Demographic Predictors of Event-Level Associations between Alcohol Consumption and Sexual Behavior

Brooke E. Wells, H. Jonathon Rendina, Brian C. Kelly,
Sarit A. Golub, and Jeffrey T. Parsons

ABSTRACT *Alcohol consumption is associated with sexual behavior and outcomes, though research indicates a variety of moderating factors, including demographic characteristics. To better target interventions aimed at alcohol-related sexual risk behavior, our analyses simultaneously examine demographic predictors of both day- and event-level associations between alcohol consumption and sexual behavior in a sample of young adults (N = 301) who are sexually active and consume alcohol. Young adults (aged 18–29) recruited using time-space sampling and incentivized snowball sampling completed a survey and a timeline follow-back calendar reporting alcohol consumption and sexual behavior in the past 30 days. On a given day, a greater number of drinks consumed was associated with higher likelihood of sex occurring, particularly for women and single participants. During a given sexual event, number of drinks consumed was not associated with condom use, nor did any demographic predictors predict that association. Findings highlight associations between alcohol and sexual behavior, though not between alcohol and sexual risk behavior, highlighting the need for additional research exploring the complex role of alcohol in sexual risk behavior and the need to develop prevention efforts to minimize the role of alcohol in the initiation of sexual encounters.*

KEYWORDS *Sexual behavior, Youth, Alcohol, HIV*

INTRODUCTION

In a variety of samples, alcohol consumption is associated with HIV and sexually transmitted infection (STI), even after controlling for confounding factors.^{1–6} Although some studies find a global association between drinking and sexual risk behavior,^{2,7} others find a null association.^{8–11} Many event-level studies examining these associations within sexual or drinking events or at the day level, rather than globally or situationally, either fail to find an association between drinking and

Wells, Rendina, Kelly, and Parsons are with the Center for HIV/AIDS Educational Studies and Training (CHEST), 142 W. 36th St., 9th Fl., New York, NY 10018, USA; Wells is with the Center for Human Sexuality Studies, Widener University, One University Place, Chester, PA 19013, USA; Kelly is with the Department of Sociology, Purdue University, 700 W. State St., West Lafayette, IN 47907, USA; Golub and Parsons are with the Department of Psychology, Hunter College of the City University of New York (CUNY), 695 Park Ave, New York, NY 10065, USA; Golub is with the Doctoral Program in Basic and Applied Social Psychology, The Graduate Center of CUNY, 365 5th Ave, New York, NY 10034, USA; Golub and Parsons are with the Doctoral Program in Health Psychology and Clinical Science, The Graduate Center of CUNY, 365 5th Ave, New York, NY 10034, USA; Parsons is with the Doctoral Program in Public Health, The Graduate Center of CUNY, 365 5th Ave, New York, NY 10034, USA.

Correspondence: Jeffrey T. Parsons, Department of Psychology, Hunter College of the City University of New York (CUNY), 695 Park Ave, New York, NY 10065, USA. (E-mail: jeffrey.parsons@hunter.cuny.edu)

sexual behavior^{10,12} or indicate that the association varies according to gender, partner characteristics (e.g., familiarity, prior sexual experiences), and other individual and situational factors.^{13,14} To better understand these complex associations, this paper examines demographic predictors of event-level associations between drinking and sexual behavior.

Age is an important moderator to consider, as young adulthood is a time of developing patterns of drinking and sexual behavior. Compared to older individuals, younger individuals have a stronger association between binge drinking and the number of sexual partners,¹⁵ between drinking and condom use,¹⁶ and are more likely to report recently having been less safe sexually after drinking.¹⁷ However, a recent review found that the association between alcohol consumption and sexual risk behavior exists for both older and younger men who have sex with men (MSM),¹⁸ highlighting the need for additional research. Despite the focus on alcohol-fueled casual sex in college settings,^{19,20} there are significant associations between drinking and sexual behavior across education levels,^{10,21,22} highlighting the need for additional research among youth with a range of educational experiences and contexts.

The role of gender in the associations between alcohol and sexual behavior is inconsistent in the literature,^{23–26} perhaps owing to the myriad gender-related factors involved in drinking, sexual behavior, and their association, such as social norms favoring heavier drinking and casual sexual activity for men.^{27,28} Because condom use and contraception may each be differentially controlled by male and female partners,²⁹ understanding gender differences in the associations between drinking and sexual risk behavior is critical.

Sexual orientation has rarely been examined as a moderator of the link between drinking and sex, though alcohol may differentially impact sexual behavior owing to differences in behavioral norms and sex-related alcohol expectancies.³⁰ Research on MSM tends to focus almost entirely on sexual risk behavior, and, similar to research with heterosexual men, findings are inconsistent.^{1,31–35} Comparing gay and straight men, studies find similar levels of alcohol use prior to unprotected sex³⁶ and similar likelihood of unsafe sex after drinking.¹⁷

