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Sociodemographic and Substance Use Disorder Determinants of HIV Sexual Risk Behavior in Men and Women in Outpatient Drug Treatment in the NIDA National Drug Abuse Treatment Clinical Trials Network

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Abstract

BACKGROUND—Sexual risk behavior is now the primary vector of HIV transmission among substance users in the United States with gender as a crucial moderator of risk behavior.

OBJECTIVES—The purpose of this study was to examine gender differences in factors (age, race/ethnicity, education) that predict main-partner unprotected sexual occasions (USO) using the unique platform of two parallel NIDA National Drug Abuse Treatment Clinical Trials Network gender-specific safer sex intervention trials.

METHODS—Baseline assessments of male (N=430) and female (N=377) participants included demographic characteristics; past 3-month sexual activity; and a diagnostic assessment for alcohol, cocaine/stimulant, and opioid use disorders. Using mixed effects generalized linear modeling of the main outcome USO, two-way interactions of gender with age, race/ethnicity, and education were evaluated and adjusted by alcohol, cocaine/stimulant, or opioid use disorder.

RESULTS—When adjusted for alcohol use disorder, the interaction of education and gender was significant. For men, a high school or greater education was significantly associated with more USO compared to men with less than high school. For women, greater than high school education was significantly associated with less USO compared to women with a high school education. None of the other interactions were significant when adjusted for cocaine/stimulant or opioid use disorder.

CONCLUSIONS/IMPORTANCE—This study demonstrates gender differences in the relationship of education, alcohol use disorder, and main-partner USO in individuals in substance abuse treatment. This underscores the importance of considering demographic and substance use factors in HIV sexual risk behavior and in crafting prevention messages for this population.

Keywords

HIV; Gender; Sexual Risk; Substance Abuse Treatment

Declaration of Interest: The other authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

INTRODUCTION

Overwhelmingly, sexual contact is the primary vector for HIV transmission, present in 90.2% of new infections (Centers for Disease Control and Prevention, 2013), including men who have sex with men (with and without injection drug use) and heterosexual transmission. Data suggest that men and women are impacted differently by sexual risk in the context of heterosexual sex (Brody et al., 2014; Katz & Gerberding, 1998; Royce, Sena, Cates, & Cohen, 1997) and often this risk includes the combination of substance use and sexual behavior (Mimiaga et al., 2013; Raj, Saitz, Cheng, Winter, & Samet, 2007). This relationship cuts across substances to include alcohol (Avins et al., 1994; Raj et al., 2007; Shillington, Cottler, Compton, & Spitznagel, 1995; Shuper, Joharchi, Irving, & Rehm, 2009), cocaine (Edlin et al., 1994; Khan et al., 2013; McElrath, 2005; Mimiaga et al., 2013; Molitor, Truax, Ruiz, & Sun, 1998; Raj et al., 2007), methamphetamine (Corsi & Booth, 2008), and opioids (Centers for Disease Control and Prevention, 2006; Chitwood, Comerford, & Sanchez, 2003; Kelly & Parsons, 2013; Mackesy-Amiti, Boodram, Williams, Ouellet, & Broz, 2013).

Women's receptive role in heterosexual sex elevates their HIV risk (Katz & Gerberding, 1998; Royce et al., 1997). Furthermore, normative gendered power dynamics often place women in submissive roles and men in dominant roles in sexual situations. The Theory of Gender and Power (Connell, 1987) also describes gender disparities in macro-level structural and social norms as well as resources that have profound implications for HIV sexual risk. Wingood et al (2009) ties gendered divisions of labor, money, and power to normative dependency of women on men for basic resources. This dependency can substantially limit women's ability to act assertively, including negotiation for condom use in sexual relations (Brody et al., 2014; Hahm, Lee, Rough and Strathdee, 2012; Higgins, Hoffman and Dworkin, 2010). These disparities are enhanced among substance-using women who often live in poverty and have limited resources, support, and social mobility (El-Bassel, Schilling, Irwin et al, 1997).

