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Moderating Effect of Age on the Association between Alcohol Use and Sexual Risk in MSM: Evidence for Elevated Risk among Younger MSM

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Abstract

Men who have sex with men (MSM) are substantially impacted by HIV/AIDS in the United States. Alcohol use is frequently studied as a predictor of sexual risk in MSM, but findings for this association have been mixed. Developmental differences in this effect may help to explain equivocal findings. 143 MSM (analytic sample 137) ages 16–40 completed weekly diaries of sexual encounters and associated situational factors for 12 weeks. Analyses were conducted with Hierarchical Linear Modeling. Alcohol use before sex was not associated with sexual risk across all participants. Participant age moderated this effect; alcohol use before sex was associated with increased odds of sexual risk in younger MSM only. These analyses expand on previous findings by utilizing a wider age range than most prior studies and adjusting for the effects of several theoretically-selected covariates. Young MSM are an important group to target for addressing alcohol use in the context of sexual behavior.

Keywords

HIV/AIDS; sexual risk; alcohol; developmental differences

INTRODUCTION

Men who have sex with men (MSM) are substantially impacted by HIV/AIDS in the United States (1), and MSM accounted for 61% of new HIV/AIDS diagnoses in the U.S. in 2009 (2). Currently, HIV incidence is on the rise in young MSM (YMSM), which is being driven by a significant increase in new infections among Black YMSM (2). In the absence of a vaccine or other bio-medical approach that durably prevents HIV acquisition, it continues to be important to identify risk factors that can be addressed through behavioral interventions.

Alcohol use is one of the most frequently studied predictors of sexual risk behavior in both general populations (3–5) and MSM (6–8). Various influential theoretical models have been proposed to describe the mechanisms by which alcohol use leads to sexual risk behavior (9–11), but despite this theoretical support, findings for the association between alcohol use and sexual risk in MSM have been mixed (7, 8). Consequently, it has been proposed that methodological differences in the measurement of these variables may account for equivocal findings (12, 13). Prospective event-level studies likely provide the most precise estimates of this effect because they map episodes of alcohol use directly onto sexual encounters.

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Furthermore, prospective analyses of an individual's sexual encounters over time compare a participant's behavior across multiple situations, which helps to control for the effects of third variables. If unaccounted for in analyses, these covariates (e.g., personality characteristics) may influence estimates of the association between alcohol use and sexual risk. Analyses that utilize more global retrospective estimates of average rates of alcohol use and sexual risk during a specified time period are particularly vulnerable to the influence of these third variables.

Inconsistent findings for the relation between alcohol use and sexual risk may also result from group differences in the strength or direction of this effect (i.e., moderating effects of group difference variables), and several researchers have suggested that developmental differences may account for equivocal findings (5, 12). For example, Mustanski (12) found that the positive association between alcohol use before sex and sexual risk increased with participant age in an online sexual diary study of MSM. Mustanski noted that the bulk of previous studies that found a positive association between these variables had samples with a higher mean age than those that found no evidence of an effect. However, very few studies have examined developmental differences in this effect using samples that contain both young and adult MSM. It is possible that the moderating effect of age on alcohol use and sexual risk may differ in a sample that has a larger proportion of YMSM under the age of 21. It is also important to note that several other group difference variables have been found to moderate the association between drinking and sexual risk in MSM, including sensation seeking and average rate of alcohol use (i.e., experience with drinking) (13), and accounting for these effects in analyses is necessary in order to increase confidence in the accuracy of findings.