Though most research focuses on racially and ethnically homogenous samples or ignores racial and ethnic variability within samples, race and ethnicity may impact associations between drinking and sex because of culturally specific norms about drinking and sex,^{37,38} discrimination-related mechanisms of drinking and sexual risk,^{39,40} the likelihood of negative sexual health outcomes (and subsequent public health prevention efforts),¹¹ and/or varying developmental trajectories of drinking, sexual behavior, and their association.^{41,42} Samples consisting solely of African American participants indicate associations between alcohol and sexual risk intentions or behaviors.^{2,43,44} A smaller body of research has examined race and ethnicity as moderators of the links between alcohol use and sexual behavior, often finding stronger associations between alcohol consumption and sexual behavior among whites.^{45–48}

While alcohol consumption increases the likelihood of sexual activity across relationship types, this effect seems to be strongest for sex with casual partners,^{10,16,46,49–54} likely owing to the centrality of alcohol consumption in scripts that guide casual sex encounters.⁵⁵ In terms of sexual risk behavior, some research indicates that the association between alcohol and sexual risk behavior is stronger in serious than in casual relationships,^{13,31} while other research indicates stronger links between alcohol and sexual risk behavior in casual partnerships.^{56–58}

Present Study

Although studies have examined drinking and sexual behavior, many have three methodological shortcomings: (1) focus solely on college students, (2) measurement of aggregate rather than event-level associations, and (3) failure to account for influences on both sexual activity and sexual risk. We sought to simultaneously examine several demographic predictors in both day- and event-level associations between the number of drinks (alcohol dose influences the association between alcohol consumption and sexual behavior^{3,24,58–61}) and sexual behavior, including vaginal and/or anal sex without a condom. All analyses adjust for problem drinking, as some research indicates an effect of alcohol abuse on sexual risk behavior.^{4,62}

METHODS

These analyses utilize data collected in Project DASH (Drinking and Sexual Health), which enrolled 301 18–29 years old who reported recent alcohol consumption and vaginal and/or anal sex. Participants were enrolled between 2010 and 2013 and all resided in the New York City (NYC) metropolitan area.

Recruitment and Enrollment

We utilized two recruitment strategies to enroll a broad sample of young adults in NYC who met the following eligibility criteria: (1) aged 18–29, (2) report at least 3 days of alcohol consumption in the last 90 days and at least 1 day of alcohol consumption in the last 30 days, and (3) report at least one act of vaginal or anal sex in the last 30 days. First, we utilized time-space sampling^{63,64} in a wide range of alcohol-serving and non-alcohol-serving venues frequented by young adults. Patrons were approached and screened using anonymous surveys on an iPod Touch; eligible individuals were given more information about the study and asked to provide contact information (collected on a separate survey). In total, recruiters approached 12,875 individuals. Of these, 9700 consented to the survey (75 % response rate), and 8005 of those lived in NYC and completed the survey. Of the 8005 completed surveys, 3206 individuals were eligible for the full project (40 % eligibility rate), and 2647 of those provided some form of contact information (83 %). Of those providing contact information, 327 of those were rescreened for eligibility by phone, yielding 168 participants enrolled via time-space sampling (56 % of the total sample). Contacts were selected for pursuit based on enrollment targets for gender, age, sexual identity, and race/ethnicity to ensure adequate diversity of the sample.

Second, we utilized incentivized snowball sampling, wherein each enrolled participant was given the opportunity to refer up to three other people into the study. Enrolled participants were given three numbered recruitment cards that were linked to their study identification number and were given a general sense of eligibility criteria. When a referral called, research staff described the study, screened for eligibility, and, if eligible, scheduled the first appointment. For each enrolled referral, the referring participant received a small payment. In total, 133 participants (44 % of the sample) were enrolled via incentivized snowball sampling.

In their initial appointment, participants first provided informed consent and then completed a timeline follow-back calendar⁶⁵ with information about their alcohol consumption and sexual behavior in the last 30 days, and completed a computerized

survey delivered via Qualtrics®. The City University of New York institutional review board approved all study procedures.

Measures

In the survey, participants reported their current age, highest level of education (dichotomized for these analyses as less than a 4-year degree vs. a 4-year degree or more), gender, sexual identity (gay and bisexual men are grouped together and compared to straight men and to women across sexual identities, though all had to report past 30-day penile-vaginal intercourse), race/ethnicity (categorized for these analyses as white, black, Latino, and multiracial or other), relationship status (single or partnered), and completed the Alcohol Use Disorders Identification Test (AUDIT), a widely used and well-validated measure of problematic drinking.⁶⁶

Alcohol consumption and sexual behavior in the past 30 days were collected using the timeline follow-back (TLFB) calendar technique.⁶⁵ Assessors explained the concept of standard drinks and assisted in the calculation of standard drink reports for each day, and participants reported sexual behavior for each day, including the number of drinks they had consumed prior to each sexual event.

Data Analysis

We began by examining the basic demographic characteristics of the sample. Following this, we utilized *Mplus* version 7.2 to fit a series of two multilevel structural equation models (MSEMs). In the first model, pictured in Fig. 1, we utilized day-level data to examine how the number of standard drinks consumed on a given day was associated with engaging in any sexual behavior on that day. In the second model, we utilized sexual event-level data to examine how, among sex events, the number of standard drinks consumed was associated with engaging in condomless sex during the event. Across both models, we utilized two random intercepts to examine how individual-level demographic variables and AUDIT scores were associated with the number of standard drinks and sexual behavior and used a random slope to examine how demographic variables and AUDIT scores impact the association between drinking and sexual behavior. The number of standard drinks within each model was specified as a negative binomial count variable, and sexual behavior was specified as a dichotomous categorical variable, relying on the *Mplus* default of robust maximum likelihood (i.e., MLR) estimation. All 9030 days of TLFB data were utilized for the day-level analyses, and the 2846 recorded sexual events were utilized in the event-level analyses. In both models, we centered age and AUDIT scores using the grand mean.

