recreational purposes.

The Composite International Diagnostic Interview (CIDI), a standardized instrument for the assessment of mental disorders based on DSM-IV criteria, was used to identify opioid and other substance-related disorders.²² As per the inclusion criteria, all participants were dependent on prescription opioids. Participants who met criteria for lifetime dependence on alcohol, cocaine, cannabis, stimulants, or sedatives were categorized as having a history of other substance dependence.

Data analysis

Quantitative analysis was conducted using SPSS 19.0 (SPSS Inc., Chicago, IL). We conducted descriptive analyses for demographic characteristics and past month substance use and sexual behaviors. Participants who were sexually active were compared to those who were not using t-tests for continuous and χ^2 -tests for categorical variables. Using a series of bivariate logistic regressions, we identified correlates of unprotected intercourse and multiple partners among sexually active participants. Predictor variables included: demographic characteristics (gender, age, education, and relationship status); history of other substance dependence; initiation of opioid use for recreational purposes; and any concurrent use of alcohol to intoxication, cocaine, cannabis, stimulants, sedatives, and/or heroin. A multivariate logistic regression model was run for each of the two sexual risk outcomes. Demographic factors were entered as covariates in a first step. Substance use variables that were associated with the outcome at $p < .05$ in the bivariate models were entered in a second step. Adjusted odds ratios and 95% confidence intervals are presented.

Results

Sample characteristics

The sample included 261 women and 392 men, mostly Caucasian (91.3%), ranging in age from 18 to 77 years ($M = 33.2$, $SD = 10.2$) (Table 1). Approximately half (52.7%) were married and/or living with a sex partner; 54.4% had ≥ 2 years of education ($M = 13.0$, $SD = 2.2$), and 62.9% were employed full-time. All participants were dependent on prescription opioids, and they had used them on an average of 28.1 days in the past month ($SD = 4.0$). Over half (58.2%) reported that they first received prescription opioids from a physician for a medical condition and that they initially did not use prescription opioids for recreational purposes. Nearly half (47.3%) had a history of other substance dependence, and 77.8% had used other substances in the past month. Among the 50 participants who had used stimulants (other than cocaine) in the past month, most used prescription stimulants (e.g., methylphenidate, dextroamphetamine); only 27 (54.0%) had ever used methamphetamine. Thus, we were unable to test our hypothesis that concurrent methamphetamine use would be associated with sexual risk behavior.

Prevalence of HIV risk behaviors

In the past month, 486 participants (74.4% of the sample) reported being sexually active (Table 2). Sexually active participants were younger and more likely to be married and/or living with a sex partner, to have initiated opioid use for recreational purposes, and to have used marijuana in the past month. Among sexually active participants, nearly all reported opposite sex partners (97.3%) and vaginal intercourse (97.1%). Very few reported anal sex (3.1%) or oral sex only (2.5%). In the past month, 76.5% had unprotected intercourse and 11.3% had multiple partners. Participants who had multiple partners were less likely to engage in unprotected intercourse (47.3% vs. 80.2%; $\chi^2(1)=29.46, p<.001$), and those who were married and/or living with a sex partner were more likely to engage in unprotected intercourse (85% vs. 63%; $\chi^2(1)=30.28, p<.001$). Only 2.5% of the sample had injected drugs in the past month. All of these individuals had injected prescription opioids; one person also injected cocaine; no one injected amphetamines. Among persons who had injected drugs, only one reported using syringes or needles that had been used by another person.

Correlates of sexual risk behaviors

Table 3 summarizes the logistic regression models predicting unprotected intercourse and multiple partners among sexually active participants in the past month. In bivariate analyses, unprotected intercourse was associated with older age, less education, being married and/or living with a sex partner, and other lifetime substance dependence. Each of these variables remained significant in the multivariate model. After adjusting for demographics, participants with a history of other substance dependence had 1.73 higher odds of engaging in unprotected intercourse.

