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Gender and risk behaviors for HIV and sexually transmitted infections among recently released inmates: A prospective cohort study

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Abstract

Women in prison have a higher prevalence of HIV than men. After release from prison, former inmates have the opportunity to engage in risk behaviors for HIV and other sexually transmitted infections (STI). We sought to assess change in risk behaviors over time and the association of gender with risk behavior in the post-release period. In this prospective cohort study, we interviewed 200 former inmates (51 women) approximately 2 weeks (baseline) and 3 months (follow-up) after release and tested them for HIV infection at follow-up. We examined the association of gender with unprotected vaginal or anal sex in the last seven days using chi-square and Fisher's exact tests and multivariable logistic regression. At baseline, 22% of men and 41% of women reported unprotected vaginal sex ($p<0.01$) and 5% of men and 8% of women reported unprotected anal sex ($p=0.51$). Being younger (OR for each decade increase 0.48, 95% CI

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Contributions:
I.A. Binswanger conceived of the study, supervised data collection and analyses, and led the writing of the study. B.L. Beaty conducted analyses and assisted with writing portions of the manuscript; S. Min guided the analyses and reviewed drafts of the manuscript. S. Mueller conducted data collection and assisted with writing the manuscript. K.F. Corsi participated in conceiving of the study and reviewing drafts of the manuscript.

0.29-0.80), being gay/lesbian or being bisexual (compared with being heterosexual, OR=4.74 95% CI 1.01–22.17, OR=3.98, 95% CI 1.41–11.26, respectively), or reporting a drug of choice of heroin/speedballs or cocaine/crack (compared with marijuana/no drug of choice, OR=24.00, 95% CI 5.15–111.81 and OR=3.49, 95% CI 1.20–10.18, respectively) were associated with unprotected vaginal or anal sex after adjusting for race, homelessness, and hazardous drinking. At follow-up, 21% of men and 44% of women reported unprotected sex (p=0.005), and female gender (OR=4.42, 95% CI 1.79–10.94) and hazardous drinking (compared with not meeting criteria for hazardous drinking, OR=3.64, 95% CI 1.34–9.86) were associated with unprotected sex, adjusting for race and homelessness. In this population with a high prevalence of HIV, we demonstrated persistent engagement in sexual risk behavior during the post-release period. Enhanced efforts to promote sexual health and reduced risk behavior among both male and female current and former prison inmates are needed, including improved access to preventive care and HIV and STI screening, testing and treatment.

Keywords

HIV; prisoners; gender; drug use; women's health; epidemiology; sexually transmitted infections

INTRODUCTION

Prison inmates have a high prevalence of HIV/AIDS (Hammett, Harmon, & Rhodes, 2002; Maruschak & Beavers, 2009; Spaulding et al., 2009) but little is known about HIV risk behaviors after release from prison, when former inmates have opportunities to engage in behaviors that put themselves and others at risk for HIV and other sexually transmitted infections (STI). A qualitative study described rapid engagement in sexual HIV/STI risk behaviors after release from prison (J. Adams et al., 2011). Risk behavior may diminish over time as former inmates establish or stabilize their social, family and sexual networks. Studies have demonstrated that the risk of drug-related death is highest in the first few weeks after release (Merrall et al., 2010), suggesting time trends in drug-related risk behavior which may also apply to HIV/STI risk. Immediate engagement in risk behavior among individuals with HIV is concerning because of poor continuation of antiretroviral therapy during this time period, (Baillargeon et al., 2009) enhancing the probability HIV transmission, whereas individuals without HIV are at risk for acquiring HIV.

Although they represented only 7% of prisoners in the United States in 2010, women were the fastest growing group during 2000–2010 (Guerino, Harrison, & Sabol, 2011). Women have a higher reported prevalence of HIV/AIDS (1.9% vs. 1.5% in 2010), and are more likely to have drug dependence and drug offenses then men in prison (Binswanger et al., 2010; Greenfield & Snell, 1999; Guerino, et al., 2011; Maruschak, 2012; U.S. Department of Justice, 2009). The over-representation of African American women in prison (Guerino, et al., 2011) may also contribute to the increased prevalence of HIV/AIDS among women in prison due to racial disparities in HIV/AIDS (Prejean et al., 2011). Prior studies suggest that HIV risk behavior may be higher among women than men in the criminal justice system due to inter-related, complex factors, such as drug use disorders, sex exchange for money/drugs, and mental health problems (N.U. Cotten-Oldenburg, Martin, Jordan, Sadowski, & Kupper,

1997). HIV risk behavior in criminal justice populations includes sharing injection equipment, engaging in unprotected sex with drug-injecting partners, having sex with multiple partners, having a history of STI, inconsistently using condoms, and using alcohol and other non-injection drugs (N. U. Cotten-Oldenburg, Jordan, Martin, & Sadowski, 1999; Hankins et al., 1994; Martin, O'Connell, Inciardi, Surratt, & Beard, 2003). Among people who inject drugs, women having sex with women (WSW) have been shown to be at increased risk for HIV (Diaz, Vlahov, Greenberg, Cuevas, & Garfein, 2001).

