



Using a Daily Diary Approach to Examine Substance Use and Negative Sexual Experiences Among College Students

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Abstract

This article examined substance use and sexual behavior by conducting an analysis of college students' reported behaviors using a daily diary approach. By isolating particular sexual events across a 2-month period, we examined situational predictors of engagement in sex and of negative sexual experiences (coerced sex and/or sex that lacks perceived control) for college men and women. Data come from the daily diary sub-study of the Sexual Health Initiative to Foster Transformation. These data include 60 days of daily responses from 420 undergraduates at one New York City institution. This was a relatively diverse sample comprised of 49% women, 28% identifying as non-heterosexual, 60% non-white, and a roughly equal number of college freshman, sophomores, juniors, and seniors. Analyses examined the effects of alcohol use, binge drinking, marijuana use, and other drug use on sexual experiences. Between-person and within-person substance uses were related to an increased likelihood of having at least one sexual encounter during the study period. After adjusting for each participants' average substance use, both the number of alcoholic drinks consumed (AOR 1.13 (1.05–1.21)) and binge drinking scores (AOR 2.04 (1.10–3.79)) increased the likelihood of negative sex. Interaction analyses showed that compared to men, women were more likely to use alcohol and marijuana prior to sexual encounters. Given that sex and substance use are co-occurring, current prevention approaches should be paired with strategies that attempt to prevent negative sexual experiences, including sexual assault, more directly. These include consent education, bystander training, augmentation of sexual refusal skills, and structural change. Efforts promoting increased sex positivity might also help make all students, and women in particular, less likely to use substances in order to facilitate sex.

Keywords Event-level analysis · College students · Sexual behavior · Alcohol use · Drug use

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Introduction

In this study, we examine college sexual behaviors using a 2-month daily diary study. We seek to understand how substance use and sexual behavior co-occur for college students to provide insights into the predecessors of sexual assault and to inform preventative interventions. Specifically, we examine frequency of alcohol, other substance use, engagement in sex, and reports of “negative sex,” which we define as sex that is coerced and/or that lacks perceived control. We developed this category in consultation with experts in the field and a review of the literature showing that sexual assault (forced sex, attempted forced sex, or incapacitated sex) and negative sex (sex that is coerced and/or that lacks perceived control) are both part of a spectrum of negative sexual experiences (Adams-Curtis & Forbes, 2004; Cantor et al., 2015; Dijulio, Norton, Craighill, & Brodie, 2015; Flack

et al., 2007; Gentzler & Kerns, 2004; Kavanaugh, 2015). Experiences of negative sex are associated with adverse psychological, physical, and sexual health effects (de Visser, Rissel, Richters, & Smith, 2007; Katz, Moore, & Tkachuk, 2007; Woerner et al., 2019); these experiences make it more likely that a student will also experience sexual assault (Flack, 2008; Franz, DiLillo, & Gervais, 2016; Van Bruggen, Runtz, & Kadlec, 2006).¹

While sex and substance use are intimately intertwined in many intimate dating/sexual contexts, this is particularly true of undergraduate campuses where alcohol and drug use are prevalent and where many students are experimenting with sex for the first time without parental/adult supervision (Armstrong, Hamilton, & Sweeney, 2006; Heldman & Wade, 2010; Hirsch et al., 2019; Wade, 2017). Qualitative work finds that students view drinking as a “fun” form of leisure—one that is expected and encouraged as part of campus social life (Hirsch et al., 2019; Patrick & Maggs, 2009; Wade, 2017; Wamboldt et al., 2017). While intoxication may help students de-stress, it may also help them manage shame and social awkwardness during sexual encounters with another person, who is sometimes someone they do not know well (Flack, 2008; Ford, 2017; Hirsch et al., 2018). Although drinking prior to sex does not always lead to sexual assault, it may contribute to negative sex and other risky sexual behaviors (e.g., less communication, unprotected sex, sex with poorly known partners), which are associated with sexual assault (Franz et al., 2016; Kettrey & Marx, 2019; Turchik & Hassija, 2014; Van Bruggen et al., 2006).

To date, less research has focused on the relationship between drug use (i.e., marijuana, stimulants, depressants, etc.) and sex (Shorey, Moore, McNulty, & Stuart, 2016; Skalski, Gunn, Caswell, Maisto, & Metrik, 2017). It seems likely that if students tend to use alcohol to facilitate social and sexual interactions, they may use drugs in a similar way (Bellis et al., 2008; Hirsch et al., 2018; Lawyer, Resnick, Bakanic, Burkett, & Kilpatrick, 2010). For example, students may use drugs to get comfortable enough to have sex or to let their guards down in social settings, which leads to sex (Kiene, Barta, Tennen, & Armeli, 2009).