In bivariate analyses, having multiple sex partners was associated with male gender, not being married or living with a sex partner, and concurrent use of cocaine and/or alcohol to intoxication. In the multivariate model, all of these variables except alcohol to intoxication remained significant. After adjusting for demographics and other covariates, participants who had used cocaine in the past month had 2.54 higher odds of having multiple partners.

Discussion

In this large national sample of patients seeking treatment for prescription opioid dependence, the prevalence of HIV risk behavior was lower than expected relative to other drug using samples. In particular, only 8.4% of the sample (11.3% of sexually active participants) reported having multiple sex partners in the past month. Previous studies of non-injecting heroin users reported that approximately one-third of sexually active participants had multiple sex partners in the past month.^{11,12} However, the prevalence of unprotected intercourse was comparable to samples of non-injecting heroin users,^{11,12} with 76.5% of sexually active participants reporting unprotected intercourse. Similarly, in two national samples, between two-thirds and three-quarters of men and women reported unprotected intercourse during their most recent sexual event.^{23,24} As in the general population,²³ participants in our sample who were married and/or living with a sex partner were more likely to engage in unprotected intercourse; however, even among those who were not married and/or living with a sex partner, nearly two-thirds had unprotected intercourse. Injection risk behavior was rare but present in this sample. Although individuals who had ever injected heroin were excluded, persons who injected prescription opioids or other drugs were accepted into the trial. Consistent with recent reports that injection is becoming a more common route of administration for prescription opioids,^{25,26} 2.5% of participants had injected prescription opioids in the past month, though only one person reported sharing needles or syringes.

One of the key findings from this study is that poly-substance use among persons with prescription opioid dependence may be a marker for HIV sexual risk. Specifically, participants with other lifetime substance dependence were nearly twice as likely to engage in unprotected intercourse, and those who used cocaine (in addition to prescription opioids) in the past month were nearly three times more likely to have multiple partners. Cocaine, a central nervous system stimulant that can increase sex drive and pleasure seeking,²⁷ is a consistent predictor of sexual risk behavior in general,^{8,9} and among heroin users specifically.^{28,29} While medication-assisted treatment for opioid dependence has been effective in reducing frequency of HIV risk behaviors and infection, adjunctive risk reduction counseling may be important for individuals with opioid dependence who also use other substances.³⁰ Effective HIV prevention interventions targeting persons who use illicit drugs have included motivational self-assessments, personalized goal setting, and skills training in condom use, communication, and problem solving, and they are often delivered in group formats to increase social support.³¹⁻³³ Our results suggest that comprehensive assessment, including past and current use of other substances, is critical for identifying persons with prescription opioid dependence who may require additional clinical intervention to reduce sexual risk behavior.

There are several possible reasons for the lower than expected prevalence of HIV risk behavior, particularly related to multiple sex partners, in this sample. First, the side-effects of opioids, which include sedation and reduced sex drive, may contribute to reduced sexual activity.^{34,35} Second, the majority of participants had initiated prescription opioid use for a medical condition under the supervision of a doctor, but subsequently developed dependence on the medication. This group may be less prone to risk-taking than those who initiated opioid use for recreational purposes. In a large study of prescription opioid users, “illicit” users were more likely than “prescribed misusers” to have concurrent use of other drugs and a history of drug injection.³⁶ However, in our sample, initiation of prescription opioids for a medical condition was unrelated to sexual risk behavior in the multivariate models. Finally, it is possible that our findings reflect the effectiveness of HIV prevention campaigns in the United States.

This study of individuals seeking treatment for prescription opioid dependence is the largest to date, with data from 10 treatment facilities across the United States using validated measures of substance use and HIV risk. Nevertheless, several limitations should be noted. First, the 30-day recall period for sexual risk behavior is fairly short, and it is possible that we underestimated the level of risk. However, this timeframe matched our substance use data and is the most commonly used timeframe in studies of drug users.³⁷ Second, we did not assess details of the sexual encounters (e.g., sex while intoxicated, sex trade for money/drugs) or characteristics of the sex partners (e.g., casual vs. primary). Future research might build upon our findings by exploring the social context in which sexual risk behavior occurs, specifically the nature of the sexual partnerships in which unprotected intercourse is occurring.