In addition to gender, many epidemiologic studies have established other demographic characteristics such as race/ethnicity, age, and socioeconomic status as important elements of HIV risk. According to the CDC, in 2014, African Americans represented 44% of new HIV diagnoses despite only comprising 12% of the U.S. population (Centers for Disease Control and Prevention, 2015). The 2013 rate of HIV infection was also disproportionately high among both African American men (105.7 per 100,000) and Latino men (41.8 per 100,000) as compared to White men (13.8 per 100,000) (Centers for Disease Control and Prevention, 2013). When Black or Latino patients are diagnosed with HIV, they are more likely to experience delayed access to care (Campo, Alvarez, Santos, & Latorre, 2005). In addition to racial/ethnic minorities, people most at risk for HIV infection are those with limited social mobility, economic disenfranchisement, and cultural marginalization (El-Sadr, Mayer, & Hodder, 2010).

Two NIDA National Drug Abuse Treatment Clinical Trials Network (CTN) studies of gender-specific HIV sexual risk reduction interventions for men and women, respectively, offered a unique platform for identifying predictors of HIV heterosexual risk behavior (Calsyn et al., 2009; Tross et al., 2008). The CTN is a national network of addiction

researchers and community-based treatment programs partnering to conduct multisite clinical trials of interventions for substance abuse and related conditions (Hanson, Leshner, & Tai, 2002). The aim of the current study was to examine gender differences in the relationship between sociodemographic characteristics and HIV sexual risk behavior (i.e., unprotected sexual occasions) in men and women when accounting for substance use disorders. This study had the advantage of including men and women in both methadone and psychosocial outpatient programs in 16 sites across the United States.

METHODS

Sample

Data for this study come from baseline assessments of sexually active male (N=430) and female (N=377) individuals seeking substance use disorder treatment in two CTN trials. Recruitment procedures are fully detailed in the primary outcome papers of these trials (Calsyn et al., 2009; Tross et al., 2008).

Men were recruited from 14 CTN sites (seven methadone maintenance and seven psychosocial rehabilitation) and women from 12 CTN sites (seven methadone maintenance and five psychosocial rehabilitation) across the U.S. – including 10 shared sites. Procedures were approved by each site's institutional review board in accordance with the Helsinki Declaration of 1975 (revised 2000) and by an independent Data Safety and Monitoring Board convened by NIDA. Inclusion criteria included: (1) age ≥ 18 years; (2) ability to understand and speak English; (3) participation in a drug treatment program; and (4) past 6-month unprotected vaginal or anal intercourse. The latter was ascertained using the Risk Behavior Survey (RBS) (Needle et al., 1995; Weatherby et al., 1994). Participants exhibiting significant cognitive impairment, denoted by a score of < 25 on the Mini-Mental Status Exam (Cockrell & Folstein, 1988), were excluded. Women were also excluded if they were currently pregnant or immediately planning pregnancy. Men were excluded if they had a primary partner intending to get pregnant while enrolled in the trial. The sample for this study was restricted to individuals who engaged in heterosexual sex – as this was the focus of both trials. Because the majority of sexual activity reported by participants occurred with main partners, analyses were limited to sexual activity of participants with main partners.

Assessments

Data related to past 3-month sexual activity were obtained using the Sexual Behavior Interview (SBI), a series of items adopted from the Sex and Drug Abuse Relationship Interview (SADAR) (D.A Calsyn, Wells, Saxon, Jackson, & Heiman, 2000) and the Sexual Risk Behavior Assessment Schedule (SERBAS) (Meyer-Bahlburg, Ehrhardt, Exner, & Gruen, 1991; Sohler, Colson, Meyer-Bahlburg, & Susser, 2000). The SBI was administered using an audio computer-assisted self-interview (ACASI) system for more complete disclosure of sensitive information as compared to face-to-face interview (Gross et al., 2000; Metzger et al., 2000). The SBI collected information on frequency of unprotected vaginal or anal sex by partner type (main versus other). Past 6-month substance use disorders (i.e. combining DSM-IV abuse and dependence) for alcohol, cocaine/stimulants, and opioids

were identified using the Composite International Diagnostic Interview for DSM-IV (CIDI) (Robins et al., 1988).