Sexual victimization (and, although not the focus here, perpetration of sexual assault) may be an adverse consequence of combining substance use and sexual relations. Alcohol use is frequently involved in unwanted sexual incidents among both college students and their non-college attending peers (Rennison & Addington, 2014). Studies show that 50–75%

of unwanted sexual incidents on campuses involve alcohol consumption by the victim, perpetrator, or both (Abbey, Wegner, Woerner, Pegram, & Pierce, 2014; Dijulio et al., 2015). Students who regularly drink or use drugs are at higher risk of both sexual assault and negative sex (Abbey et al., 2014; Bellis et al., 2008; Kerr, Washburn, Morris, Lewis, & Tiberio, 2015). For instance, in one cross-sectional survey, Mohler-Kuo, Dowdall, Koss, and Wechsler (2004) found that heavy episodic drinking was the single strongest predictor of a woman having ever experienced sexual assault during college using cross-sectional data.

Studies of men’s alcohol use show similar results; however, these studies tend to position men in the role of perpetrators. For example, surveys show college men who frequently drink heavily are more likely than other men to report sexual assault perpetration (Abbey et al., 2014). Few studies, however, have examined whether men’s drinking is also associated with their own victimization. Data show that while men report much lower rates of sexual assault compared to women, in some studies, as many as 1 in 8 men do report sexual assault experiences since coming to college (Fedina, Holmes, & Backes, 2018; Ford & Soto-Marquez, 2016; Mellins et al., 2017). By also including men in these analyses, we seek to expand our understanding of the relationship between substance use and men’s experiences of positive and negative sex.

In terms of why alcohol use heightens risk, scholarly work posits that this happens through several mechanisms. First, drinking, even moderately (1–3 drinks), has been shown to heighten miscommunication because it lowers individuals’ capacity to interpret complex information (Abbey et al., 2014; Ridgeway, 1993; Schwalbe et al., 2000). Second, alcohol can make it harder to resist coercion (Abbey et al., 2014; Ullman, 2007). Third, given the enduring presence of gender-based double standards, research shows some men are more likely to sexually coerce women who are intoxicated because they see these women as less deserving of sexual respect (Ford, 2017; Ray & Rosow, 2010). While there is evidence that these sexist stereotypes are shifting, there is also evidence of their endurance (Armstrong, England, & Fogarty, 2012; Khan, Hirsch, Wamboldt, & Mellins, 2018; Krahé, 2016). Of note, research shows substance use also heightens risk through similar mechanisms (Bellis et al., 2008; Lawyer et al., 2010; Shorey et al., 2016; Skalski et al., 2017).

In recent years, experience sampling methods, such as daily electronic questionnaires, have been increasingly used to examine the relationships among alcohol, other substance use, and sex. A handful of these existing diary studies show, for instance, that the daily level of intoxication is positively associated with the likelihood of sex with a poorly known partner (Howells & Orcutt, 2014). Scaglione et al. (2014) found an important within-person association, whereby each additional drink consumed above one’s “average” alcohol consumption resulted in a 13% increase in the likelihood of reporting regretted sex,

¹ Studies estimate that over 55% of college women will report negative sex—including either oral, vaginal, or anal intercourse that is coerced, out of control, or unwanted—by the end of college (Armstrong & Budnick, 2015; Dijulio et al., 2015; Flack et al., 2007; Sprecher, Hatfield, Cortese, Potapova, & Levitskaya, 1994).

unprotected sex, or unwanted sexual attention. Likewise, Wilhite, Mallard, and Fromme (2018) found that increases in daily estimated blood alcohol concentration (eBAC) were associated with a greater likelihood of being a victim of sexual coercion.

To date, existing event-level analyses of substance use and negative sex have tended to examine only whether a student drank alcohol (yes or no) before an unwanted sexual event, rather than the number of drinks consumed or other drugs used (Neal & Carey, 2007; Patrick & Maggs, 2009; Scaglione et al., 2014). Research shows that although imperfect, respondents do tend to recall the number of drinks that they consumed with a fair amount of accuracy (Northcote & Livingston, 2011). If anything, people are more likely to underreport the number of drinks which would result in bias toward the null.