Third, we relied on self-report of risk behavior, which is subject to response bias. In particular, the interviewer-administered surveys may be prone to social desirability bias. However, this remains the standard method for obtaining sensitive information, and other studies on persons who use illicit drugs have documented test-retest reliability and predictive validity of self-reported sexual behaviors.³⁸ Fourth, the study focused on a distinct and understudied population of individuals dependent on prescription opioids for non-medical purposes. While the sample did include heroin users, results may not generalize to prescription opioid users who regularly use or inject heroin. However, our eligibility criteria allowed us to examine, for the first time, HIV risk behavior in the growing population of opioid dependent adults who primarily use prescription opioids. Future

research is necessary to determine whether this population is less risky than prescription opioid users who primarily use heroin. Finally, despite the multi-site design and large sample size, results may not generalize to prescription opioid users who are not seeking treatment, are unwilling to participate in clinical trials, are of different ethnic/racial backgrounds, and/or live outside of the United States.

Conclusions

This study found a relatively low prevalence of HIV sexual and injection risk behavior among persons seeking treatment for prescription opioid dependence compared to other samples of persons who use illicit drugs. Nevertheless, the majority of sexually active participants engaged in unprotected intercourse, and 11% had multiple sex partners in the past month. Concurrent use of other substances, particularly cocaine, may be a marker of elevated sexual risk behavior among persons who use non-medical prescription opioids. Comprehensive assessment of substance abuse histories is critical for identifying persons with prescription opioid dependence who may require additional clinical intervention to reduce HIV sexual risk behavior.

Acknowledgments

This study was supported by the following NIDA CTN grants (Bethesda, MD): U10DA013727 (Southern Consortium Node, Kathleen T. Brady, Medical University of South Carolina), U10DA015831 (New England Consortium Node, Roger D. Weiss), U10DA020024 (Texas Node, Madhukar Trivedi, UT Southwestern Medical Center), U10DA015815 (Western States Node, James L. Sorensen, UCSF School of Medicine), and U10DA013714 (Pacific Northwest Node, Dennis M. Donovan, University of Washington). This study was also supported by the following NIDA grants (Bethesda, MD): K23 DA-028660 (Christina S. Meade), K23DA022297 (Jennifer S. Potter), and K24DA022288 (Roger D. Weiss).

References

1. Prejean J, Song R, Hernandez A, et al. Estimated HIV incidence in the United States, 2006-2009. *PLoS One*. 2011; 6(8):e17502. [PubMed: 21826193]
2. Strathdee SA, Stockman JK. Epidemiology of HIV among injecting and non-injecting drug users: current trends and implications for interventions. *Curr HIV/AIDS Rep*. 2010; 7(2):99-106. [PubMed: 20425564]
3. Des Jarlais DC, Arasteh K, Perlis T, et al. Convergence of HIV seroprevalence among injecting and non-injecting drug users in New York City. *AIDS*. 2007; 21(2):231-235. [PubMed: 17197815]
4. Strathdee SA, Sherman SG. The role of sexual transmission of HIV infection among injection and non-injection drug users. *J Urban Health*. 2003; 80(4 Suppl 3):iii7-14. [PubMed: 14713667]
5. Substance Abuse and Mental Health Services Administration. Results from the 2010 National Survey on Drug Use and Health: Summary of National Findings. Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality; Rockland, MD: 2011.
6. Becker WC, Sullivan LE, Tetrault JM, Desai RA, Fiellin DA. Non-medical use, abuse and dependence on prescription opioids among U.S. adults: psychiatric, medical and substance use correlates. *Drug Alcohol Depend*. 2008; 94(1-3):38-47. [PubMed: 18063321]
7. World Health Organization. Alcohol Use and Sexual Risk Behavior: A Cross-cultural Study in Eight Countries. World Health Organization; Geneva: 2005.
8. Hoffman JA, Klein H, Eber M, Crosby H. Frequency and intensity of crack use as predictors of women's involvement in HIV-related sexual risk behaviors. *Drug Alcohol Depend*. 2000; 58(3):227-236. [PubMed: 10759033]
9. Maranda MJ, Han C, Rainone GA. Crack cocaine and sex. *J Psychoactive Drugs*. 2004; 36(3):315-322. [PubMed: 15559679]

