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## Nonmedical use of prescription drugs and related negative sexual events: Prevalence estimates and correlates in college students

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### HIGHLIGHTS

- Nonmedical use of three classes of prescription drugs was assessed in college students
- We assessed the relation between NMUPD and negative sexual events
- Anxiolytic/sedative use was positively associated with negative sexual events.

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### ABSTRACT

The present study of college students investigated (a) the prevalence of nonmedical use of three classes of prescription drugs (stimulants, anxiolytics/sedatives, analgesics), (b) the prevalence of negative sexual events (NSE) associated with any nonmedical use of prescription drugs (NMUPD), and (c) a set of correlates of NSE. The specific NSE were sexual aggression victimization and perpetration, and regretted sex. The correlates of the NSE were sex, race/ethnicity, year in school, psychological symptoms, alcohol use, illegal drug use, and NMUPD. Participants were 509 (254 females, 255 males) randomly-selected college students who reported any NMUPD. The majority (76.2%) of the sample reported ever using stimulants, 38.9% reported ever using anxiolytics/sedatives, and 40.9% reported using analgesics. During NMUPD, 14.3% of the students reported regretted sex, 7.1% of female students reported sexual victimization, and 6.3% of male students reported perpetrating sexual aggression. Multiple logistic regression analyses indicated that anxiolytic/sedative use (Adj. OR = 1.99; 95% CI = 1.51–2.62) was positively associated with regretted sex, whereas anxiolytic/sedative use (Adj. OR = 1.79; 95% CI = 1.01–3.16) and psychological symptoms (Adj. OR = 1.06; 95% CI = 1.02–1.10) were positively associated with sexual victimization. Illegal drug use was positively associated with perpetrating sexual aggression (Adj. OR = 4.10; 95% CI = 1.21–13.86). These findings suggest that among these college students, NMUPD-associated NSE were not uncommon, and primarily associated with anxiolytic/sedative use. Given the academic, physical, and psychological implications associated with NSE, research needs to further explore the causal nature of these relations.

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### 1. Introduction

National statistics indicate that 79% of college students consume alcohol (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2015), with >60% engaging in heavy drinking during their first year at school

(Hoepfner, Paskausky, Jackson, & Barnett, 2013). In addition, prevalence estimates for marijuana use and nonmedical use of prescription drugs (NMUPD) range as high as 30% (Arria et al., 2008a; Garnier-Dykstra, Caldeira, Vincent, O'Grady, & Arria, 2012; McCabe, Cranford, Teter, Rabiner, & Boyd, 2012) on individual college campuses. NMUPD is defined as the use of a scheduled medication without a legal prescription, and is an increasing public health concern, particularly among emerging and young adults. Heavy drinking, as well as drug use (i.e., marijuana, NMUPD) have been associated with a number of negative psychological (e.g., mild distress - depression; Fielder, Walsh, Carey, & Carey, 2013; Lewis, Atkins, Blayney, Dent, & Kaysen, 2013),

Abbreviations: NMUPD, nonmedical use of prescription drugs; NSE, negative sexual events.

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physical (e.g., sleep quality; Clegg-Kraynok, McBean, & Montgomery-Downs, 2011), and academic (e.g., lower GPA; Baker et al., 2016) events for college students.

The majority of college students are sexually active (68.5%; American College Health Association, 2015). A number of studies have found a positive association between alcohol and other drug use and sexual activity among college students (Kiene, Barta, Tennen, & Armeli, 2009; Logan, Koo, Kilmer, Blayney, & Lewis, 2015; Snipes & Benotsch, 2013). Given the cognitive and physiological impairing effects of alcohol and other drugs, it is likely that a number of individuals who engage in sexual activity when high or intoxicated will experience a negative sexual event (NSE), such as sexual aggression (victimization or perpetration; i.e., sexual intercourse without consent when high/intoxicated); risky sexual behavior (e.g., multiple sex partners, unprotected sex); or regretted sex. In fact, a considerable body of research supports a positive relation between alcohol intoxication and NSE (e.g., risky sex, regretted sex, sexual aggression) among college students (Abbey, 2002; Caldeira et al., 2009; Neal & Fromme, 2007; Olmstead, Roberson, Pasley, & Fincham, 2015; Orchowski, Mastroleo, & Borsari, 2012; Oswalt, Cameron, & Koob, 2005).

Further research has found a positive relation between illicit drug use and polysubstance use and NSE (i.e., risky sex, sexual aggression; Caldeira et al., 2009; Resnick, Walsh, Schumacher, Kilpatrick, & Acierno, 2013). Given the substantial prevalence estimates of NMUPD on college campuses (e.g., Arria et al., 2008a, 2008b; S.E. McCabe et al., 2012; McCabe, West, Teter, & Boyd, 2014), and the frequent polydrug use associated with NMUPD (McCabe, Cranford, Boyd, & Teter, 2007; Quintero, 2009a, 2009b), it is likely that students who engage in NMUPD also are experiencing NSE associated with their drug use. Because NMUPD-associated NSE have received little empirical attention, they are the focus of the present study. In addition, it will be important to determine the extent to which NMUPD is associated with NSE after controlling for alcohol consumption and other illicit drug use.