By accounting for a person's typical engagement with both substance use and sex, we attempt to deal more directly with the issue of selection which often creates bias in studies (Kiene et al., 2009; Shorey et al., 2016). It is possible that students who drink or use drugs more often are also more likely to select into engagement in sex and negative sex. These students could be greater sensation seekers in general, and such a propensity could lead to taking risks during sexual encounters or an unobserved variable could make a person both more likely to drink/use drugs and also be more vulnerable to negative sex. Because this selection issue is important for making claims about the effect of substance use, we use an approach that accounts for both within-person and between-person effects. In this way, our study expands the literature on substance use, sex, and negative sex in college by using daily diary data to account for both a person's tendency to use substances and their tendency to engage in sex over time.

Given current attention to sexual victimization and substance use during college, we examine sexual events across a 2-month period to determine how between- and within-person level changes in alcohol consumption, marijuana use, and general drug use affect the likelihood of engagement in sex and experiences of negative sex. Rather than measuring sexual assault, which is frequently studied, we examine these less severe types of experiences as predecessors to sexual assault and indicators of broader gender inequality in relation to sexual behavior (Armstrong et al., 2012; Hamilton & Armstrong, 2009). In this study, we were able to measure the net associations of alcohol and drug use on the risk of engagement in sex and negative sex. Interaction analyses explore gender differences in effects. But it is possible that other unobserved factors explain these associations, making it difficult for us to make causal claims about alcohol or drugs in this population. It is our hope, however, that by isolating specific sexual events and examining the features of those particular events, this article advances existing research on the combining of sex and drugs in college settings.

Method

Participants

The research presented here was part of the Sexual Health Initiative to Foster Transformation (SHIFT) (Hirsch & Khan, 2020; Hirsch et al., 2018; Mellins et al., 2017), a large, mixed-methods study of sexual assault and sexual health among undergraduates at Columbia University and Barnard College. SHIFT's research included a random-sample survey, 16 months of ethnographic research, and the quantitative diary study described here. An Undergraduate Advisory Board comprised of students at Columbia and Barnard, as well as an institutional advisory board of administrators and faculty, provided input on the study design and implementation (for details, see Hirsch et al., 2018). To recruit for the daily diary sub-study, which included only Columbia University students, the SHIFT research team sent an email about the diary study to all undergraduates in the fall of 2015 ($n=8159$), asking interested students to complete a brief screener survey.² A total of 1152 (14.1%) completed the screener. Of those, a sample of 506 participants—stratified by gender and international status—were randomly selected to participate in the study. A total of 427 (84.4%) provided written (online) consent and agreed to participate. Of note, there were no major demographic differences between the larger fall undergraduate class and the subset who completed the screener or enrolled in the study.

Table 1 shows the mean characteristics of all respondents included in the sample. This was a relatively diverse sample comprised of 49% women,³ 28% identifying as non-heterosexual, 60% non-white, and 30% foreign-born students. Our sample included a roughly equal number of college freshman, sophomores, juniors, and seniors. The majority of students were aged 18–23; the mean age and standard deviation (SD) of the participants ($n=420$) were 21.1 years (4.3). Most students were not in a relationship at baseline (67.4%).⁴

Procedure

Upon enrolling, participants completed a baseline electronic structured survey and then began a 60-day daily survey (5–10 min in duration). The baseline survey was used to

² At the time when these data were collected, only Columbia had signed on for this portion of the larger SHIFT study. Barnard had other concurrent projects going on and did not want to have competing studies happening at once. Therefore, the daily diary data were only collected at Columbia.

³ This includes 4.8% gender-non-conforming and 45.7% male identifying students.

⁴ Of note, we considered controlling for relationship status in all logistic regression models; however, this item was only asked at baseline. Our daily questionnaires did not have accurate measures of how relationship status was changing across time. Therefore, we opted not to include it in models.

Table 1 Characteristics of the study sample

	<i>N</i>	%
<i>Age group (in years)</i>		
17–20	251	59.8
21–23	116	27.6
24+	53	12.6
<i>Gender identity</i>		
Female	208	49.5
Male	192	45.7
Other (Transgender, gender non-conforming)	20	4.8
<i>Sexual identity</i>		
Bisexual	47	11.2
Heterosexual	301	71.7
Homosexual	27	6.4
Pansexual/queer/other	45	10.7
<i>Race/ethnicity</i>		
Hispanic	75	17.9
Black	35	8.3
White	169	40.2
Asian or Indian	104	24.8
Other	37	8.8
<i>Born in the U.S.</i>		
No	124	29.5
Yes	296	70.5
<i>International student</i>		
No	327	77.9
Yes	93	22.1
<i>Year in school</i>		
First year	91	21.7
Second year	111	26.4
Third year	118	28.1
Fourth year	86	20.5
Fifth or more year (undergraduate only)	14	3.3
<i>Baseline relationship status</i>		
Not in a relationship	283	67.4
In a relationship	137	32.6