10. Meade CS, Watt MH, Sikkema KJ, et al. Methamphetamine use is associated with childhood sexual abuse and HIV sexual risk behaviors among patrons of alcohol-serving venues in Cape Town, South Africa. *Drug Alcohol Depend.* 2012; 126(1-2):232–239. [PubMed: 22717338]
11. Miller M, Neaigus A. Sex partner support, drug use and sex risk among HIV-negative non-injecting heroin users. *AIDS Care.* 2002; 14(6):801–813. [PubMed: 12511213]
12. Sanchez J, Comerford M, Chitwood DD, Fernandez MI, McCoy CB. High risk sexual behaviours among heroin sniffers who have no history of injection drug use: implications for HIV risk reduction. *AIDS Care.* 2002; 14(3):391–398. [PubMed: 12042084]
13. Subramaniam GA, Stitzer MA. Clinical characteristics of treatment-seeking prescription opioid vs. heroin-using adolescents with opioid use disorder. *Drug Alcohol Depend.* 2009; 101(1-2):13–19. [PubMed: 19081205]
14. Meade CS, McDonald LJ, Weiss RD. HIV risk behavior in opioid dependent adults seeking detoxification treatment: an exploratory comparison of heroin and oxycodone users. *Am J Addict.* 2009; 18(4):289–293. [PubMed: 19444732]
15. Weiss RD, Potter JS, Fiellin DA, et al. Adjunctive counseling during brief and extended buprenorphine-naloxone treatment for prescription opioid dependence: a 2-phase randomized controlled trial. *Arch Gen Psychiatry.* 2011; 68(12):1238–1246. [PubMed: 22065255]
16. Weiss RD, Potter JS, Copersino ML, et al. Conducting clinical research with prescription opioid dependence: defining the population. *Am J Addict.* 2010; 19(2):141–146. [PubMed: 20163386]
17. National Institute on Drug Abuse. Risk Behavior Survey. 3rd Edition. National Institute on Drug Abuse, Community Research Branch; Rockville, MD: 1993.
18. Needle R, Fisher DG, Weatherby N, et al. Reliability of self-reported HIV risk behaviors of drug users. *J Addict Behav.* 1995; 9(4):242–250.
19. McLellan AT, Kushner H, Metzger D, et al. The Fifth Edition of the Addiction Severity Index. *J Subst Abuse Treat.* 1992; 9(3):199–213. [PubMed: 1334156]
20. Sobell, LC.; Sobell, MB. Timeline Follow-back User's Guide: A Calendar Method for Assessing Alcohol and Drug Use. Addiction Research Foundation; Toronto: 1996.
21. Weiss RD, Potter JS, Provost SE, et al. A multi-site, two-phase, Prescription Opioid Addiction Treatment Study (POATS): rationale, design, and methodology. *Contemp Clin Trials.* 2010; 31(2): 189–199. [PubMed: 20116457]
22. World Health Organization. Composite International Diagnostic Interview (CIDI), Core Version 2.1, Interviewer's Manual. World Health Organization; Geneva: 1997.
23. Reece M, Herbenick D, Schick V, Sanders SA, Dodge B, Fortenberry JD. Condom use rates in a national probability sample of males and females ages 14 to 94 in the United States. *J Sex Med.* 2010; 7(Suppl 5):266–276. [PubMed: 21029384]
24. Chandra A, Billioux VG, Copen CE, Sionean C. HIV risk-related behaviors in the United States household population aged 15-44 years: data from the National Survey of Family Growth, 2002 and 2006-2010. *Natl Health Stat Report.* 2012; (46):1–19.
25. Young AM, Havens JR, Leukefeld CG. Route of administration for illicit prescription opioids: a comparison of rural and urban drug users. *Harm Reduct J.* 2010; 7:24. [PubMed: 20950455]
26. Bruneau J, Roy E, Arruda N, Zang G, Jutras-Aswad D. The rising prevalence of prescription opioid injection and its association with hepatitis C incidence among street-drug users. *Addiction.* 2012; 107(7):1318–1327. [PubMed: 22248184]
27. Volkow ND, Wang GJ, Fowler JS, Telang F, Jayne M, Wong C. Stimulant-induced enhanced sexual desire as a potential contributing factor in HIV transmission. *Am J Psychiatry.* 2007; 164(1):157–160. [PubMed: 17202559]
28. Lejuez CW, Bornoalova MA, Daughers SB, Curtin JJ. Differences in impulsivity and sexual risk behavior among inner-city crack/cocaine users and heroin users. *Drug Alcohol Depend.* 2005; 77:169–175. [PubMed: 15664718]
29. Bux DA, Lamb RJ, Iguchi MY. Cocaine use and HIV risk behavior in methadone maintenance patients. *Drug Alcohol Depend.* 1995; 37(1):29–35. [PubMed: 7882871]
30. Metzger DS, Woody GE, O'Brien CP. Drug treatment as HIV prevention: a research update. *J Acquir Immune Defic Syndr.* 2010; 55(Suppl 1):S32–S36. [PubMed: 21045597]