Data Analysis

The main outcome measure was the number of unprotected (vaginal or anal) sexual occasions (USO) with a main partner over the three months before assessment. We examined whether there were gender differences in the associations between age, race/ethnicity, and education and the main outcome of main-partner USO; when accounting for alcohol, cocaine/stimulant, or opioid use disorders, respectively. The analyses were conducted using mixed effects generalized linear models that accommodated the negative binomial distributions of the outcome. As a result, the incidence rate ratio (IRR) and corresponding 95% confidence intervals were estimated for variables associated with the outcome. Two-way interactions of gender with age, race/ethnicity, and education were evaluated together and then adjusted by alcohol use disorder, cocaine/stimulant use disorder, or opioid use disorder (see Table 2). Interaction terms that were not significant were omitted from the model and only significant two-way interactions were further explored (see Table 3). All hypothesis tests were conducted at a level of significance of 5% and all models were analyzed using SAS® (version 9.3; SAS Institute, Cary, NC, USA).

RESULTS

Data were obtained from 430 men and 377 women who were sexually active with their main partners. Table 1 contains information on age, race/ethnicity, education, substance use disorders, and past 3-month main-partner unprotected sexual occasions (USO), overall and by gender. Mean age was approximately 47.0 years old. On average, men were 50.2 years old and women were 43.2 years old. The most common race/ethnicity was White (50.3%), followed by African-American/Black (25.5%). The sample had the following distribution across three education levels: less than high school (25.7%); high school (43.4%); and greater than high school (31.0%). High school was completed by 47.9% of men vs. 38.2% of women; more than high school was reported by 28.4% of men vs. 34.0% of women. Rates of alcohol (19.32% of all subjects) and opioid use disorders (24.32% of all subjects) were similar between men and women; cocaine/stimulant use disorder was reported by 33.5% of men and 41.5% of women. On average, men reported 26.2 (median=13.5) past 3-month main-partner USO and women reported 22.5 (median=10) past 3-month main-partner USO.

Analyses examined effects of three 2-way interactions (i.e., gender-by-age; gender-by-race/ethnicity; and gender-by-education) on main-partner USO, adjusted by one of three substance use disorder types (alcohol, cocaine/stimulant, opioid). Table 2 presents the three models that evaluate together all three, two-way interaction effects; adjusted by either alcohol use disorder (row 1), cocaine/stimulant use disorder (row 2), or opioid use disorder (row 3). When adjusted by either cocaine/stimulant use disorder or opioid use disorder, none of the two-way interactions were significant; suggesting that the effects of age, race/ethnicity, and education on main-partner USO are not significantly different by gender. When adjusted by alcohol use disorder, the two-way interactions of gender-by-age and gender-by-race/ethnicity were not significant. However, the interaction between gender and

education was significant [$F(2, 700)=4.42, p=.01$], suggesting different associations between education and main-partner USO for men and women when accounting for the differential proportions of alcohol use disorder.

Table 3 details the significant interaction effect of gender and education on main-partner USO, without adjustment by alcohol use disorder (Model A) and with adjustment (Model B). Model A presents the effects of the two-way interaction between gender and education, adjusted by age and race/ethnicity but not by alcohol use disorder. Only age was significantly associated with USO [$F(1, 719)=38.22, p<.001$], with younger age being associated with more USO. Race/ethnicity was not significantly associated with USO. There was no significant interaction effect of gender and education on USO [$F(1, 719)=2.39, p=.09$]. Model B presents the effects of the two-way interaction between gender and education, adjusted by age and race/ethnicity and also adjusted by alcohol use disorder. In Model B, age remained significantly associated with USO [$F(1, 703)=33.1, p<.001$]. Race/ethnicity was not significantly associated with USO. The interaction effect of gender and education on USO was significant [$F(2, 703)=4.07, p=.02$]. The different associations for men and women are presented in Table 3 in the lower part of Model B. For men, having a high school education (IRR=1.45, 95%CI 1.09–1.91) or greater than high school education (IRR=1.52, 95%CI 1.12–2.07) was significantly associated with more main-partner USO compared to men with less than high school, while controlling for alcohol use disorder. For women, greater than high school education (IRR=0.66, 95%CI 0.49–0.87) was significantly associated with less main-partner USO compared to women with a high school education, after controlling for alcohol use disorder.