We sought to characterize gender differences in HIV/STI risk behaviors among former prison inmates. Our objectives were to 1) compare engagement in risk behavior in the first two weeks post-release (baseline) to three months later (follow-up), and to 2) examine the association of gender with risk behaviors independent of other contributing factors, such as substance use and sexual orientation. We hypothesized that HIV/STI risk behavior would be greater at baseline than at follow-up and that female gender would be independently associated with greater risk behavior.

METHODS

Study Design and Setting

This was a prospective cohort study of 200 former prison inmates released from a western state Department of Corrections (DOC) to a single metropolitan area. The system had approximately 11,000 releases in 2010 (which may not represent unique individuals), of which 13% were women. The DOC performs mandatory HIV testing on the third day after intake and the reported prevalence of HIV/AIDS is 1.0% (Maruschak, 2012).

Sample

We recruited former prison inmates November 2010 to February 2012. A research assistant used flyers and presentations to recruit from a re-entry center, correctional facilities, parole, social service providers, and by word of mouth. Based on power calculations, the anticipated 156 participants at follow-up (78%) would provide over 80% power to detect a reduction in the proportion reporting risk behavior from 34% to 17%, using McNemar's test with discordant rate=0.2–0.5 at alpha=0.05. Recruitment of women was lower than anticipated, so we targeted 50 women for adequate power to examine gender differences in HIV risk behavior.

Eligibility criteria included: 1) release from prison within the last one to three weeks; 2) age 18 and older; 3) ability to understand study procedures in English; and 4) no plans to leave the area for three months. Individuals on "current inmate" status (i.e. under locked confinement part of the day or night) were excluded because they were still under correctional observation. Individuals with and without HIV were eligible since we were interested in risk behaviors which lead to both HIV transmission and acquisition.

Data Collection and Survey Measures

Eligibility was initially assessed by phone; consent and interviews took place in private offices. Audio Computer Assisted Self-Interview (ACASI) was used for sensitive questions,

including sexual orientation and sexual activities, to minimize social desirability bias and encourage accurate reporting of risk behaviors. (Des Jarlais et al., 1999; Mills et al., 1996; Newman et al., 2002; Perlis, Des Jarlais, Friedman, Arasteh, & Turner, 2004). Participants read and heard the questions on headphones and inputted answers into the computer. We used Research Electronic Data Capture (REDCap) to manage data (Harris et al., 2009).

Participants could complete the follow-up interview between two and nine months after the baseline, but follow-up was scheduled as close as possible to three months after the baseline interview. We did not conduct interviews in jail or prison because this investigation focused on risk behaviors in the community; however, individuals incarcerated and re-released during the follow-up period were interviewed upon their subsequent release. Individuals not re-released were ineligible for follow-up. Participants received $20 and $25 compensation for baseline and follow-up interviews, respectively; transportation costs; and $5 for referring additional eligible participants. We obtained a Federal Certificate of Confidentiality.

Race, ethnicity, age, marital status, highest grade completed, and prior HIV testing and location were assessed with a verbally administered instrument using questions from the Behavioral Risk Factor Surveillance System, 2010 (Centers for Disease Control and Prevention, 2010). The instrument also included questions about gender, current living situation, whether participants considered themselves homeless, and lifetime months spent in jail, prison or juvenile detention (Takahashi, Baernstein, Binswanger, Bradley, & Merrill, 2007). Participants were asked whether a health professional had ever told them they had HIV or hepatitis C. Hazardous drinking was assessed using the AUDIT-Consumption (AUDIT-C) (Bradley et al., 2007), a three item scale that has been validated against the full AUDIT in incarcerated women (Caviness et al., 2009). We hypothesized that depression could lead to increased engagement in risk behaviors and difficulty negotiating condom use, therefore, depression symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9) (Kroenke, Spitzer, & Williams, 2001).

