Journal of Urban Health: Bulletin of the New York Academy of Medicine, Vol. 90, No. 5
doi:10.1007/s11524-013-9820-0

Substance Use and HIV Risk Behavior among Men Who Have Sex with Men: The Role of Sexual Compulsivity

Sarah E. Woolf-King, Thomas M. Rice, Hong-Ha M. Truong, William J. Woods, Roy C. Jerome, and Adam W. Carrico

ABSTRACT *The relationship between substance use, sexual compulsivity and sexual risk behavior was assessed with a probability-based sample of men who have sex with men (MSM). Stimulant, poppers, erectile dysfunction medication (EDM), alcohol use, and sexual compulsivity were independently associated with higher odds of engaging in any serodiscordant unprotected anal intercourse (SDUAI). The association of sexual compulsivity with SDUAI was moderated by poppers and EDM use. Behavioral interventions are needed to optimize biomedical prevention of HIV among substance using MSM.*

INTRODUCTION

Substance use is a driver of the HIV/AIDS epidemic among men who have sex with men (MSM).[1–4] Stimulants (e.g., cocaine, crack, methamphetamine), poppers, erectile dysfunction medications (EDM), and alcohol, all substances commonly used in sexual situations, have been prospectively linked with HIV seroconversion among MSM.[5–9] The disinhibiting effect of substances used during sex is theorized to increase engagement in risk behavior by facilitating a "cognitive escape" from the constant vigilance of practicing safe sex [10] and activating sexual outcome expectancies (e.g., "substance use enhances sexual pleasure").[6] The magnitude of the association between substance use and sexual risk behavior may be enhanced among individuals who exhibit "risk prone" psychological profiles.[11,12] For example, prior research has demonstrated that MSM who experience difficulties managing sexual thoughts, urges, or behaviors (i.e., sexually compulsivity) are more likely to use stimulants, to engage in sexual risk behavior and to use stimulants during sex.[13–16] The present study examined the associations among substance use, sexual compulsivity, and sexual risk behavior in a probability-based sample of MSM.

Woolf-King, Truong, Woods, and Carrico are with the Department of Medicine, Center for AIDS Prevention Studies, University of California, San Francisco, 50 Beale St., Suite 1300, San Francisco, CA 94105, USA; Rice is with the Department of Environmental Health Sciences, Safe Transportation Research and Education Center, University of California, Berkeley, Berkeley, USA; Jerome is with the Department of Psychiatry, Icahn School of Medicine at Mount Sinai, 1428 Madison Ave, New York, NY 10029, USA; Carrico is with the Department of Community Health Systems, School of Nursing, University of California, San Francisco, San Francisco, USA.

Correspondence: Sarah E. Woolf-King, Department of Medicine, Center for AIDS Prevention Studies, University of California, San Francisco, 50 Beale St., Suite 1300, San Francisco, CA 94105, USA. (E-mail: sarah.woolf-king@ucsf.edu)

METHODS

The Urban Men's Health Study 2002 was a probability-based sample of MSM in San Francisco. Of the 879 participants who completed a random digit dialing telephone interview, 711 completed a mail-in questionnaire assessing psychological factors and substance use. Details of the sampling frame and adjusted sample weights are described elsewhere.[13,17]

Measures. Sexual compulsivity was measured using the Sexual Impulsivity Scale (Cronbach's α=66).[18] This scale, which assesses perceived difficulties in controlling sexual behaviors, was centered (M=0, SD=+1) to facilitate interpretation of the adjusted odds ratios (AOR). *Substance use* in the last 6 months was dichotomized (any use versus no use) into separate measures of stimulant, poppers, and EDM use. *Alcohol use* in the last 30 days was categorized into: abstainers (no use), light/social drinkers (1–2 drinks on average), moderate drinkers (3–4 drinks on average), and heavy/binge drinkers (5+ drinks on average). *Sexual risk behavior* was assessed by asking sexual behavior questions about the four most recent partners in the last 12 months.[19]

Statistical Analyses. Participants were classified into three groups as follows: (1) No unprotected anal intercourse (UAI), (2) any serodiscordant UAI (SDUAI), and (3) UAI only with partners of the same HIV status (i.e., serosorting). Compared to a reference group that reported no UAI (n=415), separate multivariate logistic regression analyses examined correlates of SDUAI (n=105) and serosorting among HIV-negative MSM (n=185).[20] The multivariate models included interaction terms for sexual compulsivity with stimulant, poppers, EDM, and alcohol use. Stratified AORs adjusted for variables that were significant in the full multivariate model (e.g., poppers, EDM use), were calculated to probe significant interaction terms.

RESULTS

As described elsewhere, the majority of the 711 participants who responded to the mail-in survey were Caucasian (81 %), 40 years of age or older (63 %), and HIV-negative (73 %).[17] Results of the multivariate logistic regression are presented in Table 1. Being HIV-positive and any stimulant, poppers, EDM or heavy/binge alcohol use were independently associated with higher odds of engaging in any SDUAI. Among HIV-negative men, significant correlates of serosorting during anal intercourse included: age, stimulant, and poppers use.