### 1.1. Nonmedical use of prescription drugs and negative sexual events

A substantial body of literature demonstrates the high prevalence of NSE, particularly experiences with sexual aggression, among college women (see Fisher, Daigle, & Cullen, 2010). Prevalence estimates for sexual aggression among women during their time at college have been reported between 20% and 50% (Humphrey & White, 2000; Koss, Gidycz, & Wisniewski, 1987; Parks, Hsieh, Taggart, & Bradizza, 2014). Although reported prevalence estimates of sexual aggression experienced by male college students are limited (Turchik, 2012), research on male sexual aggression indicates that self-reported prevalence estimates of perpetration range from 17%–20% (Strang, Peterson, Hill, & Heiman, 2013; Testa, Hoffman, Lucke, & Pagnan, 2015; Thompson, Koss, Kingree, Goree, & Rice, 2011). In addition to sexual aggression, college students report frequently engaging in unplanned sexual behavior when drinking or using drugs (e.g., Olmstead et al., 2015). Oswalt et al. (2005) found that 72% of sexually active students indicated that they had regretted having sex on at least one occasion in the past. Regretted sex is associated with heavy drinking, risky sexual behaviors (Orchowski et al., 2012), and has been rated as a negative alcohol-related event by 84% of college students (Mallett, Bachrach, & Turrisi, 2008). Psychological symptoms (e.g., anxiety and depression) have been positively associated with NSE (Miron & Orcutt, 2014; Schry, Maddox, & White, 2016). In addition, NSE have been associated with subsequent or secondary negative events (e.g., physical, psychological, and academic; Baker et al., 2016; Combs, Jordan, & Smith, 2014; Ulirsch et al., 2014).

Given high prevalence estimates for NSE among college students, as well as the potential for substantial secondary negative events that are associated with NSE, it is important to understand their correlates in order to develop programs to reduce NSE and associated negative events. To date, little research has explored the relation between NMUPD and NSE in general or specifically within college populations.

Using data from the 2011–2013 national Youth Risk Behavior Surveys, Clayton, Lowry, August, and Jones (2016) found that adolescents who engaged in NMUPD were more likely to report multiple types of risky sexual behavior (e.g., unprotected sex,  $\geq 4$  lifetime partners) compared to their non-using peers. In a smaller study of sexually active young adults who engaged in NMUPD, Wells, Kelly, Rendina, and Parsons (2015) found that 47.4% reported having penetrative sex under the influence of a prescription drug (i.e., stimulant, sedative, or painkiller), while 35.9% reported having unprotected sex after NMUPD. In addition, being White, younger, and a heterosexual male increased the odds of reporting unprotected anal or vaginal sex when using prescription drugs compared to when not using prescription drugs. Although this study provides evidence that NSE are associated with NMUPD among young adults, the results are not specific to college students, a population at high risk for both NSE and NMUPD.

In one of the few studies to date on college students, Benotsch, Koester, Luckman, Martin, and Cejka (2011) found that students who reported NMUPD (i.e., analgesics, anxiolytics/sedatives, and stimulants) subsequently engaged in risky sex (increased sex partners, increased unprotected sex) at proportions that were 2–3 times higher than students who did not report NMUPD. In an older study of 3642 female university students in Canada, Newton-Taylor, Dewit, and Gliksman (1998) found that students who used illicit drugs and medications prescribed for them (e.g., stimulants, sedatives, tranquilizers) were more likely to report being physically or sexually assaulted in the past year compared to students who did not use these drugs. Collectively, the few studies conducted to date suggest that the use of scheduled prescription drugs such as stimulants, sedatives and tranquilizers might be associated with NSE. However, these studies were limited in scope (e.g., conducted on one college campus) and differ substantially in methodology (e.g., drug use measurement, different outcomes – risky sex). Thus, additional studies are needed to determine the extent to which NMUPD is associated with NSE among college students.

### 1.2. Current study

The purpose of the current study was to assess prevalence estimates for three forms of NMUPD-associated NSE (regretted sex, sexual aggression victimization, and sexual aggression perpetration) among a sample of college students from two large public universities in New York State who reported any NMUPD. We further assessed the correlates of NMUPD-associated NSE, which included sex, race, year in school, psychological symptoms, illicit drug use, alcohol use, and NMUPD by drug class (stimulants, anxiolytics/sedatives, and analgesics). We hypothesize that, due to the potential for neuropsychological impairment, all three classes of prescription drugs will be positively associated with each type of NSE, even when controlling for illicit drug use, alcohol use, and the other covariates.

## 2. Methods

### 2.1. Participants

A total of 1755 college students completed a brief, confidential web survey designed to explore several issues related to NMUPD and the use of illegal drugs. The present analyses were restricted to the 509 students who (a) reported ever nonmedically using stimulants, anxiolytics/sedatives, or analgesics, and (b) provided data on all of the variables used in this study. Half of the students were male ( $n = 255$ ) and half were female ( $n = 254$ ). The average age of the students was 20.3 years ( $SD = 1.92$ , range 18–30 years). In terms of year in school, 10.8% were freshmen, 25.5% were sophomores, 26.1% were juniors, and 37.5% were seniors. The sample was racially/ethnically diverse with 68.4% White, non-Hispanic, 15.3% other/mixed race, non-Hispanic, 9.2% Hispanic and 7.1% Black, non-Hispanic.

## 2.2. Procedures

Participants were recruited from two lists of 2500 randomly-selected undergraduate student e-mail addresses obtained from two large public universities in New York State. E-mail messages introduced the purpose of the study and provided a unique link to the web survey. Before beginning the survey, informed consent was obtained from all participants. The survey began the second week of September 2014 and remained open through the last week in November 2014, or until 1000 responses were received from each university. Weekly e-mail reminders were sent to all students who had not submitted the survey. The response rate was 35%. Participants were remunerated \$10 in campus cash for completing the survey, and were provided the opportunity to voluntarily participate in a lottery drawing for a \$500 cash prize on their respective campus. Identifying information and survey responses were saved to separate files to keep student identities confidential. The Institutional Review Boards at the two Universities approved all procedures for the study.