assess demographics and person-level constructs, while the diary was used to assess situational, time-variant constructs. The baseline and daily diary surveys were administered via a secure Web-based platform that participants could access using a smartphone, tablet, or computer. We employed a compensation plan that utilized variable reinforcement (i.e., a daily, weekly, and monthly lotteries; escalating incentives) and loss avoidance tactics (i.e., small penalties for non-completion of daily surveys). Participants were eligible to earn approximately \$150 in total for full completion of the diary (not including lotteries). The total number of days of diary data collected for each student ranged from 1 to 59 days, with an average of 42 diary days. Over 80% of the sample provided data on 30 days or more.

The current analysis employed demographic information from the baseline survey. Other key measures come from the daily diary assessment. This assessment obtained information on alcohol and drug use, affect/mood, daily positive and negative experiences (including stress, support, and gender-based stress), and sexual behavior. At the end of each day, participants were asked brief questions assessing their current mood, experiences of stress and support, sleeping behaviors, substance use, and sexual behaviors. This article focuses on measures of substance use and sexual behavior.

Substance Use

Each day, participants were prompted to consider their use of alcohol and drugs in the last 24 h. They were asked, “How many alcoholic drinks have you had in the last 24 h?” We created a dichotomous dummy variable to assess binge drinking, defined as having had 4 or more drinks (women) or 5 or more drinks (men), based on previous research (Wechsler & Nelson, 2001). Participants were also asked about drug use (including marijuana, pharmaceutical stimulants and sedatives, prescription painkillers, and other drugs) in the last 24 h. We created dichotomous dummy variables to assess any drug use that day and any marijuana use that day.

Sexual Behavior

Each day participants were asked “Have you had oral, vaginal, or anal sex since your last diary entry/in the last 24 h?” If they had not had sex, they were asked a series of questions about daily health behaviors, social activities, and media consumption. On days that participants reported engaging in sexual behavior, they were asked brief but detailed questions regarding the characteristics of their sexual encounter. Students were asked, “Did you feel as in control as you wanted to be during the sexual encounter?” (Yes/No) and “Were you forced or coerced into any of the sexual activities that took place with partner?” (Yes/No). We found that the percent of students who experienced sexual coercion was too small to have sufficient power to examine on its own and/or protect students’ privacy. Moreover, there was a great deal of overlap between the two terms; 86% (24 out of 28 coerced events) were also described as having less perceived control, and 16% (24 out of 151) events with less perceived control were also described as coerced. Thus, while we see these two terms (coerced vs. less in control) as different, we made an executive decision to combine them due to their substantial overlap and based on existing literature showing their link to sexual assault (Howells & Orcutt, 2014; Turchik & Hassija, 2014).⁵ For the current

⁵ We also tried running all models as 1 multinomial logistic model (coerced, less in control, vs. not negative sex), but two biostatisticians on this paper found that this led to convergence problems. Thus, we opted to instead run logistic regressions.

study, we created dichotomous variables to assess any sexual encounter occurring on the assessment day and a negative sexual encounter (defined as a sexual encounter that was coerced and/or in which the participant did not feel as in control as they wanted to be).

Data Analyses

Basic descriptive statistics were used to examine the frequency of alcohol use, drug use, sex, and negative sex. Multilevel logistic regression models of daily level data were used to estimate and test between- and within-person effects for the relationship between alcohol and drug use and sex. To control for non-time varying individual characteristics, a random individual-level intercept was included in the model to account for repeated measures. The non-time varying individual characteristics controlled for in the analyses were: gender (man, woman, gender non-conforming), year in school (1, 2, 3, 4+), race/ethnicity (Hispanic, White, Black, Asian or Indian, Other), and sexual identity (heterosexual, homosexual, bisexual, pansexual/queer/other).

Separate models were developed for each outcome (i.e., any sex for the full sample and negative sex among the subset of sexually active individuals). Predictors included between-person means or percentages of substance use (e.g., mean number of drinks across assessment period or percent of days using drugs), and within-person substance use (e.g., number of drinks, binge drinking, any marijuana use, and any drug use). To examine whether gender moderated the effect of substance use on sexual encounters, each model was re-analyzed including the interaction of gender by substance use predictor (alcohol number of drinks, alcohol bingeing, any drug use, or marijuana use). All analyses were conducted using SAS 9.4 with multilevel logistic regression done in Proc Glimmix.