The independent association of sexual compulsivity with SDUAI was moderated by poppers and EDM use. Stratified AORs revealed that sexual compulsivity was associated with significantly higher odds of SDUAI only among EDM users [AOR 1.61; 95 % confidence interval (CI) 1.10–2.37; P <0.05] compared to MSM who did not report EDM use (AOR 1.24; 95 % CI 0.87–1.78; P=0.25). In contrast, the association of sexual compulsivity with SDUAI was significant only for MSM who *did not* report popper use (AOR 1.83; 95 % CI 1.36–2.46; P <0.001) compared to MSM who reported using poppers (AOR 0.96; 95 % CI 0.66–1.40; P=0.82).

DISCUSSION

Consistent with prior research, alcohol and other substance use were independently associated with higher odds of SDUAI among MSM.[5–9] Findings also indicated that

TABLE 1 Correlates of any serodiscordant unprotected anal intercourse (SDUAI) and any HIV-negative serosorting

	SDUAI ($N=520$)	Serosorting ($N=458$)
	AOR (95 % CI)	AOR (95 % CI)
Age (decade)	0.79 (0.59–1.05)	0.56 (0.44–0.70)**
High school or less	Reference	Reference
Some college	0.94 (0.33–2.67)	0.57 (0.18–1.79)
College graduate	0.94 (0.32–2.74)	0.99 (0.38–2.60)
Graduate degree	1.36 (0.43–4.30)	1.09 (0.40–3.01)
Income	0.94 (0.80–1.11)	1.06 (0.92–1.22)
Ethnic minority	Reference	Reference
Caucasian	1.60 (0.64–4.01)	1.99 (0.89–4.47)
HIV-negative or unknown	Reference	
HIV-positive	2.17 (1.20–3.94)**	
Any stimulant use	2.12 (1.19–3.78)**	1.90 (1.06–3.42)*
Any poppers use	2.96 (1.69–5.18)**	2.08 (1.16–3.72)*
Any erectile dysfunction medication (EDM) use	2.05 (1.14–3.69)*	0.80 (0.45–1.44)
No alcohol use	Reference	Reference
Alcohol use—light	1.83 (0.68–4.90)	1.24 (0.59–2.62)
Alcohol use—moderate	1.43 (0.48–4.22)	1.15 (0.50–2.64)
Alcohol use—heavy/binge	3.68 (1.13–11.98)*	0.71 (0.21–2.40)
Sexual compulsivity	2.34 (1.32–4.16)**	1.03 (0.81–1.32)
Sexual compulsivity × poppers use	0.58 (0.34–0.99)*	–
Sexual compulsivity × EDM use	1.97 (1.15–3.37)*	–

*P <0.05; **P ≤0.01

HIV-negative MSM who use stimulants or poppers are more likely to engage in serosorting, perhaps as a method of reducing risk of HIV infection, than non-users.[20] Although recent ground breaking randomized clinical trials have demonstrated that antiretroviral therapy (ART) decreases rates of HIV seroconversion and onward transmission, substance users were excluded from these well-controlled efficacy trials.[21,22] Further clinical research is needed to examine whether behavioral interventions targeting substance use and sexual risk behavior optimize the effectiveness of ART for HIV prevention with substance-using MSM.[23]

Unique to our findings is the importance of sexual compulsivity as key moderator of the substance use-SDUAI association. The association of sexual compulsivity with SDUAI was significant only among EDM users compared to non-users. EDM use may increase the likelihood that sexually compulsive impulses are enacted by directly improving sexual performance and indirectly (via activation of expectancies) enhancing already difficult to manage sexual thoughts and urges. The treatment of erectile dysfunction among MSM should include HIV risk reduction counseling, particularly for those with elevated sexual compulsivity. In contrast, the association of sexual compulsivity and SDUAI was *lower* among poppers users. Unlike other substances, poppers are used almost exclusively in sexual contexts to facilitate anal intercourse.[24] Because poppers are so closely paired with anal sex, this may increase the likelihood of SDUAI, irrespective of psychological factors.

While innovative, our cross-sectional analyses do not permit any conclusions about causality or temporality. Prospective studies that collect daily data to measure the temporal co-occurrence of substance use and sexual behavior would allow for a more fine-grained analysis of this association.[25] Despite this limitation, results from

this study underscore the importance of clinical research to examine how behavioral and psychological interventions can augment the effectiveness of biomedical HIV/AIDS prevention among MSM.

This research was supported by the following grants: National Institute of Mental Health (NIMH) R01-MH054320 (Catania, PI), National Institute on Drug Abuse R03-DA030124 (Carrico, PI), and NIMH T32 MH19105 (Kegeles, PI).