Alcohol use and binge drinking escalate rapidly during adolescence (14), and young people who drink are at substantial risk for developing substance use disorders, health problems, and health-related risk behaviors (15–18) that have far-reaching consequences during adolescence and into adulthood. YMSM are particularly vulnerable to the negative effects of alcohol use as they are substantially more likely than heterosexual youth to drink (19–22). Importantly, YMSM likely have less experience with alcohol consumption and/or intoxication than adult MSM, and evidence suggests that infrequent drinkers are more vulnerable to the effects of situational intoxication on sexual risk (13). If this trend continues into adulthood, it would suggest that as drinking frequency increases, the effect of a given episode of drinking would exert less of an effect on sexual risk taking. Interestingly, this pattern is opposite to the effect described by Mustanski (12) but consistent with research in the general population, which has found that drinking has a stronger influence on condom use in adolescents compared to adults (5). Given the lack of research in this area using a developmental lens and the potential negative effects of alcohol use and sexual risk on YMSM, it is critical that we continue to examine developmental differences in the association between drinking and sexual risk in MSM.

The current study aimed to expand on previous research by examining developmental differences in the association between alcohol use before sex and sexual risk in a unique sample of ethnically-diverse MSM enrolled in a prospective sexual diary study that spans various developmental groups, including adolescence, emerging adulthood and adulthood. Figure 1 provides a graphical illustration of all between- and within-subjects effects tested in these analyses. As shown in Figure 1, analysis of the association between alcohol use before sex and sexual risk was conducted while adjusting for the following covariate effects: between-subjects main effects (i.e., demographic and group differences), within-subjects main effects which have previously been found to influence sexual risk (i.e., drug use before sex, partner's gender and number of previous encounters with a partner) (13, 23), and the moderating effects of between-subjects factors on the relationship between alcohol use

before sex and sexual risk. In accordance with previous event-level research (8), we hypothesized that alcohol use before sex would not be associated with sexual risk behavior for the MSM sample as a whole. However, we anticipated that age would moderate the association between alcohol use and sexual risk, such that the positive association between these variables would increase with age (12).

METHODS

Participants

One hundred forty-three ethnically diverse MSM were enrolled in a prospective diary study of sexual behavior. The mean age of the sample was 27.53 (*SD* = 7.33) with an age range of 16 to 40 years. At the time of enrollment, 19.6% of the sample was under age 21 and 9.1% was under age 18. Six participants did not report any sexual behavior during the 12-week assessment period, leaving an analytic sample of 137 MSM. There were no significant differences between the full and analytic sample on any of the measured demographic characteristics. See Table I for full demographic description of the sample.

Procedures & Design

Participants were recruited online via advertisements posted on Craigslist and Facebook. Inclusion criteria were: (1) oral/anal sex with a man during the previous six months, (2) between the ages of 16 and 40 years, (3) not in a sexually monogamous relationship, and (4) HIV-negative or unknown serostatus. Inclusion criteria were utilized to increase the likelihood that participants would have multiple sexual encounters/partners during the assessment period and to examine risk factors for sexual risk behavior from a primary prevention perspective in the developmental and racial groups that are currently at highest risk for HIV acquisition. The protocol was approved by the Institutional Review Board (IRB) at the University of Illinois at Chicago with a waiver of parental permission under 45 CFR 46.408(c) for participants aged 16–17 (for more information on relevant IRB issues in conducting research with LGBT minors, see 24). All participants were provided with an Information Sheet that detailed key information regarding research subjects' rights and issues related to confidentiality. Capacity of minor participants to assent was determined by administering four multiple choice questions based on this information during the eligibility screener that evaluated participants' ability to: (1) name things they would be expected to do during the study, (2) explain what they would do if they no longer wished to participate in the study, (3) explain what they would do if they experienced distress during the study, and (4) identify potential risks for participating in the study (25, 26).

Participants completed baseline measures of between-subjects variables (i.e., demographic and group differences) before beginning weekly sexual diaries. Weekly diaries were completed for 12 weeks. Each diary survey detailed the specific activities of up to three sexual encounters from the previous week and situational variables associated with these encounters (e.g., alcohol use before sex). Participants had 48 hours to complete each diary. All questionnaires were completed online. Participants were paid up to 60 dollars for participation, pro-rated for participation level. On average, participants completed 83.7% of all diary surveys. To avoid multiple enrollment of the same participant, contact information was cross-referenced against: date of birth, age, race/ethnicity, geographic location, additional contact information, and IP address. Online advertisements and the eligibility screener did not indicate the necessary requirements for eligibility in order to minimize the potential for faking eligibility (27).