## 2.3. Measures

### 2.3.1. Nonmedical use of prescription drugs

Nonmedical use of three scheduled prescription drug classes was assessed—stimulants (e.g., Adderall®, Ritalin®, Concerta®), anxiolytics/sedatives (e.g., Xanax®, Valium®, Ambien®), and analgesics (e.g., Lortab®, Vicodin®, OxyContin®). Students were asked about their most recent use of each class of prescription drugs when not prescribed for them (nonmedical use). Responses ranged from 0 = *never used* to 3 = *used in the past 30 days*.

### 2.3.2. Negative sexual events

The larger assessment of negative events included two types of negative sexual events (NSE) that were the focus of this study: regretted sex and sexual aggression (victimization among women and perpetration among men). The broad set of items was developed based on focus group discussions with college students who reported NMUPD (Parks, Levonyan-Radloff, Przybyla, Hequembourg, 2014) and measures developed and used by other researchers (Boyd & McCabe, 1999; McCabe, Boyd, Couper, Crawford, & D'Arcy, 2002; McCabe, Cranford, Morales, & Young, 2006). Male and female students were asked how frequently they experienced regretted sex (i.e., had sex with someone that they would not have had sex with when sober), female students also were asked how frequently they were sexually victimized (i.e., someone had sexual intercourse with you when you were too high to verbally agree), and male students also were asked how often they engaged in sexual perpetration (i.e., pressured someone to have sexual intercourse with you when you were high). Each of these three items were asked with respect to using each class of prescription drug for nonmedical reasons on a 4-point scale from 0 = *never* to 3 = *always*. Given the relatively low base rate of these behaviors (73 male and female students reported regretted sex, 18 female students reported sexual victimization, and 16 male students reported sexual perpetration), we dichotomized the three sexual experience variables (0 = *no*, 1 = *yes*) across drug classes and within person. For example, a student who indicated experiencing regretted sex under the influence of any prescription drug class received a score of 1 and a student reporting no regretted sex under the influence of each drug class received a score of 0.

### 2.3.3. Control variables

Several variables were included in the analyses to control for potential confounding. The demographic variables included: sex (male, female), race/ethnicity (i.e., White, non-Hispanic; Black, non-Hispanic, other/mixed race, non-Hispanic, and Hispanic), and year in school (freshman, sophomore, junior, and senior).

The Brief Symptom Inventory (BSI-18; Derogatis, 1993) was used to control for the major psychological symptoms of depression, anxiety,

and somatization. In the present study, the depression item related to suicidal thoughts was not asked, resulting in 17 items overall. The response options ranged from 0 = *never* to 4 = *every day*. For the present analyses, a global psychological symptoms score was created by summing item responses to each of the 17 items ( $M = 16.55$ ,  $SD = 15.06$ , range = 0–65,  $\alpha = 0.94$ ).

To control for overall use of illegal drugs, participants were asked to indicate their last use of marijuana, cocaine/crack, heroin, LSD, ecstasy (club drugs), crystal methamphetamine, and other drugs. The 4-point response scale ranged from 0 = *never used* to 3 = *used in the past 30 days*. An overall measure of use of illegal drugs was created by averaging responses to the seven items ( $M = 0.70$ ,  $SD = 0.51$ , range = 0–2.29,  $\alpha = 0.69$ ).

To control for alcohol use, participants were asked about their average number of drinking days per month during the past three months, number of drinks consumed on a typical drinking day, and the number of times binge drinking during the prior two weeks (4 drinks for women and 5 drinks for men in a 2 h period). Responses were open-ended. Because the variance of these three items differed, each item was standardized before being averaged into an overall alcohol use score ( $M = 0.00$ ,  $SD = 0.79$ , range =  $-1.34$ – $2.74$ ,  $\alpha = 0.71$ ). The alcohol and illegal drug items were patterned after the daily drinking questionnaire (DDQ), a well validated and frequently used measure of alcohol and other illicit drug use (Collins, Parks, & Marlatt, 1985).

### 2.4. Data analyses

Bivariate and multiple logistic regression were used to explore the unadjusted and adjusted relations of each covariate to the three NSEs that students had experienced with NMUPD. In addition, prevalence estimates are reported for the three prescription drug classes and the three NSEs.

## 3. Results

### 3.1. Prevalence estimates of substance use and negative sexual events

Among the 509 students who reported any NMUPD, 76.2% ( $n = 388$ ) reported ever using stimulants, 38.9% ( $n = 198$ ) reported ever using anxiolytics/sedatives, and 40.9% ( $n = 208$ ) reported ever using analgesics. In terms of recent (past 30 days) NMUPD, 25.7% ( $n = 131$ ) reported using stimulants, 8.8% ( $n = 45$ ) reported using anxiolytics/sedatives, and 4.9% ( $n = 25$ ) reported using analgesics. Also, 91.6% ( $n = 466$ ) reported ever using an illegal drug, and 62.7% ( $n = 319$ ) reported using an illegal drug in the past 30 days. Finally, 94.9% ( $n = 483$ ) reported using alcohol in the past 3 months and 65.2% ( $n = 332$ ) reported binge drinking at least once during the prior two weeks.

Of these 509 students reporting any NMUPD, 14.3% ( $n = 73$ ) reported experiencing regretted sex while engaging in NMUPD. The prevalence estimates for regretted sex did not differ across male (14.5%) and female (14.2%) students ( $\chi^2 [1 df] = 0.01$ ,  $p = 0.914$ ). Among the 254 female students, 7.1% ( $n = 18$ ) reported experiencing sexual aggression victimization while engaging in the NMUPD; and among the 255 male students, 6.3% ( $n = 16$ ) reported perpetrating sexual aggression while engaging in the NMUPD.