Results

Table 2 shows mean alcohol use, drug use, and engagement in sex during 60 days of observations. More than three-quarters (78.8%, 331/420) of participants reported having at least one drink during the assessment period (Table 2). For students who drank at least once, the total number of drinking days ranged from 1 to 52, with an average of 11 days. On a given drinking day, students consumed an average of 3 drinks. The total number of drinks consumed during the 60-day study period ranged from 1 to 323, with an average of 38 drinks. Among students who drank, binge drinking days ranged from 0 to 39, with an average of 2 days.

For students who binge drank at least once during the 60-day period (45.5%, 191/420), patterns indicated higher levels of alcohol consumption for this group overall. That is, among students who reported binge drinking at least one

time, the total number of drinking days ranged from 1 to 52, with an average of 14 days. On a given drinking day, binge drinkers consumed an average of 4 drinks. The total number of drinks consumed ranged from 6 to 323, with an average of 56 drinks. Binge drinking days ranged from 1 to 39, with an average of 4 days.

Table 2 also provides information on drug use; marijuana use was the most commonly used drug. Almost half (48.8%, $n = 205$) of the sample reported using drugs at least once during the assessment period, while 36.7% ($n = 154$) of participants reported using marijuana at least once during the assessment period. A minority of participants reported use of other drugs during the assessment period. Approximately, 12 percent ($n = 51$) reported using stimulants, 6.9% ($n = 29$) reported using sedatives, and 6.4% ($n = 27$) reported using painkillers. In drug users, the total number of within-person drug using days ranged from 1 to 57 days, with an average of 10 days. For marijuana use among those who used any drugs, the within-person total occasions of marijuana use ranged from 0 to 227, with an average of 12 uses over the 60-day study period. For all other drugs, the average and median number of uses over the 60-day period were between zero and one, indicating less frequent overall use of drugs other than marijuana.

Sexual Behavior

Approximately, half ($n = 213$) of participants reported having at least one sexual encounter during the assessment period. For students who had sex at least once, the total number of sexual encounter days ranged from 1 to 39, with a median of 5 days. One-third (33.3%) of sexually active participants reported at least one negative sexual encounter. Among students who reported having sex at least once during the 60-day period, the total number of negative sexual days ranged from 0 to 8, with a median of 0 days.

Within- and Between-Person Associations Between Substance Use and Sex

Table 3 provides the results from models examining between-person and within-person effects of substance use on sexual encounters. Findings suggest that alcohol and drug use both increased the likelihood of having sex at the within-person level above and beyond between-person differences. As the number of drinks consumed increased by one from the participant's average number of drinks in the study, the odds of having sex on that same day significantly increased by a factor of 1.23 (95% CI 1.2–1.3) and if the participant binge drank on that day, the odds of having sex increased by a factor of 3.73 (95% CI 2.8–5.0). Likewise, if a participant used substances on that day, their odds of having sex increased by

Table 2 Alcohol use, drug use, and sexual encounters during 60 days of observations

Within-student characteristic	Average (SD)	Median	Interquartile range
<i>Alcohol use among drinkers^a (n = 331/420)</i>			
Number of drinking days	11 (8.95)	9	(1–52)
Number of drinks consumed in a given drinking day	3 (1.79)	3	(1–13)
Number of drinks consumed over 60 days	38 (41.26)	27	(1–323)
Number of binge drinking days	2 (4.04)	1	(0–39)
<i>Alcohol use among binge drinkers^b (n = 191/420)</i>			
Number of drinking days	14 (9.19)	13	(1–52)
Number of drinks consumed in a given drinking day	4 (1.75)	4	(2–13)
Number of drinks consumed over 60 days	56 (45.10)	44	(6–323)
Number of binge drinking days	4 (4.51)	3	(1–39)
<i>Drug Use among Drug Users^c (n = 205/420)</i>			
Number of drug use days	10 (13.21)	4	(1–57)
Number of times marijuana used over 60 days	12 (28.17)	3	(0–227)
Number of times stimulants used over 60 days	3 (11.72)	0	(0–106)
Number of times sedatives used over 60 days	1 (4.35)	0	(0–53)
Number of times painkillers used over 60 days	1 (4.33)	0	(0–52)
Number of times cocaine used over 60 days	0 (0.77)	0	(0–9)
Number of times MDMA used over 60 days	0 (0.39)	0	(0–4)
Number of times hallucinogens used over 60 days	0 (0.52)	0	(0–5)
Number of times inhalants used over 60 days	0 (0.26)	0	(0–2)
Number of times meth/crystal used over 60 days	0 (0.10)	0	(0–1)
Number of times other drug used over 60 days	1 (4.03)	0	(0–52)
<i>Sex among sexually active students^d (n = 213/420)</i>			
Number of sexual encounter days	8 (7.71)	5	(1–39)
Number of negative sexual encounter days	1 (1.44)	0	(0–8)