Baseline Measures

General Demographics—The demographic questionnaire assessed participants' age, race/ethnicity, self-reported sexual orientation, and geographic location.

Brief Sensation Seeking Scale (BSSS)—The BSSS is Hoyle et al.'s (28) 8-item adaptation of the original Zuckerman sensation seeking scale, which measures propensity to seek out novel experiences. Participants used a 5-point Likert scale (1= "strongly disagree" to 5 = "strongly agree") to rate agreement with each statement (e.g., "I like to do frightening things"). The total score is calculated by computing the mean of all items. Cronbach's α was .79 in this sample, which is comparable to other studies of ethnically-diverse YMSM, Latino young adults, and Black men (Cronbach's α range: .63 – .74) (13, 28, 29).

Baseline Alcohol Use—Participants were asked two items assessing quantity and frequency of alcohol use at baseline (30, 31). For the frequency item, participants were asked to report how many days they had consumed alcohol during the 30 days prior to baseline. The quantity item assessed the average number of drinks consumed on drinking days during the past 30 days (responses range from 1 = "1 drink" to 6 = "6 or more drinks"). A baseline alcohol quantity/frequency (QF) variable was calculated by multiplying these two items together. This approach has previously been used successfully in studies of MSM (32).

Sexual Diary Measures

Sexual Behavior—Each week participants reported the number of sex partners they had during the previous week. Participants reported on specific sexual behaviors (e.g., oral and anal sex) that occurred during each of up to three sexual encounters (i.e., the three most recent sexual encounters) and whether or not a condom was used for each behavior. For these analyses, a risk episode was considered to be unprotected anal or vaginal intercourse (UAVI; coded 1) and a non-risk episode was considered to be protected anal or vaginal intercourse and any oral sex (protected or unprotected; coded 0). All other sexual encounters were excluded from analyses.

Alcohol and Drug Use before Sex—Weekly sexual diaries also assessed whether or not participants had used alcohol or drugs before each sexual encounter. Participants who endorsed drinking before sexual encounters were asked how many drinks they had consumed, and a count of number of drinks consumed before sex was used for analyses. Participants were asked whether or not they had used any of the following drugs prior to each encounter: marijuana, cocaine/crack, heroin/opiates, stimulants/uppers, methamphetamine, depressants/downers, psychedelics, club drugs (Ecstasy, MDMA, Liquid G, Special K, etc.), poppers, other inhalants (glues, nail polish remover, lighter fluid, etc.), or any other drugs not used for prescription purposes. A dichotomous variable was created indicating whether or not participants used any drugs prior to or during sex (0 = no drug use, 1 = any drug use).

Sexual Partnership Characteristics—Sexual partner's gender was dichotomized based on biological birth sex (1 = female, 0 = male). Participants also indicated the number of previous sexual encounters with a partner for each sexual encounter detailed in the weekly diary with a numerical response, which was winsorized at three standard deviations from the mean to reduce the effect of outliers (winsorized range 0–333).

Analyses

All analyses were conducted using Hierarchical Linear Modeling (HLM) 7.0 statistical software (33). HLM is well suited to analyze sexual diary data because it is designed to account for dependency in observations in data that contains a nested or multilevel structure and therefore does not assume independence of observations. In this case, sexual encounters (Level 1) were nested within participants (Level 2). At Level 1, HLM estimated the within-participant effects of time-varying constructs (e.g., alcohol use before sex) on the outcome variable (i.e., UAVI). At Level 2, HLM allows for the analysis of the main effects of differences between participants (e.g., demographic and group differences) on UAVI. Also at Level 2, between-subjects characteristics can be evaluated as moderators of Level 1 effects (e.g., moderating effect of age on the association between alcohol use before sex and UAVI).