To assess drug of choice and HIV risk behaviors (injection drug use, needle and syringe sharing, oral, vaginal and anal sex without a condom, multiple sex partners, gender of sexual partners, and sex exchange for money or drugs), we modified questions from the Risk Behavior Questionnaire (RBQ) (Corsi & Booth, 2008; Corsi, Kwiatkowski, & Booth, 2009), based on the validated Risk Behavior Assessment from the NIDA Cooperative Agreement Study (Booth, Kwiatkowski, & Stephens, 1998; Needle et al., 1995; Rhodes, Wood, & Booth, 1998; Weatherby et al., 1994). We asked about risk behaviors in the last seven days to improve recall (e.g. “During the last seven days, how many people did you have vaginal, oral and/or anal sex with?”). All participants were asked about their drug of choice. Questions about substance use were interviewer administered and questions on sexual behaviors were administered by ACASI.

After the follow-up interview, we offered participants HIV testing using a rapid oral test (OraQuick™ ADVANCE Rapid HIV-1/2 Antibody Test), which has a reported 99.3% sensitivity and 99.8% specificity (Orasure Technologies, 2012). In clinical testing, the test has 100% specificity and 96% sensitivity, with false-negatives in early initiates of antiretroviral therapy (O’Connell et al., 2003).

Statistical Analysis

First, we compared baseline characteristics and risk behaviors between those who did (n=155) and did not follow-up (n=45) using chi-square tests or Fisher's exact tests for categorical variables and t-tests or Wilcoxon tests for continuous variables. We then examined differences in risk behaviors at baseline and follow-up using McNemar-Bowker's test. Next, we examined differences in baseline socio-demographic, health-related, and substance use variables, and baseline and follow-up risk behavior by gender.

We selected unprotected vaginal or anal sex in the last seven days as our primary dependent variable at both time points. We assessed unadjusted associations and conducted multivariable logistic regression analyses. Independent variables included demographic, health-related, and substance use characteristics. Hazardous drinking and any alcohol use were collinear (correlation=0.63–0.73), so we used hazardous drinking because it was based on a validated instrument. The candidate variables for multivariable analysis at follow-up were a subset of those at baseline. In addition to gender, variables were considered in the two multivariable models if the *p*-value in unadjusted testing was <0.15. To derive the final multivariable regression models, variables other than gender were removed using backward elimination. Eleven individuals reported no drug of choice; these were combined with marijuana as the reference category for drug of choice. We also conducted sensitivity analyses excluding individuals who reported having HIV at baseline and follow-up. We employed SAS version 9.2 (SAS Institute, Cary, NC) for all analyses.

RESULTS

We screened 322 people, of whom 217 were eligible. Reasons for ineligibility included release from prison more than three weeks previously (n=71), release from jail (n=24), and current inmate status (n=9). Sixteen participants did not attend the first interview, one died between screening and enrollment, and one declined. Two hundred were enrolled and 155 (78%) completed follow-up. Median time from release to first interview was 13 days (25^{th}–75^{th} percentile 8–18) and to follow-up was 86 days (25^{th}–75^{th} percentile 78–110). Of those who did not complete follow-up (n=45), 30 were re-incarcerated, nine could not be contacted, five did not attend at least two appointments, and one died. Ten participants who completed follow-up had been re-incarcerated and released again.

There were no significant differences in baseline demographic characteristics between those who followed up and who did not except for age (mean 42.1 vs. 37.9, p=0.006). Fewer participants who followed-up reported alcohol use (29.7% vs. 46.7%, p=0.03), hazardous drinking (14.8% vs. 28.9%, p=0.03), multiple sexual partners (40.3% vs. 57.8%, p=0.04), partners with other sexual partners (11.7% vs. 24.4%, p=0.03), and unprotected vaginal or anal sex (23.9% vs. 46.7%, p=0.003) compared with those who did not follow-up.

Table 1 shows baseline characteristics of the sample. No participants identified as transgendered or reported being pregnant. Women were slightly younger (p=0.03) and had fewer years of lifetime incarceration (p<0.001) than men. Women were more likely to report being bisexual or gay/lesbian (p<0.001), being housed (p=0.002), having a drug-related

offense (p=0.01), being in drug treatment (p=0.005), and having depression symptoms (p=0.009) than men. Only one participant was receiving opioid substitution therapy.

At baseline, 99.5% had ever been tested for HIV and 85.4% reported that their last HIV test was conducted in a correctional facility. Overall, 9.5% (n=19) reported they had been told they had HIV by a health professional; 15 of these were interviewed at follow-up, of whom 12 (80%) confirmed they had been told they had HIV by a health professional; 11 of these 12 (92%) had a positive OraQuick™ test. No new cases of HIV were identified in the 154 participants who agreed to testing at follow-up (one declined).