### 3.2. Logistic regression analyses

The bivariate (unadjusted odds ratios) and multiple (adjusted odds ratios) logistic regression results for regretted sex are reported in Table 1. The unadjusted odds ratios indicate that the BSI score (OR = 1.02), alcohol use (OR = 1.83), illegal drug use (OR = 3.61), and the nonmedical use of stimulants (OR = 1.60), anxiolytics/sedatives (OR = 2.34), and analgesics (OR = 1.32) were each significantly and positively related to the experience of regretted sex. However, when all of the covariates were entered into the regression analysis



**Table 1**  
Logistic Regression Analyses of Experiencing a Regretted Sexual Event (Overall  $n = 509$ ; Prevalence of the outcome = 14.3%)

Variable	Percentage or Mean (SD) <sup>1</sup>	Unadjusted Odds Ratio	95% CI	$p$	Adjusted Odds Ratio	95% CI	$p$
<b>Sex</b>							
Male	50.1%	Ref			Ref		
Female	49.9%	0.97	0.59–1.60	0.914	0.94	0.54–1.65	0.833
<b>Race/ethnicity</b>							
White, non-Hispanic	68.4%	Ref			Ref		
Black, non-Hispanic	7.1%	0.90	0.33–2.41	0.831	1.85	0.61–5.60	0.278
Other/Mixed, non-Hispanic	15.3%	0.82	0.40–1.69	0.588	1.40	0.61–3.18	0.426
Hispanic	9.2%	0.66	0.25–1.75	0.407	0.59	0.20–1.73	0.332
<b>Year in school</b>							
Freshman	10.8%	Ref			Ref		
Sophomore	25.5%	0.77	0.30–1.93	0.572	0.76	0.27–2.12	0.595
Junior	26.1%	1.16	0.48–2.80	0.734	1.04	0.39–2.83	0.931
Senior	37.5%	1.01	0.43–2.36	0.983	1.05	0.40–2.72	0.924
Brief Symptom Inventory (BSI)	16.6 (15.1)	<b>1.02</b>	<b>1.00–1.03</b>	<b>0.048</b>	1.01	0.99–1.03	0.395
Use of illegal drugs	0.70 (0.51)	<b>3.61</b>	<b>2.25–5.77</b>	<b>0.001</b>	1.27	0.66–2.46	0.475
Alcohol use	0.00 (0.79)	<b>1.83</b>	<b>1.35–2.49</b>	<b>0.001</b>	1.28	0.87–1.87	0.210
Stimulant Use	2.54 (1.11)	<b>1.60</b>	<b>1.26–2.04</b>	<b>0.001</b>	1.33	1.00–1.77	0.054
Anxiolytic/Sedative Use	1.68 (0.99)	<b>2.34</b>	<b>1.86–2.94</b>	<b>0.001</b>	<b>1.99</b>	<b>1.51–2.62</b>	<b>0.001</b>
Analgesic Use	1.61 (0.87)	<b>1.32</b>	<b>1.01–1.71</b>	<b>0.041</b>	1.14	0.83–1.57	0.426

Note: The unadjusted odds ratio for a variable does not adjust for the other covariates, whereas the adjusted odds ratio for a variable adjusts for the other covariates. Bold signifies significant at  $p < 0.05$ .

<sup>1</sup> See Methods section for more information on the predictor variables and their scoring.

simultaneously, the adjusted odds ratios show that only anxiolytic/sedative use (OR = 1.99) was positively related to the experience of regretted sex. An additional multiple logistic regression analysis was conducted that added interactions between sex and the other 12 (including dummy variables) covariates. The results showed that the block of interactions did not improve model fit ( $\chi^2 [12 df] = 7.02, p = 0.856$ ), and none of the individual interactions were statistically significant ( $p$  values = 0.203 to 0.993). Thus, these results partially support our hypothesis with respect to nonmedical anxiolytic/sedative use, but not with respect to nonmedical stimulant and analgesic use. Also, there was no evidence of sex differences in adjusted odds ratios.

The bivariate and multiple logistic regression results for sexual victimization and perpetration are reported in Tables 2 and 3 respectively. The unadjusted odds ratios in Table 2 indicate that the BSI score (OR = 1.07), alcohol use (OR = 1.84), illegal drug use (OR = 3.33), and the nonmedical use of anxiolytics/sedatives (OR = 2.21) were each significantly and positively related to sexual victimization among female students. However, when adjusting for all covariates simultaneously, the adjusted odds ratios show that only the BSI score (OR = 1.06) and nonmedical use of anxiolytics/sedatives (OR = 1.79) were positively related to sexual victimization. The unadjusted odds ratios in Table 3 indicate that illegal drug use (OR = 4.43) and the nonmedical use of

anxiolytics/sedatives (OR = 1.59) were each significantly and positively related to sexual perpetration among male students. However, when adjusting for all covariates simultaneously, the adjusted odds ratios show that only illegal drug use (OR = 4.10) was positively related to sexual perpetration. In terms of sexual victimization, these results partially support our hypothesis with respect to nonmedical anxiolytic/sedative use, but not with respect to nonmedical stimulant and analgesic use. With respect to sexual perpetration, our hypothesis received no support.

