



Published in final edited form as:

J Interpers Violence. 2021 April ; 36(7-8): NP3574–NP3595. doi:10.1177/0886260518780413.

Alcohol Use and Sexual and Physical Assault Victimization Among University Students: Three Years of Follow-Up

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Abstract

The aim of this study was to determine the incidence of sexual and physical assault among university students and its association with alcohol use. The research is part of a wider cohort study (Spit for Science™) at a large public university in the United States. The follow-up data include the first two cohorts (2011, 2012; $n = 5,170$). The dependent variables were victim of sexual assault and victim of physical assault. The independent variables were alcohol dependence and abuse according to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.), cannabis use, residence, ethnicity, sexual orientation, and previous experience of sexual assault and/or physical assault. We used multilevel logistic regression for repeated measures. All data were analyzed using generalized linear mixed models. Incidence rates of sexual and physical assault (per 100 students a year) were 15.1 and 27.6 among nonabusers/dependents versus 36.4 and 56.7 among alcohol-dependent females at the first year, and 2.8 and 4.7 versus 7.7 and 23.1 at the third year; while in males, incident rates were 6.0 and 3.1 versus 18.5 and 66.6, and 2.3 and 7.4 versus 18.9 and 15.1, respectively. Our results show that alcohol abuse and dependence constitute risk factors to be victim of sexual assault in males (odds ratio [OR] = 2.21 and OR = 2.73) and alcohol dependence in females (OR = 2.16). Similarly, alcohol abuse and dependence are risk factors to physical assault among both males (OR = 1.52 and OR = 2.03) and females (OR = 1.70 and OR = 2.88). Ethnicity, sexual orientation, and whether the individual had been victimized in the past were associated with sexual assault. Regarding physical assault, cannabis use and past victimization are also risk factors. Our study has shown that assault victimization is strongly related to alcohol abuse and dependence diagnoses in both genders. Ethnicity and sexual orientation are also associated to both assaults. Our results show that incidence rates of both types of assaults were clearly higher in the first 6 months of university, probably explained by the novel and potentially risky environment.

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Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Keywords

underage drinking; sexual assault; physical assault; college students

Introduction

U.S. national studies have shown a high prevalence of violence in our society, with estimates that more than 50% of children and adolescents are exposed to some type of violence (Finkelhor, Ormrod, Turner, & Hamby, 2005). The data are even more disturbing when we focus on university students—A lifetime history of violence of around 80% was found in this population (Scarpa, 2001). Sexual and physical assaults are the two most likely forms of extreme violence, and both are present at high rates among university students (Briere & Elliott, 2003; Fergusson, Boden, & Horwood, 2008; Fisher, Cullen, & Turner, 2000). The U.S. Department of Justice reported that the incidence of sexual assault during college reaches 20% among women and 5% among men (Fisher et al., 2000), while physical assault figures reach 30%, with most recent studies suggesting similar rates in males and females (Briere & Elliott, 2003; Fergusson et al., 2008). In addition to the immediate damage caused by the violence, exposure to violence during young adulthood increases risk for multiple nonimmediate negative consequences: unhealthy behaviors, substance abuse, and mental and physical health concerns (Farrell & Sullivan, 2004; Fry et al., 2018; Kilpatrick et al., 2003; Sachs-Ericsson, Blazer, Plant, & Arnow, 2005). Moreover, research suggests a prior history of experiencing violence constitutes a risk factor for new episodes of victimization (Classen, Palesh, & Aggarwal, 2005; Coid et al., 2001; Cogle, Resnick, & Kilpatrick, 2009; Finkelhor et al., 2005; Waldron, Wilson, Patriquin, & Scarpa, 2014).

In relation to risk factors of sexual and physical assault, Saner and Ellickson (1996) developed four categories: demographic, negative life experiences, environmental, and behavioral. Among the risk factors associated with behavior, drug use and alcohol consumption among young people has been repeatedly cited in literature as one of the factors that increases the risk of both perpetration and victimization of physical and sexual assault (Abbey, 2002; Anderson, Flynn, & Pilgrim, 2017; Messman-Moore, Coates, Gaffey, & Johnson, 2008; Ullman, Karabatsos, & Koss, 1999). Women have been the focus of the majority of interpersonal violence studies, due to their greater likelihood of being victimized (Black et al., 2011; Fisher et al., 2000) and the antiviolence against women movement. As a result, what we know about risk factors and consequences of sexual victimization on men mostly comes from the literature on childhood sexual abuse (Dilorio, Hartwell, & Hansen, 2002; Dube et al., 2005; Schraufnagel, Davis, George, & Norris, 2010). Samples of male survivors are more challenging to gather, and resulting studies are confounded with low sample size and statistical power. However, in a recent large, population-based sample, while men experienced the lowest rates of sexual assault (compared with women and gender nonconforming participants), across gender groups, incapacitation due to alcohol and drug use was the method of perpetration reported most frequently, and binge drinking was found to be a significant factor associated with increased risk for sexual assault (Mellins et al., 2017).