Table 2 shows sexual and drug use risk behaviors by gender at baseline and follow-up. At baseline, 44.0% reported that they had ever injected drugs, but only two (males) reported injecting drugs in the prior seven days. When asked about risk behavior in the last seven days, women were more likely to report vaginal, oral, and/or anal sex with multiple partners (p<0.001), sexual partners with a history of injection drug use (p=0.048), sex exchange for drugs/money (p=0.046), and unprotected oral (p<0.001) or vaginal sex (p=0.008) than men. Among men, 4.2% reported having sex only with other men. Five women reported unprotected vaginal sex with other women. At baseline, three participants reported having sex with someone they knew had HIV; two of these men reported they had HIV. At follow-up, one man (who did not have HIV) reported sex with partner with HIV in the last seven days.

Table 3 shows characteristics associated with unprotected sex among former inmates at baseline and follow-up. Considering only participants with follow-up data (n=155), there were no significant differences between reports of drug-related or sexual risk behavior at both time points (all p-values ≥0.30; data not shown).

In the adjusted model for baseline data (Table 4), being younger (OR for each decade increase in age=0.48, 95% CI=0.29–0.80), being homeless (OR=0.40, 95% CI=0.16–-0.99), being gay/lesbian or being bisexual (compared with being heterosexual, OR=4.74 95% CI 1.01–22.17, OR=3.98, 95% CI 1.41–11.26, respectively), or reporting a drug of choice of heroin/speedballs or cocaine/crack (compared with marijuana/no drug of choice, OR=24.00, 95% CI 5.15–111.81 and OR=3.49, 95% CI 1.20, 10.18, respectively), hazardous drinking (OR=3.02, 95% CI=1.15–7.92) were significantly associated with unprotected sex. Female gender was not independently associated with unprotected sex (OR=1.03, 95% CI=0.42–2.54). In the adjusted model at follow-up (Table 4), female gender (OR=4.42, 95% CI=1.79–10.94), hazardous drinking (OR=3.64, 95% CI=1.34–9.86) and race were significantly associated with unprotected sex. To avoid excluding potentially common risk factors between baseline and follow-up, factors showing trends (race at baseline and homelessness at follow-up) were retained in the models, but their retention had minimal effects on the association between other factors and the outcome. Sensitivity analyses excluding individuals who reported having HIV at baseline and follow-up yielded similar multivariable results (data not shown).

DISCUSSION

In this prospective cohort study, we demonstrated persistent engagement in HIV/STI sexual risk behavior during the post-release period. A higher proportion of women than men engaged in several risk behaviors. Younger age, homelessness, bisexual orientation, hazardous drinking and a drug of choice of heroin/speedballs were associated with having unprotected sex in the immediate post-release period. At follow-up, female gender, race and hazardous drinking were independently associated with unprotected sex.

A substantial proportion of women self-identified as lesbian or bisexual. While not traditionally considered a high-risk group for HIV because of the low risk of woman-to-woman transmission, the elevated prevalence of HIV and HIV risk behaviors among WSW has been described (Diaz, et al., 2001; Ompad et al., 2011). In these community-based studies of drug users, WSW were more vulnerable on social, economic, violence and drug use indices, were less likely to be insured, and had higher-risk sexual and injecting networks. Our results suggest that health providers should assess WSW for HIV risk, test WSW for HIV/STIs, and include WSW in comprehensive risk reduction programs. Further efforts to reduce health inequity based on sexual orientation and gender may be required for successful prevention efforts.

Treatment of substance use disorders is a key component of adequate post-release transitional care (Springer, Spaulding, Meyer, & Altice, 2011). Former inmates often return to environments replete with triggers to use drugs and alcohol, which can negatively affect decision-making about sexual activity and may lead to sex exchange for drugs (J. Adams, et al., 2011). Whereas half of the sample was in drug treatment, only one person was in opioid substitution therapy, suggesting little uptake of pharmacologically-supported drug treatment. Our finding about the association of hazardous drinking with risk behavior supports the use of evidence-based treatment for alcohol dependent former inmates (Springer, Azar, & Altice, 2011).

After release from prison, HIV risk behavior occurs in a complex context of significant transitional challenges (J. Adams, et al., 2011). Financial and employment problems (Petersilia, 2001) may prevent former inmates from purchasing condoms. Women may engage in sex exchange for basic needs such as food, housing, and shelter. Incarceration can also erode community sexual, social and family support networks. Former inmates may experience anxiety, poor treatment continuity, and inadequately treated mental health conditions (Binswanger et al., 2011). These circumstances, combined with drug and alcohol use, may interfere with effective negotiation of condom use. Prevention efforts should include gender-based, culturally appropriate interventions which address the real-world constraints faced by individuals leaving prison. For women leaving prison, interventions should incorporate content on negotiating condom use during sex exchange.