#### 4. Discussion

A limited number of studies have assessed the specific negative behavioral and social events associated with NMUPD, and an even smaller number have attempted to look at the relationship between NMUPD and NSE among college students. The current study was designed to provide information on the nonmedical use of three different classes of prescription drugs and their association with a broader range of NSE (i.e., sexual victimization, sexual aggression perpetration, and regretted sex). The present results revealed that among students who reported ever engaging in NMUPD, the prevalence of previous and recent use of all three classes of prescription drugs was high. Additionally, a

**Table 2**  
Logistic Regression Analyses of Experiencing a Sexual Victimization Event (Only Females,  $n = 254$ ; Prevalence of the outcome = 7.1%)

Variable	Percentage or Mean (SD) <sup>1</sup>	Unadjusted Odds Ratio	95% CI	$p$	Adjusted Odds Ratio	95% CI	$p$
<b>Race/ethnicity</b>							
White, non-Hispanic	65.7%	Ref			Ref		
Black, non-Hispanic	7.9%	1.58	0.32–7.68	0.574	2.54	0.43–14.94	0.300
Other/Mixed, non-Hispanic	16.5%	1.09	0.29–4.10	0.898	1.19	0.20–7.15	0.846
Hispanic	9.8%	1.23	0.26–5.92	0.793	2.13	0.36–12.58	0.403
<b>Year in school</b>							
Freshman	11.8%	Ref			Ref		
Sophomore	24.0%	0.63	0.13–3.02	0.565	1.04	0.13–8.20	0.971
Junior	26.4%	0.89	0.21–3.80	0.870	1.45	0.19–10.83	0.718
Senior	37.8%	0.49	0.11–2.20	0.356	0.68	0.10–4.66	0.697
Brief Symptom Inventory (BSI)	18.2 (15.7)	<b>1.07</b>	<b>1.03–1.10</b>	<b>0.001</b>	<b>1.06</b>	<b>1.02–1.10</b>	<b>0.001</b>
Use of illegal drugs	0.64 (0.50)	<b>3.33</b>	<b>1.39–7.99</b>	<b>0.007</b>	1.06	0.26–4.31	0.930
Alcohol use	-0.16 (0.73)	<b>1.84</b>	<b>1.02–3.33</b>	<b>0.044</b>	1.44	0.63–3.29	0.391
Stimulant Use	2.49 (1.13)	1.28	0.83–1.97	0.270	0.93	0.52–1.67	0.810
Anxiolytic/Sedative Use	1.74 (1.02)	<b>2.21</b>	<b>1.45–3.36</b>	<b>0.001</b>	<b>1.79</b>	<b>1.01–3.16</b>	<b>0.044</b>
Analgesic Use	1.58 (0.84)	1.31	0.79–2.20	0.299	1.12	0.60–2.09	0.731

Note: The unadjusted odds ratio for a variable does not adjust for the other covariates, whereas the adjusted odds ratio for a variable adjusts for the other covariates. Bold signifies significant at  $p < 0.05$ .

<sup>1</sup> See Methods section for more information on the predictor variables and their scoring.

Table 3

Logistic Regression Analyses of Perpetrating a Sexual Aggression Event (Only Males,  $n = 255$ ; Prevalence of the outcome = 6.3%)

Variable	Percentage or Mean (SD) <sup>1</sup>	Unadjusted Odds Ratio	95% CI	<i>p</i>	Adjusted Odds Ratio	95% CI	<i>p</i>
Race/ethnicity							
White, non-Hispanic	71.0%	Ref			Ref		
Black, non-Hispanic	6.3%	2.44	0.49–12.26	0.278	3.88	0.54–28.04	0.179
Other/Mixed, non-Hispanic	14.1%	1.55	0.41–5.95	0.520	2.00	0.44–9.11	0.368
Hispanic	8.6%	0.81	0.10–6.68	0.848	0.65	0.07–6.29	0.712
Year in school							
Freshman	9.8%	Ref			Ref		
Sophomore	27.1%	0.33	0.06–1.77	0.198	0.28	0.04–1.76	0.173
Junior	25.9%	0.35	0.07–1.86	0.218	0.25	0.04–1.62	0.146
Senior	37.3%	0.58	0.14–2.44	0.460	0.48	0.10–2.29	0.360
Brief Symptom Inventory (BSI)	14.87 (14.26)	1.01	0.98–1.04	0.537	1.01	0.98–1.05	0.495
Use of illegal drugs	0.75 (0.51)	<b>4.43</b>	<b>1.75–11.21</b>	<b>0.002</b>	<b>4.10</b>	<b>1.21–13.86</b>	<b>0.023</b>
Alcohol use	0.16 (0.82)	1.15	0.62–2.12	0.659	0.87	0.42–1.79	0.702
Stimulant Use	2.59 (1.09)	1.57	0.94–2.60	0.082	1.17	0.64–2.14	0.602
Anxiolytic/Sedative Use	1.63 (0.96)	<b>1.59</b>	<b>1.02–2.46</b>	<b>0.039</b>	1.22	0.71–2.08	0.472
Analgesic Use	1.65 (0.89)	1.22	0.72–2.05	0.455	0.92	0.49–1.72	0.76

Note: The unadjusted odds ratio for a variable does not adjust for the other covariates, whereas the adjusted odds ratio for a variable adjusts for the other covariates.

Bold signifies significant at  $p < 0.05$ .

<sup>1</sup> See Methods section for more information on the predictor variables and their scoring.

significant minority of such students reported all three NSE. Finally, after controlling for the demographic, alcohol use and illegal drug use covariates, anxiolytic/sedative use was positively associated with reported regretted sex among male and female students and sexual victimization among female students. These findings partially support our hypothesis. Nonetheless, stimulant and analgesic use were unrelated to these two NSE, and none of the three prescription drug classes were related to sexual perpetration. However, the results revealed an association between the use of illegal drugs and sexual perpetration.

It is interesting that we found that anxiolytics/sedatives were the only prescription drug class associated with NSE. Neuropsychological effects of anxiolytics include sedation, impaired psychomotor functioning and reduced psychomotor speed, as well as impaired vigilance and memory (Stein & Strickland, 1998; Weathermon & Crabb, 1999). The neuropsychological effects are different for stimulants (i.e., positive effects on vigilance and memory; Stein & Strickland, 1998), and less likely to occur in regular users of analgesics (Zacny, 1995). In an earlier qualitative study with college students, participants reported the simultaneous use of anxiolytics and alcohol to enhance the effects of alcohol and to intentionally 'black out' (Parks, Levonyan-Radloff, et al., 2014). They also described situations in which they woke up following anxiolytic use with no memory of what had happened, where they were, or how they had gotten there. One female student indicated that the ramifications of this were 'frightening.' Given the neuropsychological effects of anxiolytics and these descriptions, it may be that these drugs when combined with alcohol, decrease inhibitions and lead to severe impairment in social situations, thus increasing the odds of regretted sex and sexual victimization events.