DISCUSSION

The aim of this study was to examine the relationship of sociodemographic factors, substance use disorder characteristics, and HIV sexual risk behavior (i.e., unprotected sexual occasions) in men and women. After adjusting for alcohol use disorder, we observed a significant gender-by-education interaction effect suggesting a differential relationship of education on main-partner USO among men and women. In particular for men, high school or greater than high school education was associated with more main-partner USO, as compared to men with less than high school education. For women, the opposite was found – greater than high school education was associated with less main-partner USO, as compared to women with a high school education. Thus, controlling for alcohol use disorder, greater education is a protective factor for women but not for men.

These findings are only partially consistent with those hypothesized. It is reasonable to expect that women with higher education might have greater condom access, exposure to safer sex messages and norms, self-efficacy, and ability to negotiate condom use (Brody et al., 2014; Hahm, Lee, Rough, & Strathdee, 2012; Higgins, Hoffman, & Dworkin, 2010). Increased pressure on economically or socially disempowered women to marry and have children early (Higgins et al., 2010) could explain higher main-partner USO in women with lower educational attainment (i.e. high school only). The finding that, among men, main-partner USO was associated with greater educational attainment was both surprising and counter-intuitive. However, these findings may reflect less concern about unprotected sex

(e.g. perceived risk, greater resources for children, greater access to services) among men with more education.

In the context of two large, multi-site HIV prevention trials for men and women in outpatient substance abuse treatment programs, this study reinforces the importance of examining HIV sexual risk behavior through the lens of gender differences. Gender disparities in social norms, social and relationship power, and access to resources are salient themes in the literature on HIV risk behavior. This is exemplified by Wingood et al.'s (2009) hypothesis that the sexual division of labor in society and in sexual relationships pushes women into social and relational positions that increase their risk of HIV transmission. This may be especially true for substance-using women who often live under more extreme circumstances with regard to resources, support, and social mobility.

While other studies have investigated education as a predictor of unprotected sex (Finer & Zolna, 2014; Wellings et al., 2013), few have looked at this in the context of both gender differences and substance use. Many U.S.-based studies have found that lower education and socioeconomic status are predictive of unprotected sex and HIV risk (Adimora et al., 2006; Reece et al., 2010). This association has also been documented in studies that controlled for injection drug (Hasnain, Levy, Mensah, & Sincore, 2007), cocaine (Adimora et al., 2006), and alcohol (Avins et al., 1994) use. In the study presented here, controlling for cocaine/stimulant and opioid use disorders did not change the associations between gender (and interactions with other sociodemographic characteristics) and USO. One important factor to consider is that we used substance use disorder variables (i.e., DSM-IV dependence or abuse) as opposed to days of use, quantity of use, or preferred substance. Thus, findings may differ based on operationalization or measures of substance use and substance use severity.

For both men and women, younger age (< 40) was associated with greater main-partner USO. This is consistent with the epidemiologic literature (Centers for Disease Control and Prevention, 2013; Gavin et al., 2009) and is evidenced by half of new HIV infections occurring among people under the age of 25 (Futerman, 2005).