^aDrinkers are identified as those students who reported drinking alcohol on at least 1 day during the 60 days of diary observations

^bBinge drinkers are identified as those students who reported binge drinking alcohol (4 or more drinks (women) or 5 or more drinks (men)) on at least 1 day during the 60 days of diary observations

^cDrug users are identified as those students who reported using drugs on at least 1 day during the 60 days of diary observations

^dSexually active students are identified as those students who reported having a sexual encounter on at least 1 day during the 60 days of diary observations

a factor of 1.75 (95% CI 1.35–2.27) for any drug use and 1.96 (95% CI 1.47–2.63) for marijuana use.

Focusing on sexually active students, alcohol use and binge drinking were associated with increased risk of a negative sexual encounter on the same day (AOR = 1.13 (95% CI 1.1–1.2)) for any drinking and (AOR = 2.0 (95% CI 1.1–3.8)) for binge drinking. These findings align with existing literature showing that binge drinking greatly increases the risk of negative sex (Loeb, Gaines, Wyatt, Zhang, & Liu, 2011; Moorer, Madson, Mohn, & Nicholson, 2013; Wilhite et al., 2018). Drug use was not significantly associated with the risk of negative sex.

The relationships between substance use and having a sexual encounter were stronger for women compared to men (Table 4). Specifically, we found that gender was a significant moderator for same day number of drinks ($p < .01$) and for same day marijuana use ($p < .05$) and engagement in sex. For women, the odds of having sex increased by 1.3

with each 1-unit increase in average daily drinks (95% CI 1.2–1.4), compared to 1.2 in males (95% CI 1.1–1.2). While significant, we should note that this is a small difference. Additionally, compared to days when marijuana was not used, when marijuana was used on the same day, the odds of having sex increased by 2.9 for women (95% CI 2.0–4.3) compared to 1.5 for men (95% CI 1.0–2.6). No significant interactions were found between gender and binge drinking or any drug use nor were gender interactions significant in models predicting negative sex.

Discussion

Alcohol is understood to be predictive of subsequent sexual assault and other negative sexual experiences in college. However, due to a lack of data, we have not had a full

Table 3 Multilevel logistic regression results: Between-person and within-person effects on alcohol and drug use on sexual encounters, adjusted for non-time varying individual characteristics

Substance use	Level	Had sex (Y/N)		Had negative sex (Y/N)	
		All participants (<i>N</i> = 420)		Sexually active participants (<i>N</i> = 213)	
		AOR	95% CI	AOR	95% CI
Alcohol # drinks	Between-person	1.47**	(1.16–1.86)	1.14	(0.85–1.54)
	Within-person	1.23***	(1.19–1.27)	1.13**	(1.05–1.21)
Alcohol bingeing	Between-person	4.33	(0.49–38.42)	2.35	(0.12–46.72)
	Within-person	3.73***	(2.82–4.95)	2.04*	(1.10–3.79)
Any drug use	Between-person	2.11	(0.88–5.06)	1.30	(0.34–4.96)
	Within-person	1.75***	(1.35–2.27)	1.17	(0.61–2.25)
Marijuana use	Between-person	4.38*	(1.50–12.78)	1.06	(0.23–4.89)
	Within-person	1.96***	(1.47–2.63)	1.12	(0.56–2.28)

Effects for drug use (other than marijuana) were not significant and are not shown

Non-time varying individual characteristics controlled for include: gender, year in school, race/ethnicity, and sexual identity

AOR, adjusted odds ratio; CI, confidence interval

* $p < .05$; ** $p < .005$; *** $p < .001$

Table 4 Interaction effects of substance use with gender on engagement in sex

Model	Effect	<i>F</i> value	AOR	95% CI
Alcohol # drinks	Gender*same day drinks	5.54**		
	Men		1.17	(1.12–1.22)
	Women		1.30	(1.24–1.37)
Alcohol bingeing		1.33 ^a		
Any drug use		1.44 ^a		
Marijuana use	Gender*same day marijuana use	3.28**		
	Men		1.45	(0.98–2.61)
	Women		2.91	(1.95–4.33)