This study had several limitations. First, we conducted this study in a western urban environment, which may not be representative of other regions. Participants were enrolled based on self-reported release dates rather than confirmed data. Recruitment of women was slower than expected because of the smaller numbers of women released and a narrow

window of eligibility since release, but we enrolled a diverse sample in terms of race/ethnicity, education and sexual orientation. Our results may not apply to individuals released from detention in jail or at different times relative to release. A study of risk behaviors one year after jail release showed a low proportion with 30-day risky sexual behavior and no gender differences (L. M. Adams et al., 2011). In our study, participants may not have accurately answered certain questions (e.g. injecting drugs in the last seven days) because of fear of criminal sanctions or because we did not use ACASI for all questions. We minimized this risk by conducting interviews in private and having a Federal Certificate of Confidentiality.

Our prevalence of HIV was higher than the reported prevalence (Maruschak, 2012). The difference could be due to chance alone or because persons with HIV were easily recruited because the study content related to HIV. Our sampling was designed to maximize internal validity rather than provide representative prevalence data. Three individuals reported that a doctor or nurse had told them they had HIV at baseline but changed their response at follow-up. This difference could have been due to difficulty with the question phrasing or reflect poor prior communication with healthcare providers about HIV testing results. One individual who reported having HIV at follow-up had a negative rapid test, which may have been a false-negative due to early antiretroviral therapy (O'Connell, et al., 2003).

The time relative to release from prison should be carefully considered in the design and interpretation of future research with criminal justice populations. Among those who followed-up, there were no significant differences in risk behaviors over time. However, those who did not complete follow-up, generally due to re-incarceration, engaged in a higher level of early sexual risk behavior than those who completed follow-up. Furthermore, some factors associated with risk behavior at baseline were not associated at follow-up. Our results demonstrate that some former inmates with high-risk behaviors may not be available for recruitment or follow-up based on the time elapsed since release.

Enhanced efforts are needed to reduce risk behavior among current and former prison inmates, including women and men. Improving access to HIV/STI screening, testing and treatment is critical to improving health outcomes. Different barriers and opportunities to implementing health promotion may occur in prison and after release. Traditional and novel settings, such as community health clinics, transitional clinics, (Wang et al., 2010) parole offices and drug treatment centers, should be considered as sites for intervention. Future assessment of enhanced HIV/STI preventive and treatment services may demonstrate improvements in the health of former inmates and the communities to which they return.

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Table 1

Demographic, Health, Substance Use and Mental Health Characteristics of Former Prison Inmates Overall and by Gender, n (%) Unless Otherwise Specified

Baseline Characteristic	Overall N=200	Men N=149	Women N=51	p-value*
Age in years, mean (SD)	41.1 (8.9)	41.9 (8.9)	38.8 (8.6)	0.03
Race/ethnicity				
Non-Hispanic black	77 (38.5)	59 (39.6)	18 (35.3)	0.38
Non-Hispanic white	69 (34.5)	53 (35.6)	16 (31.4)	
Hispanic/Latino	46 (23.0)	33 (22.2)	13 (25.5)	
Other	8 (4.0)	4 (2.7)	4 (7.8)	
Marital status				
Never married	105 (52.5)	83 (55.7)	22 (43.1)	0.30
Divorced, widowed, separated	69 (34.5)	48 (32.2)	21 (41.2)	
Married or part of a couple	26 (13.0)	18 (12.1)	8 (15.7)	
Self-reported sexual orientation				
Heterosexual (straight)	160 (80.4)	129 (86.6)	31 (62.0)	<0.001
Gay (males) or lesbian (females)	11 (5.5)	6 (4.0)	5 (10.0)	
Bisexual	28 (14.1)	14 (9.4)	14 (28.0)	
Educational attainment				
Less than high school graduate	24 (12.0)	15 (10.1)	9 (17.7)	0.27†
Grades 12 or GED	116 (58.0)	89 (59.7)	27 (52.9)	
Some college / technical school / more	60 (30.0)	45 (30.2)	15 (29.4)	
Current living situation				
Housed	72 (36.0)	43 (28.9)	29 (56.9)	0.002
Housing insecure	101 (50.5)	83 (55.7)	18 (35.3)	
Homeless	27 (13.5)	23 (15.4)	4 (7.8)	
Consider self homeless	157 (78.9)	120 (81.1)	37 (72.6)	0.20
Any paid days worked in last 30	36 (18.0)	30 (20.1)	6 (11.8)	0.18
On parole	173 (86.5)	130 (87.3)	43 (84.3)	0.60
Years in jail/prison/juvenile detention, median (25%ile-75%ile)	10.0 (5.0-17.0)	12.0 (6.0-18.0)	6.0 (3.5-12.0)	<0.001††
Most recent incarceration for drug-related offense				
Yes	81 (40.5)	57 (38.3)	24 (47.1)	0.01
No	79 (39.5)	55 (36.9)	24 (47.1)	
Missing	40 (20.0)	37 (24.8)	3 (5.9)	
Been told HIV positive by a health professional	19 (9.5)	12 (8.1)	7 (13.7)	0.27
Hepatitis C	62 (31.0)	49 (32.9)	13 (25.5)	0.32
Any alcohol in last 7 days	67 (33.5)	51 (34.2)	16 (31.4)	0.71
Hazardous drinking (AUDIT-C)	36 (18.0)	25 (16.8)	11 (21.6)	0.44
Drug of choice				