Limitations associated with the current study should be noted. This was a cross-sectional survey conducted at two universities in New York State. Thus, the findings might not be generalizable to students who engage in NMUPD in other areas of the country, and the results cannot be used to infer causal relations. Moreover, students who dropped out of school did not participate in the study. Because such students are more likely to use alcohol and other drugs, individuals who experienced the most serious NSE associated with NMUPD might be underrepresented in our college-based sample. We did not assess simultaneous use of each of the prescription drug classes and alcohol. Therefore, future research is needed on this issue because of the synergistic properties of alcohol, anxiolytics/sedatives and analgesics. Finally, while we controlled for a number of covariates, we cannot rule out the possibility of additional confounding due to other potential common correlates (e.g., impulsivity, prior victimization) of NMUPD and NSE. Additional research, using longitudinal (panel and daily process)

methods, is needed to provide stronger assessment of causal effects and the direction of relations between NMUPD and NSE.

## 5. Conclusions

There are growing concerns about the high prevalence estimates of NMUPD among college students. In fact, a potentially life altering correlate of NMUPD among students might be NSE because they are often associated with substantial secondary physical, psychological, and academic events (e.g., depression, PTSD, sleep disturbances, reduced GPA; Chen et al., 2010; Krakow et al., 2000). To the best of our knowledge, this is the first study to examine the relations between the non-medical use of stimulants, anxiolytics/sedatives and analgesics and multiple NSE in a sample of college students who reported any NMUPD. The consistent relations we found between anxiolytic/sedative use and multiple NSE should concern parents and college administrators given the potential for additional secondary negative events.

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### Contributors

Author A designed the study. Authors A and C wrote the protocol and implemented the surveys on two SUNY campuses. All authors reviewed and contributed to the survey measures. Authors A and B conducted the statistical analyses. Author A wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

### Conflict of interest

All authors declare that they have no conflicts of interest.

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## References

- Abbey, A. (2002). Alcohol-related sexual assault: A common problem among college students. *Journal of Studies on Alcohol, Suppl.*, 14, 118–128.
- American College Health Association (2015). *National College Health Assessment II: Reference Group Executive Summary Spring 2015*. Hanover, MD: American College Health Association.
- Arria, A. M., Caldeira, K. M., O'Grady, K. E., Vincent, K. B., Fitzelle, D. B., Johnson, E. P., & Wish, E. D. (2008a). Drug exposure opportunities and use patterns among college students: Results of a longitudinal prospective cohort study. *Substance Abuse*, 29(4), 19–38. <http://dx.doi.org/10.1080/08897070802418451>.