RESULTS

The final sample consisted of 301 young adults aged 18–29, with an average age of 23.6 ($SD=2.9$). Half of the sample identified as white, half were partnered, and most reported at least some college education. By design, the sample was 32.9 % gay and bisexual men, 31.9 % straight men, and 35.2 % women (including lesbian, bisexual, and straight-identified women who reported recent sex with a man). The median number of drinking days was 11, and the median number of standard drinks in the 30-day windows was 47. The median number of sex events was 7, with a median of 1 vaginal or anal sex act without a condom. Finally, participants reported a median of 2.4 drinks prior to anal or vaginal sex events, with a median of 1.4 drinks prior to sex without a condom (among the 187 participants who reported sex without a condom). See Table 1 for sample characteristics.

In the first MSEM, we examined individual-level (i.e., level 2) demographic characteristics and AUDIT scores as predictors of daily (i.e., level 1) number of standard drinks and whether or not the participant engaged in any sexual activity that day using random intercepts at level 2, as well as the regression of whether or not the participant had any vaginal and/or anal sex that day on the number of standard drinks consumed that day using a random slope at level 2 (see Fig. 1). These data are presented in Table 2. The fixed effect for the random slope suggested a significant, positive association between number of drinks consumed and engaging in sexual activity on a given day. Those with higher scores on the AUDIT consumed a significantly greater number of drinks on a given day but did not have a greater likelihood of sex or a greater association between drinking and sex. Compared to both women and gay men, straight men reported a significantly greater number of drinks on a given day and, compared to women, straight men had a higher probability of having sex on a given day. However, for women, there was a significantly stronger association between the number of drinks they had on a given day and whether or not they had sex on that day, compared to straight men. Participants who were partnered drank significantly less than single participants, but had a higher probability of having

TABLE 1 Sample characteristics (*N* = 301)

	Number	Percent
Race/ethnicity		
White	148	49.2
Latino	36	12.0
Black	56	18.6
Multiracial or other	61	20.3
Gender/sexual orientation		
Gay or bisexual male	99	32.9
Heterosexual (straight) male	96	31.9
Female of any sexual orientation	106	35.2
Relationship status		
Single	145	48.2
Partnered	156	51.8
Education		
High school diploma/GED or less	46	15.3
Some college or associates	70	23.3
Currently enrolled in college	53	17.6
4-year degree or higher	132	43.9
	<i>M</i>	<i>SD</i>
Age (median = 24.0)	23.60	2.90
AUDIT score (median = 10.0)	11.42	5.62
	Median	IQR
Number of drinking days	11.0	7.0,16.0
Number of standard drinks (in 30 days)	47.0	25.0,74.0
Number of sex events	7.0	4.0,12.0
Number of condomless vaginal and/or anal sex events	1.0	0.0,8.0
Number of standard drinks prior to sex events	2.4	1.1,4.1
Number of standard drinks prior to condomless anal/vaginal sex events (of the 187 who reported condomless sex)	1.4	0.3,3.5

FIG. 1 The model above demonstrates how multilevel modeling is conducted within the structural equation modeling framework of *Mplus* for the analyses of daily sexual engagement. The three *black circles* at level 1 represent the three latent variables at level 2 (i.e., two random intercepts and the random slope).

sex on a given day, and the amount that partnered participants drank on a given day was less strongly associated with whether or not they had sex that day than it was for single individuals.

In the second MSEM (Table 3), we examined event level data, in which each sex act was considered the level 1 event. As such, we examined individual-level (i.e., level 2) demographic characteristics and hazardous drinking as predictors of event-level (i.e., level 1) number of standard drinks prior to sex and whether or not the participant engaged in anal or vaginal sex without a condom during a given sex act. The model also examined the level 1 association between the number of drinks consumed prior to sex and whether or not the participant engaged in condomless anal or vaginal sex. Older age was associated with consuming fewer drinks before each sex act. As with the day-level model, AUDIT scores were significantly associated with a greater number of drinks being consumed prior to sex acts, though not associated with engagement in condomless sex or with the association between drinking and condomless sex. Latino participants had a lower likelihood of condomless sex than white participants during a given event. Similar to the results for the first MSEM, we found that those participants in a relationship consumed

TABLE 2 Demographic predictors of day-level drinking, sexual activity, and the slope of sexual activity on the number of standard drinks