Maximum likelihood estimation was used to model UAVI as the outcome variable. A Bernoulli distribution was used in estimating UAVI because this technique allows for modeling of binomial distributions. These analyses accounted for over-dispersion in the outcome variable (i.e., the standard deviation of the outcome variable is larger than the mean), and results are presented as odds ratios (OR). Listwise deletion was used for handling missing data. Robust standard errors were used in estimating significance for all effects.

RESULTS

Descriptives of Sexual Behavior and Alcohol Use before Sex

See Table II for descriptive information on study variables. Participants had approximately one sexual encounter per week ($M = .94$, $SD = 1.26$; range 0–15) and a total of 1,189 episodes observed in the data, 88.2% of which occurred with male partners. Among these, 53.6% were repeat partners and 46.4% were new partners. Out of the 1,189 encounters, 955 episodes involved oral, vaginal or anal sex, and 27.0% of these encounters were UAVI episodes. Weighted Kappa for UAVI was 0.26, indicating that participants were largely inconsistent in their unprotected sex behaviors across episodes. We tested for reactivity (i.e., behavioral change due to study participation) by entering the week of data collection as a Level 1 variable. The results did not support reactivity in responding (OR = 1.00, $p = .889$). Drinking occurred before 45.1% of sexual encounters. When drinking occurred before sex, the mean number of drinks consumed was 4.43 ($SD = 2.95$; range 1–18). Participant age was not associated with rate of alcohol use before sex (ERR = 1.01, $p = .609$). Neither Black (ERR = 0.76, $p = .230$), nor Latino (ERR = 0.79, $p = .105$), nor Other race MSM (ERR = 1.30, $p = .492$) differed significantly from White MSM in rate of alcohol use prior to sex. Note that the event-rate ratio (ERR) refers to the change in the event-rate of a count outcome (i.e., number of drinks consumed before sex) for every one unit increase in the independent variable.

Demographic and Group Differences in Sexual Risk (Level 2 main effects)

See Table III for a summary of all main and moderating effects. Likelihood of UAVI was not associated with participant age (OR = 1.02, $p = .378$). Compared to White MSM, Black MSM were 54% less likely to report UAVI (OR = .46, $p = .108$), though this effect did not reach statistical significance in these analyses. There were no differences between White MSM and either Latino (OR = 1.33, $p = .438$) or Other race MSM (OR = 1.03, $p = .957$) in odds of UAVI. Racial differences in sexual risk in this sample are reported elsewhere (23). Bisexual MSM were more likely to engage in UAVI than exclusively gay men (OR = 2.15, $p < .05$), though this effect became non-significant when accounting for partner gender (OR = 1.03, $p = .949$). Sensation seeking was positively associated with odds of UAVI at the

trend level (OR = 1.89, $p = .071$), and baseline alcohol use was not associated with odds of UAVI (OR = 1.00, $p = .729$). Of note, the effect sizes and p-values of all Level 2 effects changed as additional Level 1 effects were added into the multivariate model, as illustrated in Table III.

Alcohol Use before Sex, Drug Use before Sex, Sexual Partnership Characteristics and Sexual Risk (Level 1 main effects)

Analysis of the association between alcohol use before sex and sexual risk was conducted while adjusting for the following covariate effects: between-subjects main effects (i.e., demographic and group differences), within-subjects main effects which have previously been found to influence sexual risk (i.e., drug use before sex, partner's gender and number of previous encounters with a partner) (13, 23), and the moderating effects of between-subjects factors on the relationship between alcohol use before sex and sexual risk. Results for the final multivariate model are presented in Table III. For the sample as a whole, alcohol use before sex was not associated with odds of UAVI (OR = 1.07, $p = .215$). Additionally, drug use before sex was associated with higher odds of UAVI (OR = 1.81, $p < .01$) and participants were more likely to report UAVI with female compared to male partners (OR = 5.70, $p < .001$). Number of previous encounters with a partner was not associated with odds of UAVI (OR = 1.00, $p = .179$).