31. Tross S, Campbell AN, Cohen LR, et al. Effectiveness of HIV/STD sexual risk reduction groups for women in substance abuse treatment programs: results of NIDA Clinical Trials Network Trial. *J Acquir Immune Defic Syndr*. 2008; 48(5):581–589. [PubMed: 18645513]
32. Wechsberg WM, Lam WKK, Zule WA, Bobashev G. Efficacy of a woman-focused intervention to reduce HIV risk and Increase self-sufficiency among African American crack abusers. *Am J Public Health*. 2004; 94(7):1165–1173. [PubMed: 15226138]
33. Calsyn DA, Hatch-Maillette M, Tross S, et al. Motivational and skills training HIV/sexually transmitted infection sexual risk reduction groups for men. *J Subst Abuse Treat*. 2009; 37(2):138–150. [PubMed: 19150206]
34. Pfaus JG, Gorzalka BB. Opioids and sexual behavior. *Neurosci Biobehav Rev*. 1987; 11(1):1–34. [PubMed: 3554038]
35. Hallinan R, Byrne A, Agho K, McMahon C, Tynan P, Attia J. Erectile dysfunction in men receiving methadone and buprenorphine maintenance treatment. *J Sex Med*. 2008; 5(3):684–692. [PubMed: 18093096]
36. Green TC, Black R, Grimes Serrano JM, Budman SH, Butler SF. Typologies of prescription opioid use in a large sample of adults assessed for substance abuse treatment. *PLoS One*. 2011; 6(11):e27244. [PubMed: 22087270]
37. Napper L, Fisher D, Reynolds G, Johnson M. HIV risk behavior self-report reliability at different recall periods. *AIDS Behav*. 2010; 14(1):152–161. [PubMed: 19475504]
38. Darke S. Self-report among injecting drug users: a review. *Drug Alcohol Depend*. 1998; 51(3): 253–263. [PubMed: 9787998]

Table 1

Sample Characteristics (N=653)

<u>Demographics</u>	
Male gender, N (%)	392 (60.0%)
Caucasian race/ethnicity, N (%)	594 (91%)
Age in years, M (SD)	33.2 (10.2)
Education in years, M (SD)	13.0 (2.2)
Married or living with sex partner, N (%)	344 (52.7%)
Employed full-time, N (%)	411 (62.9%)
<u>Substance abuse</u>	
Days of prescription opioid use in past 30 days, M (SD)	28.1 (4.0)
Other lifetime substance dependence, N (%)	309 (47.3%)
Alcohol	173 (26.5%)
Cocaine	118 (18.1%)
Cannabis	101 (15.5%)
Stimulants	71 (10.9%)
Sedatives	65 (10.0%)
Heroin	0 (0%)
Any use of other substances in past 30 days, N (%)	508 (77.8%)
Alcohol to intoxication	164 (25.1%)
Cocaine	106 (16.2%)
Marijuana	286 (43.8%)
Stimulants	50 (7.7%)
Sedatives	284 (43.5%)
Heroin	38 (5.8%)
Injection drug use in past 30 days, N (%)	16 (2.5%)