We did not find an association between race/ethnicity and main-partner USO (in the unadjusted final model) or between the gender-by-race/ethnicity interaction and main-partner USO. Other studies have either found no association between race/ethnicity and condom use among women or less unprotected sex among African American women compared to their White counterparts (Merchant et al., 2006; Parks, Hsieh, Collins, Levonyan-Radloff, & King, 2009; Paterno & Jordan, 2012; Reece et al., 2010). Studies of men suggest that Black and Latino men are at disproportionately high risk for HIV infection (Centers for Disease Control and Prevention, 2013) and for disparities in access to HIV medical care (Campo et al., 2005). However, some of this increased risk may be attributable to coincident demographic factors such as limitations in social mobility, economic disenfranchisement, and cultural marginalization (El-Sadr et al., 2010). It is also important to note that the sample for this study was primarily White and African American with only small numbers of individuals from other racial/ethnic backgrounds.

Strengths and Limitations

The sample used for this analysis is advantageous for several reasons. First, it is relatively large and geographically diverse. Second, it encompasses higher HIV-risk male and female participants in outpatient substance abuse treatment programs and – importantly – includes the less frequently studied psychosocial outpatient treatment programs. The latter type of program typically serves patients with primary cocaine/stimulant and alcohol use disorders, as opposed to methadone/opioid substitution treatment programs which serve primary opioid use disorder patients. Additionally, women and men in this sample both had considerable sexual risk.

This study has several limitations. First, this analysis uses a cross sectional sample. Findings do not denote causality. Second, despite the large sample size and geographic diversity, there were still not enough participants of other racial identity categories (e.g., American Indian/Alaska Native, Asian, Native Hawaiian/Pacific Islander) to be analyzed separately. Third, the main outcome was unprotected sex among sexually active participants and their main partners. Findings may be different for non-main partner sexual risk. Sexual risk behavior with main partners is the primary vector for HIV and STI transmission, as condom use is practiced less frequently in this setting. Practicing safer sex in main partner relationships may be particularly complex as it introduces the perception of mistrust and infidelity on the part of either partner. Individuals are less likely to wear condoms during sex with a main partner (D'Anna et al., 2013; Higgins et al., 2010; Jarama, Belgrave, Bradford, Young, & Honnold, 2007) and gender differences are particularly salient for main-partner sex (Jarama et al., 2007; Nesoff, Dunkle, & Lang, 2015). Among women in relationships that adhere to traditional gender norms, there is less condom use, less perceived risk of HIV, and decreased self-efficacy in negotiating condom use (Brody et al., 2014; Campbell, 1995; Hahm et al., 2012; Jarama et al., 2007). Therefore, main-partner sex is an important context in which to examine HIV risk.

Conclusion

This study's findings regarding the differential association of educational attainment on main-partner USO (and thereby HIV risk) for men and women while accounting for alcohol use disorder diagnosis have implications for both research and clinical practice. Our findings underscore the importance of secondary data analysis using datasets that include both substance use disorder or problem substance use variables and sociodemographic variables that allow for detection of gender differences in sexual risk. Future research directions also include meta-analyses of intervention outcome studies with similar variables to look prospectively at the relationship between such variables and HIV risk outcomes.

This study also underscores the need for clinicians to adopt a “gender lens” when delivering treatment and services, while also maintaining a “comorbidity lens” in conducting HIV interventions. This perspective allows for consideration of sexual/substance use risk factors that predispose substance abuse treatment patients to HIV infection. Similarly, our findings highlight the need to integrate HIV/STI safer sex messages into substance abuse treatment settings in ways that recognize the potentially different needs and motivations of patients

based on age, educational attainment, and particular substance use disorder; all demographic considerations that impact risk behaviors.