Although the role of alcohol consumption as a risk factor for victimization is known, the impact of alcohol consumption on physical and sexual assault prevalence should be explored in specific populations (Graham et al., 2011), as different reasons could modulate this association: (a) Studies have also shown the prevalence of alcohol use and the average amount of alcohol consumed are different among both female and male college students (Moure-Rodríguez et al., 2016), and this consumption could be also significantly different from first year to upper level students (Bewick et al., 2008); (b) there are a very important number of confounder variables across different populations that must be taken into account to determine the alcohol contribution to risk for sexual and physical assault (Amstadter et al., 2011); and finally, (c) we cannot rule out the possibility that sociocultural differences between societies are associated with differences between participants regarding recognition of alcohol abuse, and this issue is very important when self-reported data are used (Midanik, 1988). Therefore, alcohol consumption is key: It could be, at the same time, a risk factor (Kilpatrick et al., 2003) and a consequence of physical and sexual assault (Anderson et al., 2017).

The present study uses data from the Spit for Science™ (Dick et al., 2014), an ongoing university-wide research project, which longitudinally assesses genetic and environmental influences on substance use and psychiatric disorders in a representative sample from a large urban university. The objective of this study was to determine the incidence of sexual assault and physical assault among university students and its association with alcohol use.

Materials and Method

Design, Population, and Sample

We analyzed a cohort study among university students (Spit for Science™). The present study includes follow-up data from first year to upper level students from the first two cohorts (2011, 2012), collected between fall 2011 and spring 2016. All incoming first-year students age 18 or older were invited to participate ($N = 7,049$). The University Institutional Review Board approved all study procedures, and informed consent was obtained from all study participants. Participants were informed that participation was voluntary and anonymous, and the possibility to opt-out was available at any time.

Data-Collection Procedure

Mail information about the study was sent to all freshmen and their parents (separately) approximately 2 weeks before their arrival on campus. The week before Welcome Week, an invitation to participate in the project was sent to the e-mail account of all eligible freshmen (age 18 or older). Survey reminders were sent the first 10 weeks; during this period, students who turned 18 were invited to participate shortly after their birthdays. For the spring survey of the 2011 entering cohort, we mailed hard copy letters to all eligible students (regardless of whether they participated in the fall) informing them about the upcoming second wave of data collection. We included US\$2 bills in the mailing as an added incentive to participate. Parallel to the fall, e-mail invitations were sent through university e-mail accounts with a link to the online survey. Two surveys were programmed for the spring: One was a follow-up survey sent to individuals who had participated in the fall (Dick et al., 2014).

Study data were collected and managed using Research Electronic Data Capture (REDCap) hosted at Virginia Commonwealth University (Harris et al., 2009). REDCap is a secure, web-based application designed to support data capture for research studies (Dick et al., 2014).

Participants who declared that they had a drink of alcohol, excluding small tastes and sips, were asked further alcohol questions, such as their current use (self-attribution of use: “abstainer,” “abstainer—former problem drinker in recovery,” “infrequent drinker,” “light drinker,” “moderate drinker,” “heavy drinker,” and “problem drinker”). A frequency/quantity variable was then created by multiplying a participant’s score on frequency (how many days they had one or more drinks in the past 30 days) by their score on quantity (how many drinks they usually had on days that they drank). Questions related to symptoms of alcohol dependence were included, as adapted from the Semi-Structured Assessment of the Genetics of Alcoholism (Bucholz et al., 1994). Response options for these questions were “never,” “one to two times,” “three or more times,” or “don’t know.” An alcohol problem score was created by summing the number of symptoms for which a participant endorsed “three or more times” (Dick et al., 2014).

Participants received US\$10 and a t-shirt for their involvement. Participants who were enrolled in the fall completed follow-up surveys each spring beginning their first year, while those who were enrolled in the spring of their first year completed follow-up surveys beginning the spring of their sophomore year. More details about sample collection, survey instrumentation, and so on can be found in Dick et al. (2014).