Moderators of the Association between Alcohol Use before Sex and Sexual Risk

Participant age was a significant moderator of the relation between alcohol use before sex and odds of sexual risk (Figure 2; OR = 0.99, $p < .01$), such that the positive association between drinking and odds of UAVI increased as participant age decreased. Similarly, the positive association between drinking and odds of UAVI increased as baseline alcohol use decreased (OR = 0.99, $p < .001$). Sensation seeking was also a significant moderator of this effect, such that the positive association between drinking and odds of UAVI increased as level of sensation seeking increased (OR = 1.15, $p < .01$). Participant sexual orientation (bisexual vs. gay) did not moderate the association between alcohol use and sexual risk (OR = 0.99, $p = .830$). Participant race also did not moderate the effect of alcohol use before sex on sexual risk behavior, and this was true of Black MSM (OR = 1.07, $p = .307$), Latino MSM (OR = 1.14, $p = .180$), and Other race MSM (OR = 1.09, $p = .219$) compared to White MSM.

HLM makes several assumptions that can be assessed by examining the residual files generated when running analyses. We examined the histograms of the Level 1 residuals and Level 2 empirical Bayes residuals in order to assess the assumption that all error terms are normally distributed. The current data did not violate this assumption. Next, we examined the scatter plots of the Level 1 residuals on all study variables included in the multivariate analysis in order to assess the assumption that the Level 1 residual variance is constant. Again, this assumption was not violated with the current data.

DISCUSSION

The results of the current analyses indicate that there are important developmental differences in the association between alcohol use before sex and sexual risk behavior in MSM. According to these findings, alcohol use is associated with an increased likelihood of unprotected sex in younger MSM only. These developmental differences help to account for previous inconsistent findings for the relation between alcohol use and sexual risk in MSM and point to important targets for primary HIV prevention interventions in YMSM.

Our finding that younger MSM had a stronger positive association between alcohol use before sex and likelihood of unprotected sex contradicts Mustanski's (12) previous finding from a similar sample of adult MSM enrolled in a daily diary study. In fact, this prior study found the opposite effect; the positive association between drinking and unprotected sex increased with participant age. In comparing our finding with this previous work (12), however, it is important to consider that the current study utilized a sample that contained a higher proportion of individuals under the age of 21 (approximately 20%), and nearly 10% of the current sample was under age 18 at the time of enrollment. Because of this, the current study likely had more power to examine developmental differences in this effect. Additionally, the current study specifically recruited individuals who were not in sexually monogamous relationships, and as a result the majority of sexual encounters reported in this study occurred with casual partners (only 28.1% of encounters occurred with serious or main partners). At least one prior study found that alcohol use was only associated with unprotected anal sex in MSM when having sex with non-primary partners compared to main or serious partners (34). Upon further review of this effect in the literature, there appears to be a pattern in which alcohol use is more strongly linked to sexual risk in samples that either contained a larger proportion of sexual encounters occurring with casual partners or a larger proportion of MSM participants identifying as single (35, 36). In contrast, those with larger proportions of MSM in serious relationships found no such link (37, 38).

Given that evidence suggests that event-level analyses of multiple sexual encounters within-persons provide the most reliable estimates of the relationship between alcohol use and sexual risk, the differences in age range and proportion of MSM in serious partnerships between Mustanski's (12) study and the current analyses likely explain contradictory findings. Future research should improve upon these sample differences by enrolling MSM of multiple developmental groups who engage in sex with both serious and casual partners. These contradictory findings suggest that there may be important developmental differences in the association between alcohol use, sexual partner type, and sexual risk (i.e., three-way interaction; participant age X partner type X alcohol use). In fact, evidence suggests this may also be the case in heterosexual populations, and research with heterosexual adolescents has found that the link between alcohol use and decreased condom use may be limited to encounters with casual partners (39) or encounters near the time of sexual debut (5). Examining these developmental differences more precisely in a larger sample with more longitudinal follow-up is a critical next step in understanding which groups of MSM in which contexts are most at risk for unprotected sex while under the influence of alcohol.