	Random intercept: number of standard drinks			Random intercept: any vaginal and/or anal sexual activity			Random slope: any sexual activity on number of standard drinks		
	B	S.E.	p	B	S.E.	p	B	S.E.	p
Intercept (fixed effect)	0.68	0.12	<0.001	-1.86	0.19	<0.001	0.11	0.03	<0.001
Age (centered)	0.02	0.02	0.30	0.04	0.02	0.06	-0.01	0.00	0.15
AUDIT score (centered)	0.06	0.01	<0.001	0.01	0.01	0.29	0.00	0.00	0.50
Education (ref: less than 4-year degree)									
4-year degree or more	-0.02	0.10	0.84	-0.15	0.16	0.33	0.03	0.02	0.24
Gender/sexual orientation (ref: straight male)									
Gay or bisexual male	-0.28	0.10	0.004	-0.18	0.16	0.26	0.03	0.03	0.28
Female	-0.24	0.09	0.008	-0.42	0.15	0.005	0.06	0.03	0.03
Race/ethnicity (ref: white)									
Black	0.09	0.15	0.56	-0.17	0.20	0.40	-0.02	0.03	0.54
Latino	0.20	0.12	0.10	0.13	0.20	0.53	-0.01	0.03	0.71
Multiracial or other	0.00	0.10	0.99	-0.05	0.16	0.76	-0.01	0.03	0.71
Relationship status (ref: single)									
Partnered	-0.16	0.08	0.05	1.33	0.14	<0.001	-0.06	0.02	0.01
	Est.	S.E.	p	Est.	S.E.	p	Est.	S.E.	p
Residual variance	0.31	0.04	<0.001	0.81	0.11	<0.001	0.01	0.00	0.02

TABLE 3 Demographic predictors of event-level drinking during sex, sex without a condom, and the association between number of drinks and sex without a condom

	Random intercept: number of standard drinks prior to or during sexual activity			Random intercept: any condomless anal/vaginal sex			Random slope: any condomless anal/vaginal sex on number of standard drinks during sex		
	B	S.E.	p	B	S.E.	p	B	S.E.	p
Intercept (fixed effect)	0.91	0.17	<0.001	-0.85	0.56	0.13	-0.16	0.12	0.21
Age (centered)	-0.05	0.02	0.02	-0.01	0.10	0.89	0.01	0.01	0.43
AUDIT score (centered)	0.07	0.01	<0.001	0.05	0.05	0.26	0.01	0.01	0.43
Education (ref: less than 4-year degree)									
4-year degree or more	-0.06	0.13	0.64	-0.74	0.55	0.18	0.04	0.09	0.67
Gender/sexual orientation (ref: straight male)									
Gay and bisexual male	-0.21	0.16	0.19	-0.98	0.61	0.11	0.05	0.10	0.62
Female	0.10	0.14	0.47	-0.79	0.66	0.23	0.01	0.10	0.90
Race/ethnicity (ref: white)									
Black	0.21	0.21	0.32	-0.81	0.78	0.30	-0.07	0.14	0.60
Latino	0.22	0.17	0.18	-1.62	0.71	0.02	0.13	0.11	0.25
Multiracial or other	0.09	0.15	0.58	-1.06	0.74	0.15	0.02	0.12	0.85
Relationship status (ref: single)									
Partnered	-0.76	0.13	<0.001	3.24	0.52	<0.001	0.16	0.15	0.27
Residual variance	Est. 0.46	S.E. 0.12	p <0.001	Est. 13.74	S.E. 2.29	p <0.001	Est. 0.10	S.E. 0.10	p 0.31

fewer drinks prior to sex but had a higher probability of condomless sex during a given sex event than single participants. The non-significant fixed intercept for the random slope, the lack of statistically significant demographic differences from this fixed effect, and a non-significant residual variance in this effect suggests that the association between number of drinks prior to sex and condomless sex is not significantly different from zero in this sample overall.

DISCUSSION

Consistent with other event-level analyses, we found that, controlling for AUDIT scores, the number of drinks consumed was associated with the likelihood of sex occurring, which was particularly true for women and single participants. However, there was not a significant association between the number of drinks and condom use.

When compared to women, straight men were more likely to report sex on a given day and to report more drinks, though the association between number of drinks and engaging in sexual activity was significantly stronger among women than among straight men. The increased likelihood of sexual activity and heavier drinking among straight-identified men is consistent with other research,^{67,68} perhaps reflecting a tendency for men to engage in risk behavior at higher rates than women.⁶⁹ Interestingly, though, number of drinks was more strongly associated with engaging in sexual behavior among women than among straight men. As others have suggested,⁷⁰ this finding could be understood, at least in part, using alcohol myopia theory,⁷¹ which maintains that inhibition conflict—the discrepancy between impelling and inhibiting cognitions and emotions about sexual behavior—may best predict behavior change associated with drinking. Alcohol may have a stronger impact on women's sexual behavior because women likely experience more conflicting cognitions and emotions about engaging in sexual behavior, particularly with casual partners.^{28,68}

Consistent with other research,^{16,53} we found that alcohol had a stronger influence on the occurrence of sexual behavior among single people than among partnered people. As noted by others, alcohol is a critical component of “hooking up,”^{20,52} defined as sexual activity between partners who are not in a romantic relationship and do not necessarily expect a romantic relationship.⁵¹ These findings may also indicate that romantic relationships provide a context in which people feel more comfortable initiating sexual activity. There may also be distinctions in individual characteristics of those who partner vs. those who do not, such as sensation seeking. On the other hand, relationship status did not significantly influence the (non-significant) association between drinking and condom use, perhaps because alcohol use is associated with sexual activity with casual partners, but sex with casual partners is characterized by more consistent condom use than sex with relationship partners. Those in relationships may have also negotiated other risk-reduction strategies, such as birth control and/or HIV and STI testing prior to condomless sex. Future research should examine the role of alcohol consumption in condom use across the duration of ongoing casual partnerships and in varying kinds of casual partnerships.