Baseline Characteristic	Overall N=200	Men N=149	Women N=51	p-value*
Marijuana/hashish/no drug of choice§	65 (32.5)	52 (34.9)	13 (25.5)	0.19
Crack or cocaine	61 (30.5)	38 (25.5)	23 (45.1)	
Amphetamines	24 (l2.0)	19 (12.8)	5 (9.8)	
Heroin or Speedball	17 (8.5)	13 (8.7)	4 (7.8)	
Alcohol	24 (12.0)	19 (12.8)	5 (9.8)	
Other	9 (4.5)	8 (5.4)	1 (2.0)	
Currently in drug treatment	73 (36.5)	46 (30.9)	27 (52.9)	0.005
Depression screen score (PHQ-9)				0.009†
No symptoms	101 (50.5)	80 (53.7)	21 (41.2)	
Minimal symptoms	46 (23.0)	36 (24.2)	10 (19.6)	
Minor depression	27 (13.5)	19 (12.8)	8 (15.7)	
Major depression, moderately severe	14 (7.0)	8 (5.4)	6 (11.8)	
Major depression, severe	12 (6.0)	6 (4.0)	6 (11.8)	

*Chi-square tests for categorical variables and t-tests for continuous variables, unless otherwise specified

†Mantel-Haenszel chi-square test

††Wilcoxon test

§For drug of choice, 11 individuals who did not respond with a drug of choice were grouped with marijuana

Table 2

Lifetime and HIV Risk Behaviors in the Last Seven Days of Former Prison Inmates Overall and by Gender, at Baseline and Follow-up, N (%) Unless Otherwise Specified

	BASELINE			
	Overall, N=200	**Men, n=149**	**Women, n=51**	**p-value** *
Lifetime risk behaviors				
Injection drug use, ever	88 (44.0)	64 (43.0)	24 (47.1)	0.61
Exchanged money, drugs, or sex	110 (55.0)	81 (54.4)	29 (56.9)	0.76
Exchanged sex for drugs or money	65 (32.5)	36 (24.2)	29 (56.9)	<.001
Exchanged drugs or money for sex	78 (39.0)	71 (47.7)	7 (13.7)	<.001
Risk behaviors in last seven days (baseline interview)				
Injection drug use	2 (1.0)	2 (1.3)	0 (0.0)	0.99†
One or more sexual partners	88 (44.2)	55 (36.9)	33 (66.0)	<.001
One or more sexual partners ever used injection drugs	21 (10.6)	12 (8.1)	9 (18.0)	0.048
One or more sexual partners had other sexual partners	29 (14.6)	20 (13.4)	9 (18.0)	0.43
One or more sexual partners known to have HIV	3 (1.5)	3 (2.0)	0 (0.0)	0.57†
Gender of sexual partner(s)				<.001†
Same gender	11 (5.7)	6 (4.2)	5 (10.0)	
Opposite gender	68 (35.1)	41 (28.5)	27 (54.0)	
Both	4 (2.1)	3 (2.1)	1 (2.0)	
Neither	111 (57.2)	94 (65.3)	17 (34.0)	0.32†
Exchanged money, drugs, or sex	13 (6.5)	8 (5.4)	5 (10.0)	
Exchanged sex for drugs or money	9 (4.5)	4 (2.7)	5 (10.0)	0.046†
Exchanged drugs or money for sex	6 (3.0)	6 (4.0)	0 (0.0)	0.34†
Unprotected oral sex	52 (26.0)	29 (19.5)	23 (45.1)	<.001
Unprotected vaginal sex	54 (27.0)	33 (22.2)	21 (41.2)	0.008
Unprotected anal sex	12 (6.0)	8 (5.4)	4 (7.8)	0.51†