Table 2
 Characteristics of participants who were sexually active versus not sexually active in the past month

	Sexually active N = 486	Not sexually active N = 167	Statistic
<u>Demographics</u>			
Male gender, N (%)	298 (61.3%)	94 (56.3%)	$\chi^2(1) = 1.31$
Age in years, M (SD)	31.8 (9.6)	37.3 (10.8)	$t(651) = 6.11^{***}$
Education in years, M (SD)	13.0 (2.2)	13.2 (2.2)	$t(651) = 0.93$
Married or living with sex partner, N (%)	295 (60.7%)	49 (29.3%)	$\chi^2(1) = 49.03^{***}$
<u>Substance abuse</u>			
Initiated opioid use for recreation	218 (44.9%)	55 (32.9%)	$\chi^2(1) = 7.26^{**}$
Other lifetime substance dependence	231 (47.5%)	78 (45.7%)	$\chi^2(1) = 0.03$
Concurrent (past month) use of:			
Alcohol to intoxication	123 (25.3%)	41 (24.6%)	$\chi^2(1) = 0.04$
Cocaine	85 (17.5%)	21 (12.6%)	$\chi^2(1) = 2.21$
Marijuana	226 (46.5%)	60 (35.9%)	$\chi^2(1) = 5.65^*$
Stimulants	34 (7.0%)	16 (9.6%)	$\chi^2(1) = 1.18$
Sedatives	199 (40.9%)	79 (47.3%)	$\chi^2(1) = 2.06$
Heroin	27 (5.6%)	11 (6.6%)	$\chi^2(1) = 0.24$

* p < .05;

** p < .01;

*** p < .001

Table 3

Bivariate and multivariate logistic regression models predicting sexual risk behaviors in past 30 days

	Unprotected intercourse N = 485		Multiple partners N = 486	
	Bivariate models OR (95% CI)	Multivariate model AOR (95% CI)	Bivariate models OR (95% CI)	Multivariate model AOR (95% CI)
<u>Demographics</u>				
Male gender	0.96 (0.62-1.47)	1.21 (.75-1.91)	3.17 (1.55-6.45)**	2.57 (1.22-5.41)*
Age in years	1.04 (1.01-1.06)**	1.03 (1.00-1.06)*	0.97 (0.94-1.00)	0.99 (0.96-1.03)
Education in years	0.89 (0.81-0.97)*	0.87 (0.78-0.97)**	1.07 (0.95-1.21)	0.99 (0.85-1.15)
Married or living with sex partner	3.29 (2.13-5.08)***	2.93 (1.85-4.65)***	0.20 (0.11-0.38)***	0.24 (0.12--0.46)***
<u>Substance abuse</u>				
Initiated opioid use for recreation	1.43 (0.94-2.18)	---	0.70 (0.40-1.23)	---
Other lifetime substance dependence	1.70 (1.10-2.61)*	1.73 (1.10-2.71)*	0.60 (0.33-1.07)	---
Concurrent (past month) use of:				
Alcohol to intoxication	1.28 (0.78-2.11)	---	2.38 (1.33-4.25)**	1.58 (0.85-2.97)
Cocaine	0.67 (0.40-1.14)	---	2.92 (1.58-5.40)**	2.54 (1.31-4.92)**
Marijuana	1.01 (0.66-1.53)	---	1.44 (0.82-2.53)	---
Stimulants	1.47 (0.59-3.64)	---	1.39 (0.51-3.74)	---
Sedatives	1.37 (0.89-2.12)	---	0.61 (0.34-1.12)	---
Heroin	2.45 (0.72-8.30)	---	0.98 (0.29-3.36)	---

* p < .05;

** p < .01;

*** p < .001