AOR, adjusted odds ratio; CI, confidence interval

* $p < .05$; ** $p < .005$; *** $p < .0001$

^aEffects are not disaggregated by gender for the non-significant interactions

understanding of precisely what levels of alcohol consumption and which other drugs are related to not only negative sex, but also to engagement in sex more generally. By isolating particular sexual events across a 2-month period, we show that while drugs and alcohol use are both predictive of engagement in sex, it is only alcohol consumption and binge drinking that increase the risk of negative sex, after controlling for non-time varying individual characteristics.

Our findings show that sex and drug use are common occurrences on this campus as they are on a majority of campuses across the U.S. (Abbey et al., 2014; Cantor et al., 2015; Ford & Soto-Marquez, 2016). Over half the sample reported using

alcohol, marijuana, or having sex at least once during the study period. While binge drinking is never healthy, it seems important to acknowledge that respondents who drank reported a median of 1 day of binge drinking over the 2-month assessment period and an average of 3 drinks during any given drinking day. This finding could suggest that binge drinking is not as rampant as some fear (Abbey et al., 2014; Mitka, 2009), at least on this campus. Alternatively, the finding could also signify an underreporting of binge/heavy drinking (Northcote & Livingston, 2011).

Importantly, our results do suggest that students may be using drugs or alcohol to get comfortable enough to have sex. After accounting for individual levels of use, we observed associations between each substance use type (i.e., alcohol use, binge drinking, marijuana use, and other drug use) and engagement in sex. This suggests that when participants drink or engage in drug use on a given day more than they usually do, they are more likely to have sex on that same day. Strikingly, when looking at negative sex as an outcome, it is solely within-person alcohol use—measured as number of drinks that day and binge drinking that day—that was associated with negative sex. Other within-person and between-person effects of our predictors on negative sex were not statistically significant.

These findings are in line with existing event-level literature. For instance, in a study of nearly 7500 sexual events, Cooper, O’Hara, and Martins (2016) showed that while many individuals drink with the goal of sexual disinhibition, sexual experiences were “less positive” after drinking. Other research documented above has consistently found a link between heavy alcohol use and poor sexual outcomes, including sexual coercion, sexual risk-taking, and unprotected sex (Kahler et al., 2015; Kerr et al., 2015; Kiene et al.,

2009; Neal & Carey, 2007; Patrick & Maggs, 2009; Scaglione et al., 2014). Importantly, people who consume alcohol for the explicit motive of engaging in sex may be more likely to engage in risky sexual behaviors (Kahler et al., 2015), which may have relevance for this sample. That is, alcohol use impairs decision making and risk assessment, leading students to either partners or situations where negative sex is more likely (Abbey et al., 2014; Ford, 2017; Mohler-Kuo et al., 2004).

We should note, however, that it is not our intention to suggest that combining alcohol and sex is always a bad thing. While alcohol can dull sexual experiences and blur lines of consent, it is also possible that some students drink and have sex because they enjoy both (Kahler et al., 2015; Patrick & Maggs, 2009; Wade, 2017; Wamboldt et al., 2017). These findings point to the importance (and difficulty) of differentiating normative alcohol use from unhealthy alcohol use. That is, we find evidence that alcohol increases the likelihood of sex and negative sex. Yet it is not always clear when these lines are crossed. This area should be a focus of future research.

Little research to date has examined the effect of marijuana use on negative sex. We did identify one study showing no link between marijuana use and risk for engaging in sexual risk behaviors (Skalski et al., 2017). Importantly, the findings here suggest that marijuana use did not elevate the risk of a negative sexual experience nor did use of other drugs. We posit that for these other non-marijuana drugs, this may be because people are prescribed these drugs and are using them as directed.

