Published in final edited form as:

AIDS Behav. 2017 July ; 21(7): 2023–2032. doi:10.1007/s10461-016-1652-y.

Substance use and sexual risk behavior among black South African men who have sex with men: the moderating effects of reasons for drinking and safer sex intentions

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Abstract

Research studies suggest an association between substance use and sexual risk behavior, but are not completely consistent. The moderating effects of other psychosocial factors might help explain these inconsistencies. The current study therefore assessed whether substance use is associated with sexual risk behavior, and whether this relationship is modified by expectancies about the effects of alcohol, reasons for consuming alcohol, or intentions to engage in safe sex. A cross-sectional survey was conducted among 480 black South African men who have sex with men recruited using respondent-driven sampling. In multivariable analyses, the effect of alcohol use on unprotected receptive anal intercourse (URAI) was modified by drinking to enhance social interaction (R^2 change=.03, $p<.01$). The effect of drug use on URAI was modified by safe sex intentions (R^2 change=.03, $p<.001$). Alcohol use was positively associated with URAI only among those who drink to enhance social interaction ($\beta=.08$, $p<.05$). Drug use was positively associated with URAI only among those with high safe sex intentions ($\beta=.30$, $p<.001$). Our findings suggest that efforts to minimize the impact of substance use on HIV risk behavior should target men who drink to enhance social interaction and men who intend to engage in safer sex. Efforts made to increase safer sex intentions as a way to reduce HIV risk behavior should additionally consider the effects of substance use.

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Conflict of Interest: Justin Knox declares that he has no conflict of interest. **Vasu Reddy** declares that he has no conflict of interest. **Tim Lane** declares that he has no conflict of interest. **Deborah Hasin** declares that she has no conflict of interest. Theo Sandfort declares that he has no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

COMPLIANCE WITH ETHICAL STANDARDS:

Informed consent: Informed consent was obtained from all individual participants included in the study.

Keywords

men who have sex with men (MSM); substance use; sexual risk behavior; South Africa

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INTRODUCTION

Because of the tremendous global burden of HIV, especially in sub-Saharan Africa [1], a better understanding of the relationship between substance use and HIV sexual risk behavior remains a public health priority, particularly in areas with high HIV transmission rates [2–5].

Alcohol and other illicit substances are known to impair decision-making, have disinhibiting effects, encourage impulsivity, and minimize fear of negative consequences, particularly those that are more distal, [6–8]. Therefore, substance use may contribute to increased sexual risk behavior. Research on the association between substance use and sexual risk behavior largely supports a link between substance use and sexual risk behaviors, including in sub-Saharan Africa [2,4,5,9]. However, reviews of the literature on this topic have found some inconsistencies, with many studies not identifying an association [10–12]. These discrepancies have not been further explored.

Explanations for these inconsistencies include the unmeasured moderating effects of other psychosocial factors [4,7,11,13–21]. Moderating factors are variables whose presence impacts the magnitude of the effect of an exposure on an outcome. Relevant moderating factors to the relationship between substance use and sexual risk behavior could include alcohol/drug expectancies (i.e. expectations about the effects of alcohol, such as it will enhance sexual experience, increase sexual risk taking, or disinhibit sexual behavior) [4,7,15,17–21], reasons for drinking (drinking motives) [13,22] and underlying intentions regarding safer sex practices [23]. Researchers have called for clarification on the relationship between substance use and HIV sexual risk behavior [24,25], particularly whether other modifying factors impact this relationship. A better understanding of this topic would help inform HIV prevention efforts.

To investigate these issues, we used data from a study of black men who have sex with men (MSM) from the metropolitan area of Tshwane (Pretoria), South Africa. This is a population with a heavy burden of substance use, sexually transmitted infections (self-reported) and HIV [26–31]. There have been inconsistencies in the research looking at the association between substance use and sexual risk behavior among black South African MSM [26,27]. An initial study found that sexual risk behavior and alcohol use are common among these men and that the two are associated [26]. This finding was not replicated in a subsequent study among this population [27]. Findings regarding drug use and sexual risk behavior were also inconsistent. This first study among MSM in townships measured drug use but found no association with sexual risk behavior [26]. In the second study, recent marijuana use was protective against HIV infection, although buying drugs or alcohol for a partner was a predictor of HIV infection [27]. These discrepancies have also not been further explored. Therefore, our study had two objectives. The first was to assess whether substance use is associated with sexual risk behavior. The second was to determine whether the relationship between substance use and sexual risk behavior is modified by expectancies

about the effects of alcohol, reasons for consuming alcohol, or intentions to engage in safe sex.