- Arria, A. M., Caldeira, K. M., O'Grady, K. E., Vincent, K. B., Johnson, E. P., & Wish, E. D. (2008b). Nonmedical use of prescription stimulants among college students: Associations with attention-deficit-hyperactivity disorder and polydrug use. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*, 28(2), 156–169. <http://dx.doi.org/10.1592/phco.28.2.156>.
- Baker, M. R., Frazier, P. A., Greer, C., Paulsen, J. A., Howard, K., Meredith, L. N., ... Shallcross, S. L. (2016). Sexual victimization history predicts academic performance in college women. *Journal of Counseling Psychology, Advance Online Publication*. <http://dx.doi.org/10.1037/cou0000146>.
- Benotsch, E. G., Koester, S., Luckman, D., Martin, A. M., & Cejka, A. (2011). Non-medical use of prescription drugs and sexual risk behavior in young adults. *Addictive Behaviors*, 36(1–2), 152–155. <http://dx.doi.org/10.1016/j.addbeh.2010.08.027>.
- Boyd, C. J., & McCabe, S. E. (1999). *Student life survey*. University of Michigan Substance Abuse Research Center, University of Michigan: University of Michigan & National Institute on Drug Abuse.
- Caldeira, K. M., Arria, A. M., O'Grady, K. E., Zaratte, E. M., Vincent, K. B., & Wish, E. D. (2009). Prospective associations between alcohol and drug consumption and risky sex among female college students. *Journal of Alcohol and Drug Education*, 53(2), 71–92.
- Chen, L. P., Murad, M. H., Paras, M. L., Colbenson, K. M., Sattler, A. L., Goranson, E. N., ... Zirakzadeh, A. (2010). Sexual abuse and lifetime diagnosis of psychiatric disorders: Systematic review and meta-analysis. *Mayo Clinic Proceedings*, 85(7), 618–629. <http://dx.doi.org/10.4065/mcp.2009.0583>.
- Clayton, H. B., Lowry, R., August, E., & Jones, S. E. (2016). Nonmedical use of prescription drugs and sexual risk behaviors. *Pediatrics*, 137(1). <http://dx.doi.org/10.1542/peds.2015-2480>.
- Clegg-Kraynok, M. M., McBean, A. L., & Montgomery-Downs, H. E. (2011). Sleep quality and characteristics of college students who use prescription psychostimulants nonmedically. *Sleep Medicine*, 12, 598–602. <http://dx.doi.org/10.1016/j.sleep.2011.01.012>.
- Collins, R. L., Parks, G. A., & Marlatt, G. A. (1985). Social determinants of alcohol consumption: The effects of social interaction and model status on the self administration of alcohol. *Journal of Consulting and Clinical Psychology*, 53, 189–200.
- Combs, J. L., Jordan, C. E., & Smith, G. T. (2014). Individual differences in personality predict externalizing versus internalizing outcomes following sexual assault. *Psychological Trauma: Theory, Research, Practice, and Policy*, 6(4), 375–383. <http://dx.doi.org/10.1037/a0032978>.
- Derogatis, L. R. (1993). *BSI (brief symptom inventory): Administration, scoring, and procedures manual*. Minnesota: National Computer Systems, Inc.
- Fielder, R. L., Walsh, J. L., Carey, K. B., & Carey, M. P. (2013). Predictors of sexual hookups: A theory-based, prospective study of first-year college women. *Archives of Sexual Behavior*, 42(8), 1425–1441. <http://dx.doi.org/10.1007/s10508-013-0106-0>.
- Fisher, B. S., Daigle, L. E., & Cullen, F. T. (2010). *Unsafe in the ivory tower: The sexual victimization of college women*. Thousand Oaks, CA, US: Sage Publications, Inc.
- Garnier-Dykstra, L. M., Caldeira, K. M., Vincent, K. B., O'Grady, K. E., & Arria, A. M. (2012). Nonmedical use of prescription stimulants during college: four-year trends in exposure opportunity, use, motives, and sources. *Journal of American College Health*, 60(3), 226–234. <http://dx.doi.org/10.1080/07448481.2011.589876>.
- Hoepfner, B. B., Paskausky, A. L., Jackson, K. M., & Barnett, N. P. (2013). Sex differences in college student adherence to NIAAA drinking guidelines. *Alcoholism-Clinical and Experimental Research*, 37(10), 1779–1786. <http://dx.doi.org/10.1111/acer.12159>.
- Humphrey, J. A., & White, J. W. (2000). Women's vulnerability to sexual assault from adolescence to young adulthood. *Journal of Adolescent Health*, 27, 419–424.
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Miech, R. A. (2015). *Monitoring the future National Survey Results on drug use, 1975–2014: Volume 2, college students and adults ages 19–55*. Ann Arbor: Institute for Social Research, The University of Michigan.
- Kiene, S. M., Barta, W. D., Tennen, H., & Armeli, S. (2009). Alcohol, helping young adults to have unprotected sex with casual partners: Findings from a daily diary study of alcohol use and sexual behavior. *Journal of Adolescent Health*, 44(1), 73–80. <http://dx.doi.org/10.1016/j.jadohealth.2008.05.008>.
- Koss, M. P., Gidycz, C. A., & Wisniewski, N. (1987). The scope of rape: Incidence and prevalence of sexual aggression and victimization in a national sample of higher education students. *Journal of Consulting and Clinical Psychology*, 55(2), 162–170.
- Krakow, B., Artar, A., Warner, T. D., Melendrez, D., Johnston, L., Hollifield, M., & Koss, M. (2000). Sleep disorder, depression, and suicidality in female sexual assault survivors. *Crisis*, 21(4), 163–170.
- Lewis, M. A., Atkins, D. C., Blayney, J. A., Dent, D. V., & Kaysen, D. L. (2013). What is hooking up? Examining definitions of hooking up in relation to behavior and normative perceptions. *Journal of Sex Research*, 50(8), 757–766. <http://dx.doi.org/10.1080/00224499.2012.706333>.
- Logan, D. E., Koo, K. H., Kilmer, J. R., Blayney, J. A., & Lewis, M. A. (2015). Use of drinking protective behavioral strategies and sexual perceptions and behaviors in U.S. college students. *Journal of Sex Research*, 52(5), 558–569. <http://dx.doi.org/10.1080/00224499.2014.964167>.
- Mallett, K. A., Bachrach, R. L., & Turrissi, R. (2008). Are all negative consequences truly negative? Assessing variations among college students' perceptions of alcohol related consequences. *Addictive Behaviors*, 33(10), 1375–1381. <http://dx.doi.org/10.1016/j.addbeh.2008.06.014>.
- McCabe, S. E., Boyd, C. J., Couper, M. P., Crawford, S., & D'Arcy, H. (2002). Mode effects for collecting alcohol and other drug use data: Web and U.S. mail. *Journal of Studies on Alcohol*, 63, 755–761.