In our sample, the relationships between drinking and marijuana use and having a sexual encounter were stronger for women compared to men. These findings mirror those documented by Kiene et al. (2009) where heavy drinking increased the likelihood of engagement in sex for women more than it did men. Research on college campuses consistently documents the presence of an enduring sexual double standard where women are judged more harshly than men for sexual behavior (Allison & Risman, 2013; Armstrong et al., 2006; Heldman & Wade, 2010; Owen, Rhoades, Stanley, & Fincham, 2010). Hence, one interpretation of our data is that due to this sexual double standard, women may be more inclined to use substances in order to have sex. Alternatively, studies also find that college men describe pressure to behave in masculine ways—to take advantage of all sexual opportunities and to perform successfully during sex (Ford, 2017; Khan et al., 2018; Kimmel, 2010). Men also fear being accused of sexual assault (Hirsch et al., 2018; Hirsch & Khan, 2020). Therefore, men may be less likely than women to use substances before sex for fear of missing a sexual opportunity, being unable to maintain an erection, or being too intoxicated to gauge consent.

Several limitations should be considered when interpreting the findings. Perhaps most important is their generalizability. Our study examined the experiences of undergraduates at one

urban university. While our sample did include many forms of diversity, there were significant limitations to generalizing our findings to different populations and contexts. Another limitation is that “alcoholic drinks” was not defined (e.g., 1 drink = 1 standard drink) for participants in this study. It is well known that heavy drinking impairs judgment, and therefore perhaps unsurprising that respondents reported less control during sexual encounters on days when they binge drank. When students reported that they did not feel as in control as they wanted to be, we did not gather information on why this was the case. Therefore, despite our intention to focus on non-sexual assault experiences, given these limitations in measures, it is possible that some experiences that may be considered sexual assault (incapacitation) were instead categorized as negative sex (depending on the specifics of the encounter, which we do not know). The analyses we conducted did not allow us to disentangle the exact temporal sequencing of substance use or sex within a given day, nor the motivations people have when they engage in substance use and sex on the same days. In other words, it is not possible to ascertain whether students in our sample drank or used drugs because they wanted to have sex, or whether they engaged in substance use as a result of sex. Future research, including qualitative work, would benefit from increased attention to the motivations behind students’ coupling of substances and sex. Likewise, a similar daily diary study with follow-up questions about the temporal ordering of sex and substance use would also be valuable in further parsing this association.

Despite these limitations, the event-level approach employed was novel, particularly in its ability to unpack between- and within-person differences in substance use behaviors, and their ties to sex and negative sex. Moreover, these findings provide important evidence confirming research showing that drinking is associated with increases in the probability of having a negative sexual encounter. Scholarly work posits that this happens through several mechanisms: whereby drinking heightens misperception (Abbey et al., 2014; Mohler-Kuo et al., 2004), makes it more difficult to resist coercion (Abbey et al., 2014; Ullman, 2007), and can lead to stereotyping that enables sexual disrespect (Ford, 2017; Ray & Rosow, 2010; Ridgeway, 1993; Schwalbe et al., 2000). Although the findings presented here do not allow us to directly test these mechanisms, our findings do provide further evidence that drinking generally, and binge drinking especially, both increase the risk of negative sex.

Our research points to several possible points for intervention. For example, given that sex and substance use are co-occurring within the same 24-h period, campus prevention efforts may want to tailor their prevention programs to this reality. This study suggests that it is alcohol in particular that is associated with an increased risk of negative sex. Therefore, harm reduction strategies such as moderating and/or abstaining from alcohol consumption should be paired with strategies

that attempt to prevent negative sex and sexual assault directly. These include consent education, bystander training, augmentation of sexual refusal skills, and structural change (Hirsch, Khan, Wamboldt, & Mellins, 2019; Kettrey & Marx, 2019; Muehlenhard, Humphreys, Jozkowski, & Peterson, 2016). Bystander training programs, in particular, may help encourage young people to intervene when witnessing warning signs of negative sex or sexual assault (e.g., a potential perpetrator taking an intoxicated person to an isolated area). Recent meta-analytic work shows that a variety of bystander training interventions including co-ed, gender segregated, and small and large groups trainings are all equally successful in giving students new skills to intervene (Kettrey & Marx, 2019). However, not all encounters happen in the presence of others. Interventions focused on supporting students in their decisions about when, how, and with whom they want to have sexual relationships may also help to reduce negative sexual experiences and sexual assault. Other efforts promoting increased sex positivity and/or comfort during sex might make all students, and women in particular, less likely to use substances in order to facilitate sex.

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Compliance with Ethical Standards

Conflict of interest There is no conflict of interest to declare.

Ethical Approval All study procedures were approved by the Institutional Review Board at Columbia University Medical Center (IRB-AAAP0458).

Informed Consent Informed consent was obtained from participants through an electronic form describing the study, confidentiality, compensation for time and effort, data handling procedures, and the right to refuse to answer any question.

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