METHODS

Participants

Black South African MSM were recruited using respondent-driven sampling (RDS), [32,33] a strategy commonly used for samples that are difficult to include in research. In this case, RDS was selected because of the stigmatization surrounding homosexuality in South Africa, and the importance of fostering a strong sense of confidentiality and safety about participation in potential participants. Eligibility criteria included: age between 18 and 44; having engaged in oral, anal, or masturbatory sex with another man in the prior 12 months; living, working, or socializing in the Tshwane metropolitan area; fluency in English, Sepedi (Northern Sotho), or Tswana (Setswana); and willingness to take a rapid HIV test. Consistent with RDS methodology, seeds were purposively selected based on geographic place of residence and their potential to propagate large and diverse recruitment chains. Twenty seeds were selected and asked to distribute three to five recruitment coupons to eligible men from their social networks, other men who have sex with men over the age of 18 who they know and would be willing to recruit into the study. All participants were linked using recruitment coupon identification numbers. Once men were enrolled in the study and completed study procedures, staff provided them with recruitment coupons for further distribution. Although not an eligibility requirement, the race/ethnicity of all seeds was Black as the focus of the study was on black South African MSM. Over three quarters of South Africans are Black. The racial/ethnic segregation demonstrated by the sample likely reflects the racial/ethnic segregation that still characterizes much of life in South Africa to this day. Further details regarding the methods for this study have been previously provided [31].

Procedures

All participants completed a 90-minute interviewer-administered computer-assisted personal interview. All interviews were conducted in a private space, either the office of the Human Sciences Research Council in the Center of Pretoria or in one of the townships, e.g., in a community health center, at the participant's choice. Research staff involved in screening, interviewing, HIV testing, and instruction for participant recruitment were trained in a three-day session. All study participants received gift cards to be redeemed for purchase of products at a supermarket as primary incentive for their own participation, as well as an additional gift card for each successful referral to the study.

All study procedures were approved by the New York State Psychiatric Institute Institutional Review Board in the U.S. and the Human Sciences Research Council Research Ethics Committee in South Africa. Participants provided separate written informed consent for the survey and HIV testing components of the study. Study staff provided referrals for confirmatory HIV testing and counseling in the case of a positive test result, as well as mental health, or primary care services as indicated.

Measures

Scales were primarily those adapted for and previously validated in South Africa. The survey addressed demographic characteristics (age, education, housing quality [34], financial problems [35,36], and residential status (living in a Pretoria or in one of the townships). The outcome measure, unprotected anal intercourse (UAI), was assessed as part of the general sexual behavior assessment using the Sexual Practices Assessment Schedule (SPAS) [37,38]. The SPAS tallies absolute counts of number of sexual acts, and includes questions about number of occasions of different sexual acts (oral, anal; receptive, insertive) with different types of partners (men, women, regular partner), with or without protection, during two different time periods (lifetime, past 3 months). For this study, unprotected receptive anal intercourse (URAI) was calculated as the number of times that the participant reported having receptive anal intercourse with another man without using a condom and unprotected insertive anal intercourse (UIAI) was calculated as the number of times that the participant reported having insertive anal intercourse with another man without using a condom in the past year. URAI and UIAI were considered as separate outcomes due to the inherently different risks associated with each of these behaviors [39], as well as because of the exclusivity in sexual roles (i.e. being the insertive or receptive sexual partner) observed among black South African MSM [40]. UAI (UIAI or URAI) was defined as any reported event without the use of a condom.

Problematic drug use and alcohol use over the past year were the exposure variables of interest. The 9-item Drug Abuse Screening Test (DAST) [41] was used to assess problematic drug use over the past year; (Cronbach's $\alpha = 0.81$). Before being administered the DAST, men were asked if they had ever used marijuana, poppers, cocaine, crack, crystal methamphetamine, methaqualone, hallucinogens, heroin, or amphetamines, and if they had used any of these drugs in the past year. A sample item from the DAST is "The next questions are about drugs. With drugs we mean dagga, ganja, weed, grass, khat, cocaine, heroine, etc. Alcohol and drugs that you use for medical purposes do not count. The questions are about the past year....Do you ever feel bad or guilty because of your drug use?" (Yes, No). DAST scores were calculated as a continuous measure tallying the number of times that a participant answered yes to an item [41]. Alcohol use over the past year was evaluated using the Alcohol Use Disorders Identification Test - Consumption (AUDIT-C), [42,43], a scale developed and validated by the World Health Organization for international use, including in South Africa [42–44], where it has been used in multiple studies [45–47]. The AUDIT-C uses 3 items: how often the respondent drinks, how many drinks the respondent consumes in a typical day of drinking, and how frequently the respondent drinks six or more drinks at a time. The AUDIT-C was calculated as a continuous measure reflecting the amount of alcohol a participant consumes, with scores ranging from 0–12 [48,49].