Few other demographic characteristics were associated with behavioral outcomes. Being Latino was associated with a lower likelihood of sex without a condom (when compared to whites). Lower rates of condom use among white participants compared to Latinos is consistent with other research,^{11,41} perhaps reflecting more

reliance on condoms for birth control among people of color (owing to socioeconomic differences in access to hormonal contraception), efficacy of safer sex interventions aimed at racial and ethnic minorities, and/or awareness of increased risk for HIV and other STIs.

Age predicted the quantity of drinking prior to sex at the event level, such that older participants reported fewer drinks prior to sex than did younger participants. This finding may reflect less reliance on alcohol use prior to sex as people acquire more sexual experience and become more competent and comfortable negotiating relationships and sexual encounters. Because age was not associated with the number of standard drinks on a given day, the role of age in drinking prior to sex does not appear to simply reflect heavier drinking among younger participants. Further, educational attainment was not associated with any outcomes. As most people initiate both drinking and sexual activity prior to the age of 18 (the minimum age of this sample),⁷² it is possible that many participants had established patterns of both behaviors (and their combination), thus discounting the influence of college education.

Findings have implications for the development and targeting of sexual education programs. First, interventions designed to target the association between alcohol and sexual behavior should highlight the role of alcohol in the decision to engage in sex, particularly with casual partners. Some have suggested heat-of-the-moment scenarios to help individuals learn decision-making skills during arousal and intoxication to help them better understand individual and contextual factors that may precipitate sexual behavior.⁷³ Second, interventions should integrate gendered sexual norms to better target the underlying motivations for combining alcohol and sex.⁷⁴ Findings indicate that women may benefit from interventions designed to improve their ability to initiate (and perhaps feel less conflict about) sex while sober.

Interpretations of these findings should be considered in the context of the study's methodological strengths and limitations. First, the sample consists of NYC young adults who report recent vaginal or anal sex and a minimum of 3 days of alcohol consumption in the past 3 months. The eligibility criteria eliminated the possibility of comparing those who drink to those who do not or comparing those engaging in non-penetrative sexual activity with those who engaged in penile-vaginal sex. However, the day and event-level analyses facilitated within-subject analyses that supported more in-depth examinations of event-level combinations of alcohol and sexual activity, allowing an individual to act as his or her own point of comparison. Day-level recall using the TLFB data collection method is also a strength of the study as research indicates that people lack the ability to retrospectively judge the effects of alcohol on their sexual behavior.⁷⁵ Second, a portion of the sample was recruited in NYC bars and clubs, indicating some level of social activity. As such, the sample may not be representative of all NYC young adults or of socially active adults in other locations. However, NYC youth are at high risk of STI and HIV transmission, particularly MSM and youth of color, and report low rates of condom use,^{59,76} thus warranting additional research. Further, a portion of the sample was recruited via incentivized snowball sampling, though we could not account for dependency in these analyses, which may be a network-level factor influencing the model. Third, though we examined a range of individual characteristics as predictors of the associations between drinking and sexual behavior, the nature of the multilevel models, coupled with a small sample, prevented investigation of interactions between demographic factors (i.e., gender and education), which have been identified as important in predicting drinking and associated risks.^{77,78} However,

all demographic factors were entered simultaneously, allowing an examination of each demographic predictor while controlling for the effects of the other predictors in the model. Future research should examine these event-level associations in larger samples to facilitate more in-depth analyses of demographic interactions. Finally, though we used the number of standard drinks as our alcohol consumption predictor because of research indicating dose effects, the same number of standard drinks may have different effects across participants depending on drinking experience, gender, and the spacing of drinks. Future research should assess the subjective state of intoxication during sexual activity.

In conclusion, these event-level analyses provide additional evidence contextualizing the link between alcohol consumption and sexual risk behavior. Future research should examine the role of psychosocial factors in these demographic distinctions. As noted above, alcohol use prior to any sexual encounter may most strongly influence specific groups because of the stigma they face around sexual behavior (gender roles, internalized homophobia, sexual conflicts or fears, etc.), the expectations they have developed about drinking and sex (i.e., from group-specific social networks), or other psychological factors more likely to affect specific demographic groups.

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COMPLIANCE WITH ETHICAL STANDARDS

The City University of New York institutional review board approved all study procedures.

REFERENCES

1. Sander PM, Cole SR, Stall RD, et al. Joint effects of alcohol consumption and high-risk sexual behavior on HIV seroconversion among men who have sex with men. *AIDS*. 2013; 27(5): 815–23.
2. Seth P, Wingood GM, DiClemente RJ, Robinson LS. Alcohol use as a marker for risky sexual behaviors and biologically confirmed sexually transmitted infections among young adult African-American women. *Womens Health Issues*. 2011; 21(2): 130–5.
3. Baliunas D, Rehm J, Irving H, Shuper P. Alcohol consumption and risk of incident human immunodeficiency virus infection: a meta-analysis. *Int J Public Health*. 2010; 55(3): 159–66.
4. Fisher JC, Cook PA, Sam NE, Kapiga SH. Patterns of alcohol use, problem drinking, and HIV infection among high-risk African women. *Sex Transm Dis*. 2008; 35(6): 537–44.
5. Koblin BA, Husnik MJ, Colfax G, et al. Risk factors for HIV infection among men who have sex with men. *AIDS*. 2006; 20(5): 731–9.