Also notable is that the current study confirmed previous findings that both sensation seeking and average rates of alcohol use moderate the association between alcohol use before sex and sexual risk (13). Consistent with this prior study, MSM with higher levels of sensation seeking and lower rates of baseline alcohol use showed a stronger link between drinking before sex and UAVI. It is also important to note that in the current analyses the moderating effect of participant age remained significant in the presence of these previously established moderators, as well as in the presence of key Level 2 demographic covariates (i.e., participant age, race/ethnicity, and sexual orientation), selected Level 1 sexual partnership characteristic covariates (i.e., sexual partner gender and number of previous encounters with a partner), and the Level 1 effect of drug use before sex on sexual risk. The fact that participant age remained a significant moderator of the association between alcohol use and sexual risk in the presence of these theoretically-selected covariates increases confidence in the robustness of our findings.

Future research should seek to further describe developmental differences in the association between alcohol use and sexual risk in MSM and should investigate the mechanisms behind the discrepancy between the current findings and previous research (12). More specifically,

it is possible that relationship status or sexual partner type also moderates the association between drinking before sex and sexual risk and that this moderating effect may differ depending on the developmental group being investigated. It seems clear that alcohol use is only linked to sexual risk behavior for some but not all MSM, and knowing why drinking and unprotected sex are linked for some (but not all) MSM will help in the development of intervention efforts to break the association between these variables. Furthermore, in developing interventions for YMSM specifically, it may be particularly important to be mindful that risk-taking behaviors (including sexual risk and substance use) are more normative in adolescence and young adulthood (40, 41). As such, the co-occurrence of alcohol use, drug use, and unprotected sex may not be perceived by YMSM as problematic given the more permissive attitudes toward risk-taking in this developmental group (42). Importantly, if these risk behaviors do in fact co-occur among YMSM (as has previously been described in the literature) (43, 44), then it may be impossible to reduce sexual risk behavior without also addressing alcohol use, drug use, and various other psychosocial concerns experienced by this group.

All findings from this study must be considered within the context of several important limitations. With online recruitment, multiple enrollment of participants or faking eligibility is possible. While we adhered to rigorous procedures to minimize these risks, it is not possible to fully rule out these possibilities. Additionally, all data for this study were collected online. While it is not possible to control the environments in which participants completed online assessments, evidence suggests that online data collection is just as accurate as in-person data collection, and it may be perceived as more anonymous and may reduce the effect of social desirability with self-report data (45). Alcohol use before sex was assessed with a single item that was a count of the number of drinks consumed before sex. While the use of this item is advantageous in that it allows the analyst to directly map drinking episodes onto sexual risk episodes, it does not assess other aspects of alcohol use that may influence sexual risk (e.g., degree of impairment). Finally, the current study did not include MSM who were in sexually-monogamous relationships, were HIV-positive, or who had not had oral or anal sex with a man in the six months prior to enrollment. Not including these groups means that our results cannot be generalized to the MSM community as a whole.

These limitations notwithstanding, the current study reveals an important developmental difference in the association between alcohol use and unprotected sex in MSM. These data indicate that drinking before sex increases the likelihood of unprotected sex in younger but not adult MSM. This study helps to elucidate previous inconsistencies in the literature by using a sample that contained a larger proportion of MSM under age 21 than most prior studies and utilizing event-level analyses of multiple sexual encounters within-persons. These findings also provide a more comprehensive view of the effects of alcohol use on sexual risk by accounting for the effects of various theoretically-selected covariates and previously established main and moderating effects. Addressing alcohol use in conjunction with other behavioral risk factors may be particularly important in interventions targeting YMSM and may increase the effectiveness of HIV prevention efforts in this population.