The Sex-Related Alcohol Expectancy Scale [50,51] was used to assess expectancies about the effects of alcohol use on sexual behavior, representing three domains: enhancement of sexual experience ($\alpha = 0.93$), increased sexual risk taking ($\alpha = 0.91$), and disinhibition of sexual behavior ($\alpha = 0.88$) [19,52]; (overall $\alpha = 0.95$). A sample item is: "After a few drinks of alcohol I am more sexually responsive". Men replied on a 4-point Likert scale ("Strongly

disagree” (1) - “Strongly agree” (4)). Additionally, men were asked about reasons for drinking [22]; including two items about enhancing social interaction that are relevant to this study. The two items are: “How often did you drink because a drink helps you to relax around people?” and “How often did you drink because a drink helps you to have better sex?”; ($\alpha = 0.70$). Men replied on a five point Likert scale (“Never” (1) – “Always” (5)). Three items from the information-motivation-behavioral skills (IMB) model were used to assess intentions to engage in safe sex [23]. The IMB model is a behavioral model that asserts that HIV prevention information, motivation, and behavioral skills are the fundamental determinants of HIV preventive behavior [23]. Men were asked how likely it is that they will always use a condom when having anal sex and how likely it is they will discuss safe sex; ($\alpha = 0.89$). Men replied on a 4-point scale (“Very Unlikely” (1) - “Very Likely” (4)). Sociodemographic characteristics were also assessed, including age, education, income, money problems and housing quality.

Statistical Analyses

Since RDS was the recruitment method used for this sample, all data were adjusted prior to analyses using an RDS II estimator [53,54]. This approach gives greater weight to those with a small personal network size, since those men presumably would be less likely to be recruited into the study.

The specific objectives of our analyses were to assess 1) whether alcohol use is associated with URAI and UIAI; 2) whether drug use is associated with URAI and UIAI; 3) whether the relationship between alcohol use and URAI and UIAI is modified by expectancies about the effects of alcohol, reasons for consuming alcohol, or intentions to engage in safe sex; 4) whether the relationship between drug use and URAI and UIAI is modified by intentions to engage in safe sex.

Tests to determine which variables were associated with URAI and UIAI included t-tests for continuous and scaled variables (with URAI and UIAI log transformed to achieve more normal distributions) and Chi-squared tests for dichotomous variables. Variables associated with URAI or UIAI at $p < .20$ were included in the multivariable analyses [55–57]. Multivariable analyses to assess whether alcohol use and drug use were associated with URAI and UIAI were run using ordinary least squares regression, and included the covariates listed above. Initially, a main effect between alcohol use and drug use on UIAI and URAI was tested. Effect modification was then tested by adding multiplicative interaction terms for alcohol use and drug use and each hypothesized effect modifier to the regression model. If effect modification was identified, stratified multivariate analyses with all relevant covariates were run among groups at low and high levels of the relevant modifying construct. Statistical tests were 2-sided and $p < .05$ was considered statistically significant. SPSS 17.0 was used for all statistical analyses.

RESULTS

In total, 480 eligible participants were recruited in 18 waves between August 2011 and January 2013. The mean age was 24 years and the mean level of education was 12 years (see

Table 1). More than half (57%) the men lived in a township (versus metropolitan Tswane), and 35% had a regular income.

The majority of men (86%, $n = 414$) had consumed alcohol in their lifetime, including 77% of men ($n = 368$) who had consumed alcohol in the past year. More than half of men (51%, $n = 188$) reported either buying alcohol for men that they want to have sex with or being bought alcohol by men who wanted to have sex with them. In response to the 3 questions that comprise the AUDIT-C, 20% of men drink twice a week or more, 21% reported that they have 10 or more drinks on a typical day that they are drinking, and 24% reported that they have 6 or more drinks on a single occasion weekly. The mean AUDIT-C score was 4.7 ($SD = 3.5$).