REFERENCES

1. Colfax G, Santos GM, Chu P, et al. Amphetamine-group substances and HIV. *Lancet*. 2010; 376: 458–474.
2. Halkitis PN, Parsons JT, Stirratt MJ. A double epidemic: crystal methamphetamine drug use in relation to HIV transmission among gay men. *J Homosex*. 2001; 41: 17–35.
3. Koblin BA, Husnik MJ, Colfax G, et al. Risk factors for HIV infection among men who have sex with men. *AIDS*. 2006; 20: 731–739.
4. Shoptaw S, Frosch D. Substance abuse treatment as HIV prevention for men who have sex with men. *AIDS Behav*. 2000; 4(2): 93–203.
5. Benotsch EG, Seeley S, Mikytuck JJ, Pinkerton SD, Nettles CD, Ragsdale K. Substance use, medications for sexual facilitation and sexual risk behavior among traveling men who have sex with men. *Sex Transm Dis*. 2006; 33(12): 706–711.
6. Halkitis PN, Mukherjee PP, Palamar JJ. Multi-level modeling to explain methamphetamine use among gay and bisexual men. *Addiction*. 2007; 102(Suppl 1): 76–83.
7. Ostrow DG, Plankey MW, Cox C, Li X, Shoptaw S, Jacobson LP, Stall RC. Specific sex drug combinations contribute to the majority of recent HIV seroconversions among MSM in the MCAS. *J Acquir Immune Defic Syndr*. 2009; 51(3): 349–355.
8. Plankey MW, Ostrow DG, Stall R, et al. The relationship between methamphetamine and popper use and risk of HIV seroconversion in the Multicenter AIDS Cohort Study. *J Acquir Immune Defic Syndr*. 2007; 45(1): 85–92.
9. Woolf SE, Maisto SA. Alcohol use and risk of HIV infection among men who have sex with men. *AIDS Behav*. 2009; 13(4): 757–782.
10. McKirnan DJ, Vanable PA, Ostrow DG. Expectancies of sexual "escape" and sexual risk among drug and alcohol-involved gay and bisexual men. *J Subst Abuse*. 2001; 13(1–2): 137–154.
11. McKirnan DJ, Ostrow DG, Hope B. Sex, drugs and escape: a psychological model of HIV-risk behaviors. *AIDS Care*. 1996; 8(6): 655–670.
12. Newcomb ME, Clerkin EM, Mustanski B. Sensation seeking moderates the effect of alcohol and drug use prior to sex on sexual risk in young men who have sex with men. *AIDS Behav*. 2011; 15(3): 565–575.
13. Carrico AW, Pollack LM, Stall R, et al. Psychological processes and stimulant use among men who have sex with men. *Drug Alcohol Depend*. 2012; 123(1–3): 79–83.
14. Grov C, Parsons JT, Bimbi DS. Sexual compulsivity and sexual risk in gay and bisexual men. *Arch Sex Behav*. 2010; 39(4): 340–349.
15. Parsons JT, Grov C, Golub SA. Sexual compulsivity, co-occurring psychosocial health problems, and HIV risk among gay and bisexual men: further evidence of a syndemic. *Am J Public Health*. 2012; 102(1): 156–162.
16. Semple SJ, Zians J, Grant I, Patterson TL. Sexual compulsivity in a sample of HIV-positive methamphetamine-using gay and bisexual men. *AIDS Behav*. 2006; 10(5): 587–598.
17. Catania JA, Osmond D, Stall RD, et al. The continuing HIV epidemic among men who have sex with men. *Am J Public Health*. 2001; 91(6): 907–914.
18. Exner TM, Meyer-Bahlberg HFL, Erhardt AA. Sexual self control as a mediator of high risk sexual behavior in a New York City cohort of HIV+and HIV- gay men. *J Sex Res*. 1992; 29(3): 389–406.

19. Osmond DH, Pollack LM, Paul JP, Catania JA. Changes in prevalence of HIV infection and sexual risk behavior in men who have sex with men in San Francisco: 1997–2002. *Am J Public Health*. 2007; 97: 1677–1683.
20. Jin F, Crawford JF, Prestage GP, et al. Unprotected anal intercourse, risk reduction behaviors, and subsequent HIV infection among a cohort of homosexual men. *AIDS*. 2009; 23(2): 243–252.
21. Grant RM, Lama JR, Anderson PL, et al. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. *N Engl J Med*. 2010; 363(27): 2584–2599.
22. Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *N Eng J Med*. 2011; 365(6): 493–505.
23. Hall HI, Holtgrave DR, Tang T, Rhodes P. HIV transmission in the United States: considerations of viral load, risk behavior, and health disparities. *AIDS Behav*. 2013; 17(5): 1632–1636.
24. Ostrow DG. Substance use and HIV-transmitting behaviors among gay and bisexual men. *NIDA Res Monogr*. 1994; 143: 88–113.
25. Barta W, Portnoy DB, Kiene SM, Tennen H, Abu-Hasaballah KS, Ferrer R. A daily process investigation of alcohol-involved sexual risk behavior among economically disadvantaged problem drinkers living with HIV/AIDS. *AIDS Behav*. 2008; 12(5): 729–740.