BASELINE				
Unprotected vaginal *or* anal sex	58 (29.0)	37 (24.8)	21 (41.2)	0.03
FOLLOW-UP				
	Overall, N=155	**Men, n=114**	**Women, n=41**	**p-value**
Lifetime risk behaviors				
Injection drug use, ever	66 (42.6)	45 (39.5)	21 (51.2)	0.19
Exchanged money, drugs, or sex	79 (51.0)	53 (46.5)	26 (63.4)	0.06
Exchanged sex for drugs or money	49 (31.6)	24 (21.1)	25 (61.0)	<.001
Exchanged drugs or money for sex	55 (35.5)	49 (43.0)	6 (14.6)	0.001
Risk behaviors in last seven days (follow-up interview)				
Injection drug use	4 (2.6)	3 (2.6)	1 (2.4)	0.99†
One or more sexual partners	58 (37.7)	33 (29.2)	25 (61.0)	<.001
One or more sexual partners ever used injection drugs	11 (7.1)	6 (5.3)	5 (12.2)	0.16†
One or more sexual partners had other sexual partners	16 (10.4)	12 (10.6)	4 (9.8)	0.99†
One or more sexual partners known to have HIV	1 (0.7)	1 (0.9)	0 (0.0)	0.99†
Gender of sexual partner(s)				<.001†
Same gender	3 (2.0)	1 (0.9)	2 (4.9)	
Opposite gender	53 (34.4)	31 (27.4)	22 (53.7)	
Both	2 (1.3)	1 (0.9)	1 (2.4)	
Neither	96 (62.3)	80 (70.8)	16 (39.0)	0.70†
Exchanged money, drugs, or sex	9 (5.8)	6 (5.3)	3 (7.3)	
Exchanged sex for drugs or money	4 (2.6)	1 (0.9)	3 (7.3)	0.06†
Exchanged drugs or money for sex	5 (3.3)	5 (4.4)	0 (0.0)	0.33†
Unprotected oral sex	35 (22.6)	22 (19.3)	13 (31.7)	0.10
Unprotected vaginal sex	42 (27.1)	24 (21.1)	18 (43.9)	0.005
Unprotected anal sex	4 (2.6)	1 (0.9)	3 (7.3)	0.06†
Unprotected vaginal *or* anal sex	42 (27.1)	24 (21.1)	18 (43.9)	0.005

* Chi-square tests for categorical variables and t-tests for continuous variables, unless otherwise specified

† Fisher's exact test

Table 3

Demographic, Health, and Substance Use Characteristics of Former Prison Inmates by Unprotected Vaginal or Anal Sex in the Last Seven Days at Baseline and Follow-up, n (%) Unless Otherwise Specified

	Baseline, N=200			Follow-up, N=155		
Characteristic *	**Any unprotected sex N=58**	**No unprotected sex N=142**	**p-value**	**Any unprotected sex N=42**	**No unprotected sex N=113**	**p-value**
Female	21 (36.2)	30 (21.1)	0.03	18 (42.9)	23 (20.4)	0.005
Age in years, mean (SD)	37.6 (9.3)	42.6 (8.4)	<0.001	39.2 (6.8)	43.5 (8.6)	0.004
Race/ethnicity			0.047			0.003
Non-Hispanic white	16 (28.6)	53 (39.0)		13 (34.2)	38 (34.9)	
Non-Hispanic black	20 (35.7)	57 (41.9)		8 (21.1)	50 (45.9)	
Hispanic	20 (35.7)	26 (19.1)		17 (44.7)	21 (19.3)	
Homeless	39 (67.2)	118 (83.7)	0.01	19 (45.2)	67 (59.3)	0.12
Sexual orientation			<0.001			0.22[F]
Heterosexual (straight)	36 (62.1)	124 (87.9)		33 (78.6)	98 (87.5)	
Gay (males) or lesbian (females)	5 (8.6)	6 (4.3)		2 (4.8)	6 (5.4)	
Bisexual	17 (29.3)	11 (7.8)		7 (16.7)	8 (7.1)	
Any paid days worked in last 30	8 (13.8)	28 (19.7)	0.32	23 (54.8)	55 (48.7)	0.50
Years in jail/prison/juvenile detention, median (25%-75%)	9.0 (5.0-15.0)	11.0 (5.3-17.0)	0.23[†]	14.0 (7.0-18.0)	10.0 (5.0-18.0)	0.34[†]
Most recent incarceration for drug-related offense			0.89			0.31
Yes	25 (43.1)	56 (39.4)		19 (45.2)	42 (37.2)	
No	22 (37.9)	57 (40.1)		19 (45.2)	49 (43.4)	
Missing	11 (19.0)	29 (20.4)		4 (9.5)	22 (19.5)	
Been told HIV positive by a health professional	6 (10.3)	13 (9.2)	0.80	1 (2.4)	11 (9.7)	0.18[F]
Any alcohol in last 7 days	29 (50.0)	38 (26.8)	0.002	20 (47.6)	31 (27.4)	0.02
Hazardous drinking	17 (29.3)	19 (13.4)	0.008	15 (35.7)	17 (15.0)	0.005
Drug of choice			0.006			0.91
Marijuana/Hashish/no drug of choice	13 (22.4)	52 (36.6)		10 (23.8)	32 (28.3)	