About one-fifth of the sample (20%, $n = 94$) had ever used drugs; men most commonly used marijuana (19%, $n = 91$). In the past year, 16% ($n = 75$) of men had used drugs. Only a few men (6%, $n = 27$) had ever used poppers, cocaine, crack, crystal methamphetamine, methaqualone, hallucinogens, heroin, or amphetamines. The mean DAST score was 0.2 ($SD = 0.6$).

Nearly half (47%, $n = 226$) of men had engaged in URAI or UIAI over the past 3 months. The mean frequency of UIAI was 7.3 times ($SD = 33.6$) and the mean frequency of URAI was 4.6 times ($SD = 26.3$). URAI was not significantly correlated with UIAI ($p = .35$).

Table 1 shows the relationship between substance use, potential effect modifiers of substance use and URAI and UIAI. Expectancies about alcohol use ($r = .16$, $p < .001$) and drinking to enhance social interaction ($r = .18$, $p < .01$) were both positively associated with URAI. Intentions to engage in safe sex were negatively associated with URAI ($r = -.30$, $p < .001$) and UIAI ($r = -.22$, $p < .001$). Alcohol use was positively associated with URAI ($r = .13$, $p < .01$) but drug use was not ($p = .07$). Neither alcohol use ($p = .87$) nor problematic drug use ($p = .77$) were associated with UIAI.

Table 2 shows the relationship between alcohol use and problematic drug use and URAI and UIAI, as well as the interaction of potential effect modifiers. In multivariable analyses, alcohol use was positively associated with URAI ($\beta = .02$, $p = .02$) but problematic drug use was not ($p = .62$). Neither alcohol use ($p = .98$) nor problematic drug use ($p = .90$) were associated with UIAI. The effect of alcohol use on URAI was modified by drinking to enhance social interaction (R^2 change = .03, $p < .01$). The effect of problematic drug use on URAI was modified by safe sex intentions (R^2 change = .03, $p < .001$). There was no observed effect modification of alcohol use or problematic drug on UIAI.

Based on the observed interactions, the relationship between alcohol use and URAI was analyzed among the subgroups who did and did not endorse drinking to enhance social interaction (see Figure 1). In these analyses, alcohol use was positively associated with URAI only among those who drink to enhance social interaction ($\beta = .08$, $p < .05$).

The relationship between problematic drug use and URAI was analyzed among the subgroups of men with high and low safer sex intentions (see Figure 2). In these analyses, problematic drug use was positively associated with URAI among those with high safe sex

intentions ($\beta = .30, p < .001$) while it was negatively associated with URAI among those with low safe sex intentions ($\beta = -.26, p < .0$).

DISCUSSION

The purpose of this study was to assess whether substance use is associated with sexual risk behavior among black South African MSM, and whether the relationship between substance use and sexual risk behavior in this group is modified by expectancies about the effects of alcohol, reasons for consuming alcohol, or intentions to engage in safe sex. We found that men who drank more reported more unprotected receptive anal intercourse. We also found that the effects of alcohol use on unprotected receptive anal intercourse were influenced by reasons for drinking. Among men who endorsed drinking to enhance social interaction, men who drank more reported more unprotected receptive anal intercourse. Among men who did not endorse drinking to enhance social interaction, increased alcohol use did not lead to increased unprotected receptive anal intercourse. We also found that the effects of drug use were influenced by intentions to engage in safe sex. Among men who intended to engage in safe sex, men who had more drug problems reported more unprotected receptive anal intercourse. Among men who did not intend to engage in safe sex, men who had more drug problems reported less unprotected receptive anal intercourse.

Our finding that men who drank more reported more sexual risk behavior is in line with much research showing that there is a link between substance use and sexual risk behavior, including among studies conducted in sub-Saharan Africa [2,4,5,9]. Although most participants who tested HIV positive as part of the study were not aware of their HIV status, we explored whether controlling for HIV status would alter our findings. The outcomes of these analyses were remarkably similar.

Our findings demonstrating the modifying effects of reasons for drinking and safe sex intentions on the relationship between substance use and sexual risk behavior may help to explain why there have been inconsistencies among the research linking substance use to sexual risk behavior [10–12], including among black South African MSM [26,27]. Varying distributions of causal partners for substance use to lead to increased sexual risk behavior among populations might help explain why this relationship has not always been observed [6–8]. Among the men in this study, drinking to enhance social interaction was a necessary condition for alcohol use to be associated with increased sexual risk behavior. This suggests that the reasons men drink influence how alcohol use affects their behavior. Likewise, only among men who intend to engage in safer sex practices was drug use increased the likelihood of sexual risk behavior. Among men who did not intend to practice safer sex, drug use decreased the likelihood of sexual risk behavior. Both of these factors, reasons for drinking and safe sex intentions, have been discussed in the literature as potential effect modifiers of the relationship between substance use and sexual risk behavior [16,22]. Gordon et al. observed that including dispositional factors, such as reasons for drinking or safe sex intentions, may help to explain sexual risk behavior during a drinking event [16]. Golding et al. note that there are cultural differences in motivations for drinking and that these differences might account for differences in the effect of drinking [16]. Our study observed both of these psychosocial factors to have an empirical influence on the

relationship between substance use and sexual risk behavior in a completely novel population.