6. Cook RL, Clark DB. Is there an association between alcohol consumption and sexually transmitted diseases? A systematic review. *Sex Transm Dis.* 2005; 32(3): 156–64.
7. Dye C, Upchurch DM. Moderating effects of gender on alcohol use: implications for condom use at first intercourse. *J Sch Health.* 2006; 76(3): 111–6.
8. Velez-Blasini CJ. Evidence against alcohol as a proximal cause of sexual risk taking among college students. *J Sex Res.* 2008; 45(2): 118–28.
9. Cooper ML. Does drinking promote risky behavior. *Curr Dir Psychol Sci.* 2006; 15(1): 19–23.
10. Parks K, Hsieh Y, Lorraine CR, Levonyan-Radloff K. Daily assessment of alcohol consumption and condom use with known and casual partners among young female bar drinkers. *AIDS Behav.* 2011; 15(7): 1332–41.
11. Sanders SA, Reece M, Herbenick D, Schick V, Dodge B, Fortenberry JD. Condom use during most recent vaginal intercourse event among a probability sample of adults in the United States. *J Sex Med.* 2010; 7: 362–73.
12. Leigh BC, Vanslyke JG, Hoppe MJ, Rainey DT, Morrison DM, Gillmore MR. Drinking and condom use: results from an event-based daily diary. *AIDS Behav.* 2008; 12(1): 104–12.
13. Scott-Sheldon LA, Carey MP, Carey KB. Alcohol and risky sexual behavior among heavy drinking college students. *AIDS Behav.* 2010; 14(4): 845–53.
14. Cooper ML. Toward a person x situation model of sexual risk-taking behaviors: illuminating the conditional effects of traits across sexual situations and relationship contexts. *J Pers Soc Psychol.* 2010; 98(2): 319–41.
15. Patrick ME, O'Malley P, Johnston LD, Terry-McElrath Y, Schulenberg JE. HIV/AIDS risk behaviors and substance use by young adults in the United States. *Prev Sci.* 2012; 13(5): 532–8.
16. Cooper ML. Alcohol use and risky sexual behavior among college students and youth: evaluating the evidence. *J Stud Alcohol.* 2002; Suppl. 14: 101–17.
17. Wells BE, Kelly BC, Golub SA, Grov C, Parsons JT. Patterns of alcohol consumption and sexual behavior among young adults in nightclubs. *Am J Drug Alcohol Abuse.* 2010; 36(1): 39–45.
18. Heath J, Lanoye A, Maisto S. The role of alcohol and substance use in risky sexual behavior among older men who have sex with men: a review and critique of the current literature. *AIDS Behav.* 2012; 16(3): 578–89.
19. Bogle KA. The shift from dating to hooking up in college: what scholars have missed. *Sociol Compass.* 2007; 1(2): 775–88.
20. Downing-Matibag TM, Geisinger B. Hooking up and sexual risk taking among college students: a health belief model perspective. *Qual Health Res.* 2009; 19(9): 1196–209.
21. Cooper ML, Orcutt HK. Alcohol use, condom use, and partner type among heterosexual adolescents and young adults. *J Stud Alcohol.* 2000; 61(3): 413–9.
22. Gilmore M, Morrison D, Leigh B, Hoppe M, Gaylor J, Rainey D. Does “high = high risk”? An event-based analysis of the relationship between substance use and unprotected anal sex among gay and bisexual men. *AIDS Behav.* 2002; 6(4): 361–70.
23. Connell CM, Gilreath TD, Hansen NB. A multiprocess latent class analysis of the co-occurrence of substance use and sexual risk behavior among adolescents. *J Stud Alcohol Drugs.* 2009; 70(6): 943.
24. Hutton HE, McCaul ME, Santora PB, Erbeling EJ. The relationship between recent alcohol use and sexual behaviors: gender differences among sexually transmitted disease clinic patients. *Alcohol Clin Exp Res.* 2008; 32(11): 2008–15.
25. MacDonald TK, Zanna MP, Fong GT. Why common sense goes out the window: effects of alcohol on intentions to use condoms. *Personal Soc Psychol Bull.* 1996; 22(8): 763–75.
26. Leigh BC. Alcohol and condom use: a meta-analysis of event-level studies. *Sex Transm Dis.* 2002; 29: 476–82.