- McCabe, S. E., Cranford, J. A., Boyd, C. J., & Teter, C. J. (2007). Motives, diversion and routes of administration associated with nonmedical use of prescription opioids. *Addictive Behaviors*, 32(3), 562–575. <http://dx.doi.org/10.1016/j.addbeh.2006.05.022>.
- McCabe, S. E., Cranford, J. A., Morales, M., & Young, A. (2006). Simultaneous and concurrent polydrug use of alcohol and prescription drugs: Prevalence, correlates, and consequences. *Journal of Studies on Alcohol*, 67(4), 529–537.
- McCabe, S. E., Cranford, J. A., Teter, C. J., Rabiner, D. L., & Boyd, C. J. (2012). Use, misuse, and diversion of scheduled prescription medications by college students. In H. R. White, & D. L. Rabiner (Eds.), *College drinking and drug use* (pp. 36–59). New York, NY, US: Guilford Press.
- McCabe, S. E., West, B. T., Teter, C. J., & Boyd, C. J. (2014). Trends in medical use, diversion, and nonmedical use of prescription medications among college students from 2003 to 2013: Connecting the dots. *Addictive Behaviors*, 39, 1176–1182. <http://dx.doi.org/10.1016/j.addbeh.2014.03.008>.
- Miron, L. R., & Orcutt, H. K. (2014). Pathways from childhood abuse to prospective revictimization: Depression, sex to reduce negative affect, and forecasted sexual behavior. *Child Abuse & Neglect*, 38(11), 1848–1859. <http://dx.doi.org/10.1016/j.chiabu.2014.10.004>.
- Neal, D. J., & Fromme, K. (2007). Event-level covariation of alcohol intoxication and behavioral risks during the first year of college. *Journal of Consulting and Clinical Psychology*, 75(2), 294–306. <http://dx.doi.org/10.1037/0022-006x.75.2.294>.
- Newton-Taylor, B., Dewit, D. J., & Gliksmann, L. (1998). Prevalence and factors associated with physical and sexual assault of female university students in Ontario. *Health Care for Women International*, 19, 155–164.
- Olmstead, S. B., Roberson, P. N. E., Pasley, K., & Fincham, F. D. (2015). Hooking up and risk behaviors among first semester college men: What is the role of precollege experience? *Journal of Sex Research*, 52(2), 186–198. <http://dx.doi.org/10.1080/00224499.2013.843147>.
- Orchowski, L. M., Mastrole, N. R., & Borsari, B. (2012). Correlates of alcohol-related regretted sex among college students. *Psychology of Addictive Behaviors*, 26(4), 782–790. <http://dx.doi.org/10.1037/a0027840>.
- Oswalt, S. B., Cameron, K. A., & Koob, J. J. (2005). Sexual regret in college students. *Archives of Sexual Behavior*, 34(6), 663–669. <http://dx.doi.org/10.1007/s10508-005-7920-y>.
- Parks, K. A., Hsieh, Y. P., Taggart, C., & Bradizza, C. M. (2014). A Longitudinal Analysis of Drinking and Victimization in College Women: Is There a Reciprocal Relationship? *Psychology of Addictive Behaviors*, 28(4), 943–951. <http://dx.doi.org/10.1037/a0036283>.
- Parks, K. A., Levonyan-Radloff, K., Przybyla, S., & Hequembourg, A. (2014). College student opinions about the use of nonmedical prescription drugs. *Drug & Alcohol Dependence*, 146, E62–E63. <http://dx.doi.org/10.1016/j.drugalcdep.2014.09.539>.
- Quintero, G. (2009a). Controlled release: A cultural analysis of collegiate polydrug use. *Journal of Psychoactive Drugs*, 41(1), 39–47.
- Quintero, G. (2009b). Rx for a party: A qualitative analysis of recreational pharmaceutical use in a collegiate setting. *Journal of American College Health*, 54, 269–278.
- Resnick, H. S., Walsh, K., Schumacher, J. A., Kilpatrick, D. G., & Acierio, R. (2013). Prior substance abuse and related treatment history reported by recent victims of sexual assault. *Addictive Behaviors*, 38(4), 2074–2079. <http://dx.doi.org/10.1016/j.addbeh.2012.12.010>.
- Schry, A. R., Maddox, B. B., & White, S. W. (2016). Social anxiety and alcohol-related sexual victimization: A longitudinal pilot study of college women. *Addictive Behaviors*, 61, 117–120. <http://dx.doi.org/10.1016/j.addbeh.2016.05.022>.
- Snipes, D. J., & Benotsch, E. G. (2013). High-risk cocktails and high-risk sex: Examining the relation between alcohol mixed with energy drink consumption, sexual behavior, and drug use in college students. *Addictive Behaviors*, 38(1), 1418–1423. <http://dx.doi.org/10.1016/j.addbeh.2012.07.011>.
- Stein, R. A., & Strickland, T. L. (1998). A review of the neuropsychological effects of commonly used prescription medications. *Archives of Clinical Neuropsychology*, 13(3), 259–284.
- Strang, E., Peterson, Z. D., Hill, Y. N., & Heiman, J. R. (2013). Discrepant responding across self-report measures of men's coercive and aggressive sexual strategies. *Journal of Sex Research*, 50(5), 458–469. <http://dx.doi.org/10.1080/00224499.2011.646393>.
- Testa, M., Hoffman, J. H., Lucke, J. F., & Pagnan, C. E. (2015). Measuring sexual aggression perpetration in college men: A comparison of two measures. *Psychology of Violence*, 5(3), 285–293. <http://dx.doi.org/10.1037/a0037584>.
- Thompson, M. P., Koss, M. P., Kingree, J. B., Goree, J., & Rice, J. (2011). A prospective mediational model of sexual aggression among college men. *Journal of Interpersonal Violence*, 26(13), 2716–2734. <http://dx.doi.org/10.1177/0886260510388285>.
- Turchik, J. A. (2012). Sexual victimization among male college students: Assault severity, sexual functioning, and health risk behaviors. *Psychology of Men & Masculinity*, 13(3), 243–255. <http://dx.doi.org/10.1037/a0024605>.
- Ulirsch, J. C., Ballina, L. E., Soward, A. C., Rossi, C., Hauda, W., Holbrook, D., ... McLean, S. A. (2014). Pain and somatic symptoms are sequelae of sexual assault: Results of a prospective longitudinal study. *European Journal of Pain*, 18(4), 559–566. <http://dx.doi.org/10.1002/j.1532-2149.2013.00395.x>.
- Weathermon, R., & Crabb, D. W. (1999). Alcohol and medication interactions. *Alcohol Research & Health*, 23(1), 40–54.
- Wells, B. E., Kelly, B. C., Rendina, H. J., & Parsons, J. T. (2015). Prescription drug misuse and sexual behavior among young adults. *Journal of Sex Research*, 52(6), 659–668. <http://dx.doi.org/10.1080/00224499.2014.918085>.
- Zacny, J. P. (1995). A review of the effects of opioids on psychomotor and cognitive functioning in humans. *Experimental and Clinical Psychopharmacology*, 3(4), 432–466. <http://dx.doi.org/10.1037/1064-1297.3.4.432>.