Our study did not find that expectancies about alcohol impact the relationship between alcohol use and sexual risk behavior. This latter finding is in contrast to other research on alcohol expectancies and the relationship of alcohol to behavior, including studies of adolescents [17,18], MSM [20], and in experimental settings [15]. Based on qualitative descriptions of drinking and sexual behavior provided by black South Africans, Morojele et al. propose a conceptual model of alcohol use and sexual risk behavior that includes individual expectations as a moderating factor of the effect of alcohol use on sexual risk behavior, among others [19]. George and Stoner have argued that alcohol expectancies need to be considered in any inquiry into alcohol use and sexual behavior [7,21]. While we agree that expectancies about alcohol are important to consider when exploring the relationship between alcohol use and sexual risk behavior, our findings suggest that further research, particular studies conducted in sub-Saharan Africa, should consider the impact of other potential effect modifiers as well, particularly those such as reasons for drinking and safe sex intentions, which have not received as much attention in the literature.

Our findings also lend support to the utility of the IMB model [23] as a tool for understanding HIV risk behavior among an African MSM population [58] given the impact of safer sex intentions on the relationship between substance use and sexual risk behavior, as well as the strong negative association between safer sex intentions and sexual risk behavior in bivariate analyses. Further understanding of the determinants that lead to sexual risk behavior in this context of high HIV prevalence is important for informing HIV prevention efforts. Given the high HIV prevalence in this population and the variability in safe sex intentions, these men may have developed a sense of fatalism regarding HIV infection, a topic of some importance for future studies. Awareness of HIV status and perception of HIV risk were also low, with only a third (34.7%) of men having tested for HIV in the past 6 months and among HIV positive men in the sample, nearly half (48.3%) thought that it was unlikely or very unlikely that they were HIV-infected [31]. For this reason, HIV status was not controlled for in the analyses. Our finding that URAI was not significantly correlated with UIAI also speaks to the high frequency of sex role exclusivity among this population [31].

There are certain limitations to the current study. The cross-sectional research design limits the ability to infer causality. For example, we assume that substance use influences one's sexual risk behavior. However, these findings may reflect that men who report more sexual risk tend to use more drugs or alcohol as a way to cope with their decision-making. With further regard to this issue of temporality, our findings suggest that men who drink more engage in more sexual risk behavior. The measures used, however, do not tell us about the temporal overlap of these behaviors. As we assessed general substance use and sexual risk behavior over these defined periods of time, we also were not able to account for other relationship- and event-specific characteristics in our analyses, which have been shown to influence sexual risk behavior [58,59]. There were also certain findings that were not in agreement with our hypotheses. For example, it is not clear why there were only significant associations observed when looking at receptive anal intercourse and not insertive anal

intercourse. One might expect an insertive partner to have more control during a sexual encounter and thus for their psychosocial status and substance use behavior to be stronger predictors of their sexual behavior. The fact that this was not observed, though, likely speaks to the complexity of substance use and gender dynamics among men in this setting [31,60,61]. These issues merit further exploration. Also, we did not include a measure of strategies that persons may employ to lower their risk of HIV that are not condom-based (e.g., strategic positioning). Also, the measure we used to assess the likelihood of using a condom did not specify what type (e.g. main, casual) of sexual partner. It is also important to note that the current study was conducted among black South African MSM and may have limited generalizability outside of that setting. The constructs used were almost exclusively developed in Western settings, and while all of them have previously been demonstrated to be reliable and valid, including many in South Africa, there may be additional culture-specific factors, such as social norms regarding substance use or sexual behavior, that have not been accounted for. Lastly, the data collected are self-reported and could have been subject to social desirability or recall bias. However, computer-assisted self-interviewing in a private location was used to help minimize social desirability bias.