27. Iwamoto DK, Cheng A, Lee CS, Takamatsu S, Gordon D. "Man-ing" up and getting drunk: the role of masculine norms, alcohol intoxication and alcohol-related problems among college men. *Addict Behav.* 2011; 36(9): 906–11.
28. Conley TD, Ziegler A, Moors AC. Backlash from the bedroom stigma mediates gender differences in acceptance of casual sex offers. *Psychol Women Q.* 2013; 37(3): 392–407.
29. Woolf SE, Maisto SA. Gender differences in condom use behavior? The role of power and partner-type. *Sex Roles.* 2008; 58(9–10): 689–701.
30. Hatzenbuehler ML, Corbin WR, Fromme K. Trajectories and determinants of alcohol use among LGB young adults and their heterosexual peers: results from a prospective study. *Dev Psychol.* 2008; 44(1): 81–90.
31. Newcomb ME, Mustanski B. Developmental change in the relationship between alcohol and drug use before sex and sexual risk behavior in young men who have sex with men. *AIDS Behav.* 2014; 18(10): 1981–90.
32. Parsons JT, Kutnick AH, Halkitis PN, Punzalan JC, Carbonari JP. Sexual risk behaviors and substance use among alcohol abusing HIV-positive men who have sex with men. *J Psychoactive Drugs.* 2005; 37(1): 27–36.
33. Heidinger BE, Gorgens K, Morgenstern J. The effects of sexual sensation seeking and alcohol use on risky sexual behavior among men who have sex with men. *AIDS Behav.* 2015; 19(3): 431–9.
34. Choi K, Operario D, Gregorich SE, McFarland W, MacKellar D, Valleroy L. Substance use, substance choice, and unprotected anal intercourse among young Asian American and Pacific Islander men who have sex with men. *AIDS Educ Prev.* 2005; 17(5): 418–29.
35. Irwin TW, Morgenstern J, Parsons JT, Wainberg M, Labouvie E. Alcohol and sexual HIV risk behavior among problem drinking men who have sex with men: an event level analysis of timeline followback data. *AIDS Behav.* 2006; 10(3): 299–307.
36. McCoul MD, Haslam N. Predicting high risk sexual behaviour in heterosexual and homosexual men: the roles of impulsivity and sensation seeking. *Personal Individ Differ.* 2001; 31(8): 1303–10.
37. Martin JL, Groth G, Buckner L, Gale MM, Kramer ME. Perceived drinking norms among black college students: the race of reference group members. *Addict Behav.* 2013; 38(10): 2586–8.
38. Anderson NE. A racial/ethnic comparison of teen sexual attitudes and behavior. *Health Behav Policy Rev.* 2014; 1(1): 16–27.
39. Roberts ME, Gibbons FX, Gerrard M, et al. From racial discrimination to risky sex: prospective relations involving peers and parents. *Dev Psychol.* 2012; 48(1): 89–102.
40. Hatzenbuehler ML, Corbin WR, Fromme K. Discrimination and alcohol-related problems among college students: a prospective examination of mediating effects. *Drug Alcohol Depend.* 2011; 115(3): 213–20.
41. Khan MR, Berger AT, Wells BE, Cleland CM. Longitudinal associations between adolescent alcohol use and adulthood sexual risk behavior and sexually transmitted infection in the United States: assessment of differences by race. *Am J Public Health.* 2012; 102(5): 867–76.
42. Zapolski TCB, Pedersen SL, McCarthy DM, Smith GT. Less drinking, yet more problems: understanding African American drinking and related problems. *Psychol Bull.* 2014; 140(1): 188–223.
43. Woolf-King SE, Maisto SA. The effects of alcohol, relationship power, and partner type on perceived difficulty implementing condom use among African American adults: an experimental study. *Arch Sex Behav.* 2015; 44(3): 571–81.
44. Sales JM, Brown JL, Vissman AT, DiClemente RJ. The association between alcohol use and sexual risk behaviors among African American women across three developmental periods: a review. *Curr Drug Abuse Rev.* 2012; 5(2): 117–28.
45. Hou SL. HIV-related behaviors among black students attending Historically Black Colleges and Universities (HBCUs) versus white students attending a traditionally white institution (TWI). *AIDS Care.* 2009; 21(8): 1050–7.