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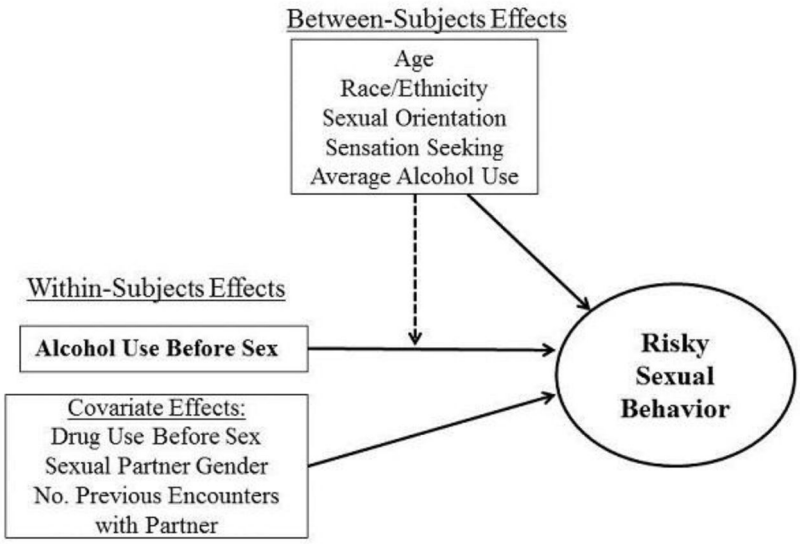

Figure 1.
Analytic Model for the Association between Alcohol Use before Sex and Risky Sexual Behavior including Covariate Effects

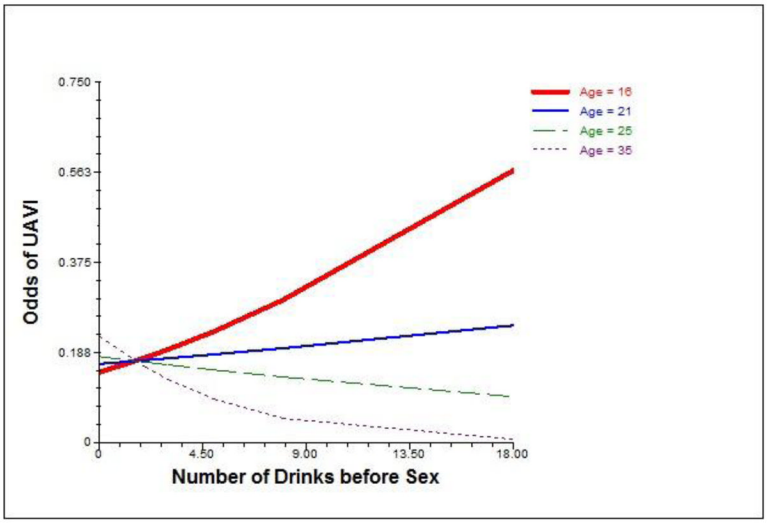

Figure 2. Moderating Effect of Age on the Association between Alcohol Use before Sex and Sexual Risk

NOTE: Participant age was measured as a continuous variable. This figure estimates the association between alcohol use before sex and sexual risk at several key ages across the age range of the sample. This is done solely for illustrative purposes. UAVI = unprotected anal or vaginal intercourse.

Table I

Participant Demographics: Men Who Have Sex with Men Recruited Online, 2011

Variable	% of Full Sample *N* (%)	% of Analytic Sample *N* (%)
Age		
16–20	28 (19.6)	27 (19.7)
21–24	31 (21.7)	30 (21.9)
25–30	36 (25.2)	33 (24.1)
31–40	48 (33.5)	47 (34.3)
Mean (*SD*)	27.53 (7.33)	27.54 (7.40)
Race/Ethnicity		
White/Caucasian	53 (37.1)	50 (36.5)
Black/African American	32 (22.4)	31 (22.6)
Hispanic/Latino	39 (27.3)	37 (27.0)
Asian/Pacific Islander	6 (4.2)	6 (4.4)
Other or Multi-Racial	13 (9.1)	13 (9.5)
Sexual Orientation		
Gay	111 (77.6)	106 (77.4)
Bisexual	29 (20.3)	28 (20.4)
Heterosexual (same-sex attracted)	3 (2.1)	3 (2.2)
Geographic Region		
Northeast	37 (25.9)	36 (26.3)
Midwest	40 (28.0)	37 (27.0)
West Coast	42 (29.4)	40 (29.2)
South/Southeast	24 (16.8)	24 (17.5)
Total *N*	143	137

NOTE: There were no significant differences between the full and analytic sample for any of the above described demographic characteristics.