In summary, the current study contributes to a more complete understanding of substance use and its relationship to sexual risk behavior by demonstrating how the moderating effects of other psychosocial factors could lead to inconsistent findings among studies attempting to demonstrate the link between these behaviors. Understanding more about the context in which substance use leads to sexual risk behavior is important information for determining the most effective strategies for reducing HIV transmission among this critical population. Knowing whether substance use impacts HIV risk behavior on its own, and whether its effect is impacted by the presence of other casual partners (i.e. effect modification), helps provide information on a range of contextual characteristics to consider when deciding how to design effective HIV prevention interventions. Specifically, our findings suggest that efforts to minimize the impact of substance use on HIV risk behavior should target men who drink to enhance social interaction and men who intend to engage in safer sex by assessing these characteristics and taking them into account. Efforts made to increase safer sex intentions as a way to reduce HIV risk behavior should additionally consider efforts to negate the impact of substance use on sexual risk behavior among men who express safe sex intentions. Given that South Africa has a high prevalence of hazardous drinking [62], a growing problem with drug use [63], and the highest burden of HIV in the world [1], identifying and addressing factors that contribute to these public health problems is of critical importance.

Acknowledgments

Supported by grants from the National Institute on Drug Abuse (F31-DA037128; PI: Justin Knox) and the National Institute of Mental Health (R01-MH083557; PI: Theodorus Sandfort, PhD, and P30 MH43520; PI: Robert Remien, PhD). We thank OUT Well-being, the communities that partnered with us in conducting this research, and the study participants for their contributions. We also thank study staff at all participating institutions for their work and dedication, in particular Kate Collier, MPH, and William Tsang.

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Figure 1.
Effect of alcohol use on URAI among MSM who drink to enhance social/sexual interaction and MSM who do not

Figure 2.

Effect of drug use on URAI among MSM with high safer sex intentions and MSM with low safer sex intentions

Demographic characteristics and potential modifiers of the effect of substance use on sexual risk behavior by unprotected receptive anal intercourse (URAI) and unprotected insertive anal intercourse (UIAI) among black MSM (n=480) in Pretoria, South Africa

Table 1

	Total		URAI ^a		UIAI ^b	
	M	SD	r	p	r	p
Demographic characteristics ²						
Age	24.5	5.3	-0.10	0.023	0.18	<0.001
Years of education ^c	12.5	2.5	-0.05	0.313	0.09	0.055
Money problems ^d	2.7	1.0	0.11	0.022	-0.04	0.364
Housing quality ^e	3.9	1.2	-0.06	0.210	-0.06	0.201
Alcohol use ^f	4.7	3.5	0.13	0.004	0.01	0.865
Drug use ^g	0.2	0.6	0.08	0.066	-0.01	0.773
Potential effect modifiers						
Expectancies about alcohol ^g	2.4	0.6	0.16	<0.001	0.07	0.136
Drink to enhance social interaction ^h	2.8	1.1	0.18	0.001	0.05	0.311
Intentions to engage in safe sex ^g	3.2	0.7	-0.30	<0.001	-0.22	<0.001

^a. Outcomes were log transformed.

^b. Higher scores indicate higher levels of the constructs.

^c. Range: 0–22 (postgraduate).

^d. Defined as problems related to needing money [1,2]. Range 1–5.

^e. Defined as having conveniences (e.g. running water, electricity) where you live [3]. Range: 0–5.

^f. Range: 0–12.

^g. Range 1–4.

^h. Range 1–5.

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Multivariable analyses looking at the effect of substance use on sexual risk behavior and the role of potential modifiers among black MSM (n=480) in Pretoria, South Africa^a

Table 2

Substance use ^c	URAI ^b				UIAI ^b			
	β	SE	t	P	β	SE	t	P
Alcohol use	0.018	0.01	2.59	0.010	0.00	0.01	0.03	0.976
Drug use	0.019	0.04	0.50	0.618	-0.004	0.03	-0.13	0.895
Potential effect modifiers	t	P	R² change	P	t	P	R² change	P
Expectancies about alcohol * Alcohol use	-0.31	0.756			-0.59	0.555		
Drink to enhance social interaction * Alcohol use	2.46	0.015	0.03	0.002	1.41	0.159		
Intentions to engage in safe sex * Alcohol use	-0.42	0.675			-0.71	0.477		
Intentions to engage in safe sex * Drug use	3.05	0.002	0.03	< 0.001	-0.74	0.462		

^a . All models controlled for demographic variables associated with outcomes in bivariate analyses at $p < .2$ (URAI: age, township and money problems; UIAI: age, township and education).

^b . Outcomes were log transformed.

^c . Main effects without interaction terms in the models.