46. Thomson Ross L, Zeigler S, Kolak AM, Epstein D. Sexual hookups and alcohol consumption among African American and Caucasian college students: a pilot study. *J Psychol.* 2015; 149(6): 582–600.
47. Cooper ML, Peirce RS, Huselid RF. Substance use and sexual risk taking among black and white adolescents. *Health Psychol.* 1994; 13: 251–62.
48. Kim S, De La Rosa M, Trepka MJ, Kelley M. Condom use among unmarried students in a Hispanic-serving university. *AIDS Educ Prev.* 2007; 19(5): 448–61.
49. Patrick ME, Maggs JL, Lefkowitz ES. Daily associations between drinking and sex among college students: a longitudinal measurement burst design. *J Res Adolesc.* 2015; 25(2): 377–86.
50. Patrick ME. Daily associations of alcohol use with sexual behaviour and condom use during spring break. *Drug Alcohol Rev.* 2013; 32(2): 215–7.
51. Fielder RL, Walsh JL, Carey KB, Carey MP. Predictors of sexual hookups: a theory-based, prospective study of first-year college women. *Arch Sex Behav.* 2013; 42(8): 1425–41.
52. Fielder RL, Carey MP. Prevalence and characteristics of sexual hookups among first-semester female college students. *J Sex Marital Ther.* 2010; 36(4): 346–59.
53. Clutterbuck DJ, Gorman D, McMillan A, Lewis R, Macintyre CCA. Substance use and unsafe sex amongst homosexual men in Edinburgh. *AIDS Care.* 2001; 13(4): 527–35.
54. Testa M, Collins RL. Alcohol and risky sexual behavior: event-based analyses among a sample of high-risk women. *Psychol Addict Behav.* 1997; 11(3): 190.
55. Garcia JR, Reiber C, Massey SG, Merriwether AM. Sexual hookup culture: a review. *Rev Gen Psychol.* 2012; 16(2): 161.
56. Kiene SM, Barta WD, Tennen H, Armel S. Alcohol, helping young adults to have unprotected sex with casual partners: findings from a daily diary study of alcohol use and sexual behavior. *J Adolesc Health.* 2009; 44(1): 73–80.
57. Brown JL, Venable PA. Alcohol use, partner type, and risky sexual behavior among college students: findings from an event-level study. *Addict Behav.* 2007; 32(12): 2940–52.
58. Venable PA, McKirnan DJ, Buchbinder SP, et al. Alcohol use and high-risk sexual behavior among men who have sex with men: the effects of consumption level and partner type. *Health Psychol.* 2004; 23(5): 525–32.
59. Farley T, Olson C, Frazer MS, Kerker B. Alcohol use and risky sex in New York City. *NYC Vital Signs.* 2008; 7: 1–4.
60. Raj A, Reed E, Santana MC, et al. The associations of binge alcohol use with HIV/STI risk and diagnosis among heterosexual African American men. *Drug Alcohol Depend.* 2009; 101: 101–6.
61. Vosburgh H, Mansergh G, Sullivan P, Purcell D. A review of the literature on event-level substance use and sexual risk behavior among men who have sex with men. *AIDS Behav.* 2012; 16(6): 1–17.
62. King KM, Nguyen H, Kosterman R, Bailey JA, Hawkins JD. Co-occurrence of sexual risk behaviors and substance use across emerging adulthood: evidence for state- and trait-level associations. *Addiction.* 2012; 107(7): 1288–96.
63. Parsons JT, Grov C, Kelly BC. Comparing the effectiveness of two forms of time-space sampling to identify club drug-using young adults. *J Drug Issues.* 2008; 38(4): 1061–81.
64. Stueve A, O'Donnell L, Duran R, San Doval A, Blome J. Time-space sampling in minority communities: results with young Latino men who have sex with men. *Am J Public Health.* 2001; 91(6): 922–6.
65. Sobell LC, Sobell MB. Timeline follow-back: a technique for assessing self-reported alcohol consumption. *Meas Alcohol Consum Psychosoc Biochem Methods.* 1992; 17: 41–72.
66. Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption—II. *Addiction.* 1993; 88(6): 791–804.

67. French DJ, Sargent-Cox KA, Kim S, Anstey KJ. Gender differences in alcohol consumption among middle-aged and older adults in Australia, the United States and Korea. *Aus N Z J Public Health*. 2014; 38(4): 332–9.
68. Petersen JL, Hyde JS. A meta-analytic review of research on gender differences in sexuality, 1993–2007. *Psychol Bull*. 2010; 136(1): 21–38.
69. Byrnes JP, Miller DC, Schafer WD. Gender differences in risk taking: a meta-analysis. *Psychol Bull*. 1999; 125(3): 367–83.
70. Griffin JA, Umstattd MR, Usdan SL. Alcohol use and high-risk sexual behavior among collegiate women: a review of research on alcohol myopia theory. *J Am Coll Health*. 2010; 58(6): 523–32.
71. Steele CM, Josephs RA. Alcohol myopia. Its prized and dangerous effects. *Am Psychol*. 1990; 45(8): 921–33.
72. Kann L, Kinchen S, Shanklin SL, et al. Youth risk behavior surveillance—United States, 2013. *Morb Mortal Wkly Rep*. 2014; 63: 17–29.
73. Andrasik MP, Otto JM, Nguyen HV, et al. The potential of alcohol “heat-of-the-moment” scenarios in HIV prevention: a qualitative study exploring intervention implications. *Arch Sex Behav*. 2013; 42(8): 1487–99.
74. Lindgren KP, Pantalone DW, Lewis MA, George WH. College students’ perceptions about alcohol and consensual sexual behavior: alcohol leads to sex. *J Drug Educ*. 2009; 39(1): 1–21.
75. Leigh BC, Morrison DM, Hoppe MJ, Beadnell B, Gillmore MR. Retrospective assessment of the association between drinking and condom use. *J Stud Alcohol Drugs*. 2008; 69: 773–6.
76. The New York City Department of Health and Mental Hygiene Bureau of Sexually Transmitted Disease Control. 4th quarter 2013 quarterly report. New York, NY; 2013.
77. Gilman SE, Breslau J, Conron KJ, Koenen KC, Subramanian SV, Zaslavsky AM. Education and race-ethnicity differences in the lifetime risk of alcohol dependence. *J Epidemiol Community Health*. 2008; 62(3): 224–30.
78. Hines AM, Caetano R. Alcohol and AIDS-related sexual behavior among Hispanics: acculturation and gender differences. *AIDS Educ Prev*. 1998; 10(6): 533–47.