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Glossary of Terms

Alcohol use disorders

collectively refers to the DSM-IV-TR (APA, 2000) diagnoses of “alcohol abuse” characterized by maladaptive pattern of alcohol use leading to clinically significant impairment or distress and “alcohol dependence” characterized by tolerance and withdrawal

Cocaine/stimulant use disorders

collectively refers to the DSM-IV diagnoses of “cocaine abuse” characterized by maladaptive pattern of cocaine use leading to clinically significant impairment or distress and “cocaine dependence” characterized by tolerance and withdrawal

HIV sexual risk behavior

vaginal or anal sex without a condom

Opioid use disorders

collectively refers to the DSM-IV diagnoses of “opioid abuse” characterized by maladaptive pattern of opioid use leading to clinically significant impairment or distress and “opioid dependence” characterized by tolerance and withdrawal

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Table 1

Demographic characteristics, substance use disorder prevalence, and number of main-partner unprotected sexual occasions with a main partner by gender

	Total (n=807)	Men (n=430)	Women (n=377)
	Mean (SD) or %		
Age (% 40 years)	46.96	50.23	43.24
Race/Ethnicity			
White	50.31	44.19	57.29
Black	25.53	27.44	23.34
Hispanic/Latino/a	14.37	18.60	9.55
Other	9.79	9.77	9.81
Education			
<High	25.65	23.72	27.85
High	43.37	47.91	38.20
>High	30.98	28.37	33.95
Substance use disorder (6 mos)			
Alcohol	19.32	17.44	21.55
Cocaine/stimulants	37.22	33.49	41.49
Opioids	24.32	23.72	25.00
Unprotected sex occasions (3 mos)	24.70 (31.18)	26.26 (30.12)	22.91 (32.29)
	Median = 12	Median = 13.5	Median = 10
	Range = (0,35)	Range = (0,194)	Range = (0,325)

Table 2

Analyses of interaction effects of gender (n=377 women, n=430 men) by age, race/ethnicity and education, adjusted by substance use disorder (alcohol, cocaine/stimulants, opioids), on main-partner unprotected sexual occasions

	Interaction between gender and the demographic characteristics		
Model adjusted by substance use disorder covariate	Age	Race/Ethnicity	Education
	F(df ₁ ,df ₂), p-value		
Alcohol	F(1,700)=0.63, p=.43	F(2,700)=0.72, p=.49	F(2,700)=4.42, p=.01
Cocaine/Stimulants	F(1,714)=0.85, p=.36	F(2,714)=0.90, p=.41	F(2,714)=2.86, p=.06
Opioids	F(1,714)=0.85, p=.36	F(2,714)=0.88, p=.42	F(2,714)=2.86, p=.06

Analyses of the interaction effect of gender (n=377 women, n=430 men) and education, unadjusted and adjusted by alcohol use disorder (AUD), on main-partner unprotected sex occasions

Table 3

	Model A (unadjusted)			Model B (adjusted by AUD)		
	IRR (95%CI)	F(df ₁ , df ₂)	p-value	IRR (95%CI)	F(df ₁ , df ₂)	p-value
Age (<40 vs. 40)	1.70 (1.44,2.01)	F(1,719)=38.22	<.001	1.64 (1.38,1.94)	F(1,703)=33.10	<.001
Race/ethnicity	---	F(2,719)=1.93	.15	---	F(2,703)=2.20	.11
Black vs. White	0.84 (0.69,1.02)		.08	0.84 (0.69,1.03)		.09
Hispanic vs. white	1.03(0.81,1.31)		.80	1.08 (0.85,1.37)		.54
AUD (6 mos)				1.33 (1.08,1.63)	F(1,703)=7.29	.01
Gender	---	F(1,719)=2.64	.10	---	F(1, 703)=5.86	.02
Education	---	F(2,719)=3.67	.03	---	F(2,703)=4.82	.01
Gender × Education	---	F(2,719)=2.39	.09	---	F(2,703)=4.07	.02
<i>Among Men</i>						
12 yrs vs. <12 yrs				1.45 (1.09,1.91)		.01
>12 yrs vs. <12 yrs				1.52 (1.12,2.07)		.01
>12 yrs vs. 12 yrs				1.05 (0.81,1.36)		.70
<i>Among Women</i>						
12 yrs vs. <12 yrs				1.30 (0.96,1.77)		.09
>12 yrs vs. <12 yrs				0.86 (0.62,1.18)		.34
>12 yrs vs. 12 yrs				0.66 (0.49,0.87)		.004