Table II

Summary of Group Difference, Sexual Behavior, and Substance Use Variables (N = 137)

	Mean	*SD*	%
Group Difference Variables			
Sensation Seeking	3.57	0.70	
Baseline Alcohol Use (QF)	30.55	28.27	
Sexual Behavior			
Number of Sexual Encounters per Week	0.94	1.26	
Sexual Risk Episodes (UAVI)			27.0
Encounters with Male Partners			88.2
Encounters with Repeat Partner			53.6
Alcohol and Drug Use Before Sex			
Number of Drinks Before Sex	4.43	2.95	
Encounters with Alcohol Use Before Sex			45.1
Encounters with Any Drug Use Before Sex			18.0

NOTE: QF = quantity-frequency. UAVI = unprotected anal or vaginal intercourse.

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Table III

Summary of Main and Moderating Effects on Sexual Risk (N =137)

Fixed Effect	Between-Subjects Effects only			Full Multivariate Model		
	Odds Ratio	Confidence Interval	*p*-value	Odds Ratio	Confidence Interval	*p*-value
Intercept	0.29	0.14 – 0.59	*<.001	0.23	0.10 – 0.49	*<.001
Participant Age	1.02	0.98 – 1.07	.378	1.03	0.98 – 1.07	.288
Participant Race – White (ref.)	--	--	--	--	--	--
Black/African American	0.46	0.17 – 1.19	.108	0.47	0.19 – 1.18	.107
Hispanic/Latino	1.33	0.65 – 2.72	.438	1.03	0.45 – 2.34	.944
Other	1.03	0.40 – 2.61	.957	1.09	0.40 – 2.96	.859
Sexual Orientation (Bisexual)	2.15	1.13 – 4.09	*<.05	1.03	0.48 – 2.21	.949
Sensation Seeking	1.89	0.95 – 3.78	.071	1.59	0.80 – 3.17	.184
Baseline Alcohol Use (QF)	1.00	0.99 – 1.01	.729	1.01	1.00 – 1.02	.314
Alcohol Use Before Sex	--	--	--	1.07	0.96 – 1.20	0.215
X Participant Age	--	--	--	0.99	0.98 – 0.99	*<.01
X Participant Race – White (ref.)	--	--	--	--	--	--
X Black/African American	--	--	--	1.07	0.94 – 1.22	0.307
X Hispanic/Latino	--	--	--	1.14	0.94 – 1.37	0.180
X Other	--	--	--	1.09	0.95 – 1.24	0.219
X Sexual Orientation (Bisexual)	--	--	--	0.99	0.85 – 1.14	0.830
X Sensation Seeking	--	--	--	1.15	1.05 – 1.27	*<.01
X Baseline Alcohol Use (QF)	--	--	--	0.99	0.99 – 0.99	*<.001
Drug Use Before Sex	--	--	--	1.81	1.26 – 2.62	*<.01
Sexual Partner Gender	--	--	--	5.70	2.40 – 13.60	*<.001
No. Previous Encounters w. Partner	--	--	--	1.00	1.00 – 1.01	0.179

NOTE: This table presents two separate models. The first presents demographic and group differences in sexual risk without Level 1 variables entered. The second presents the full multivariate model used to examine Level 1 effects and interactions. All effects preceded by an "X" refer to the interactions between these variables and alcohol use before sex in predicting sexual risk behavior. Ref = reference group. QF = quantity-frequency.