	Baseline, N=200			Follow-up, N=155		
Crack or cocaine	22 (37.9)	39 (27.5)		14 (33.3)	34 (30.1)	
Heroin or Speedball	10 (17.2)	7 (4.9)		3 (7.1)	10 (8.9)	
Other	13 (22.4)	44 (31.0)		15 (35.7)	37 (32.7)	
Currently in drug treatment	25 (43.1)	48 (33.8)	0.22	23 (54.8)	60 (53.1)	0.85
Depression screen (PHQ-9)			0.81††			0.35††
No symptoms	25 (43.1)	76 (53.5)		22 (52.4)	58 (51.3)	
Minimal symptoms	19 (32.8)	27 (19.0)		8 (19.0)	29 (25.7)	
Minor depression	7 (12.1)	20 (14.1)		4 (9.5)	15 (13.3)	
Major depression, moderate severity	4 (6.9)	10 (7.0)		4 (9.5)	7 (6.2)	
Major depression, severe	3 (5.2)	9 (6.3)		4 (9.5)	4 (3.5)	

*There were few (<6%) missing cases for each characteristic; Chi-square tests for categorical variables and t-tests for continuous variables, unless otherwise specified.

†Wilcoxon test

*F*Fisher's exact test

††Mantel-Haenszel chi-square test

Table 4

Unadjusted and Adjusted Odds Ratio (OR) of Characteristics for Unprotected Vaginal or Anal Sex within Last Seven Days among Former Prison Inmates at Baseline and Follow-up

	Baseline, N=200		Follow-up, N=155	
Characteristic	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI) ***	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI) ***
Gender				
Male	Ref.	Ref.	Ref.	Ref.
Female	2.12 (1.08-4.14)	1.03 (0.42-2.54)	2.94 (1.37-6.30)	4.42 (1.79-10.94)
Increasing age (per 10 years)	0.52 (0.36-0.75)	0.48 (0.29-0.80)	0.52 (0.33-0.82)	
Race				
Non-Hispanic white	Ref.	Ref.†	Ref.	Ref.
Non-Hispanic black	1.16 (0.55-2.48)	1.71 (0.61-4.75)	0.47 (0.18-1.24)	0.56 (0.19-1.63)
Hispanic	2.55 (1.14-5.72)	3.46 (1.23-9.72)	2.37 (0.96-5.81)	2.24 (0.84-5.97)
Homeless	0.40 (0.20-0.81)	0.40 (0.16-0.99)	0.57 (0.28-1.16)	0.45 (0.19-1.04)††
Sexual orientation				
Heterosexual	Ref.	Ref.	-	-
Gay or Lesbian	2.87 (0.83-9.95)	4.74 (1.01-22.17)		
Bisexual	5.32 (2.29-12.38)	3.98 (1.41-11.26)		
Hazardous drinking	2.69 (1.28-5.65)	3.02 (1.15-7.92)	3.14 (1.39-7.09)	3.64 (1.34-9.86)
Drug of choice				
Marijuana/hashish/no drug of choice§	Ref.	Ref.	-	-
Crack or cocaine	2.26 (1.01-5.03)	3.49 (1.20-10.18)		
Heroin or speedball	5.71 (1.83-17.89)	24.00 (5.15-111.81)		
Other	1.18 (0.50-2.81)	1.64 (0.57-4.76)		

*Baseline multivariable regression model used N=190, and follow-up multivariable regression model used N=147 due to missing cases of predictors.

-indicates variables were not candidates for inclusion in the multivariable model based on a p>0.15 in unadjusted testing

†p=0.06

††p=0.06

§For drug of choice, marijuana together with those who did not respond to the question, were selected as the reference category