Definition of Variables

Dependent variables

Victim of sexual assault.: Participants were asked whether they had been victims of rape, attempted rape, or made to perform any type of sexual act through force or threat of harm in the past 12 months. The variable was measured in each survey using Life Events Checklist (Gray, Litz, Hsu, & Lombardo, 2004) and dichotomized (yes/no).

Victim of physical assault.: Participants were asked whether they had been attacked, hit, slapped, kicked, beaten up, shot, or stabbed in the past 12 months. The variable was measured in each survey using Life Events Checklist (Gray et al., 2004) and dichotomized (yes/no).

Independent variables

Alcohol use.: This variable was assessed in each survey using items adapted from the Semi-Structured Assessment for the Genetics of Alcoholism (Bucholz et al., 1994). Diagnoses and symptom counts for each of the following are available at all waves: *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994) alcohol abuse and *DSM-IV* alcohol dependence. The variable presents three categories: nonabuse or dependence/abuse/dependence. Nondrinkers were considered nonabusers and nondependents.

Cannabis use.: This variable was measured in each survey with the question, “Have you consumed cannabis in the last 12 months? Yes/No.” This variable was derived from the Substance Abuse and Mental Health Services (2013) questionnaire.

Previous victim of sexual assault.: We generated this dichotomous variable by considering participants’ answers about whether they have been victims of sexual assault according to Life Events Checklist (Gray et al., 2004) in at least one previous period.

Previous victim of physical assault.: We generated this dichotomous variable by considering participants’ answers about whether they have been victims of physical assault according to Life Events Checklist (Gray et al., 2004) in at least one previous period.

Participants were asked whether they had been (sexual assault) and whether they had been attacked, hit, slapped, kicked, beaten up, shot, or stabbed in the past 12 months (physical assault). Both variables were measured in each survey using Life Events Checklist (Gray et al., 2004).

The sociodemographic variables were gender (female/male), ethnicity (Asian/African American/Hispanic/more than one race/White), sexual orientation (homosexual/heterosexual/bisexual), place of residence (parents’ home/residence hall/off-campus housing), and work status (currently not working/part-time/full-time). These two last variables were measured in each survey by means of the REDCap.

Statistical Analysis

We used multilevel logistic regression for repeated measures to obtain adjusted odds ratios (OR) for independent variables from the final explicative models of sexual assault and physical assault. Confidence intervals of 95% were calculated. These models are more flexible than traditional models and, therefore, allow us to work with correlated data. As this is the case, there is a dependency structure. The same participant was measured several times, and the responses were strongly correlated. The cohort was considered to be a random variable because we cannot rule out that each of the cohorts has its own characteristics.

Maximal models were generated, including all theoretical independent variables. From these maximal models, final models were generated. Final models included all significant variables or nonsignificant variables when their exclusion changed the OR of other variables by more than 10%. Data were analyzed using generalized linear mixed models in SPSS v.20 statistical software.

Results

The response rate at the beginning of the study was 73.3% ($n = 5,170$). The characteristics of the sample, broken down for females and males separately, are summarized in Tables 1 and 2, respectively. There were no significant differences between the initial sample and follow-up samples regarding the main variables.

The incidence rates of sexual assault expressed per 100 students per year were as follows: In females, 15.1 among nonabusers/dependents versus 36.4 among alcohol-dependent

individuals in the first year, and 2.8 versus 7.7 in the third year, while in males, these values were 6.0 versus 18.5 in the first year, and 2.3 versus 18.9 in the third year. Physical assault incidence rates were as follows: In females, 27.6 among nonabusers/dependents versus 56.7 among alcohol dependents in the first year, and 4.7 versus 23.1 in the third year, while in males, these values reached 3.1 versus 66.6 in the first year, and 7.4 versus 15.1 in the third year (Figures 1 to 4). Sexual assault and physical assault cumulative incidence in each age group of women and men are shown in Tables 3 and 4, respectively.

After adjusting for the rest of the variables, our results show alcohol abuse and alcohol dependence constitute risk factors for sexual assault in males (OR = 2.21 and OR = 2.73) and just alcohol dependence in females (OR = 2.16). In addition, alcohol abuse and alcohol dependence are risk factors for physical assault among both males (OR = 1.52 and OR = 2.03) and females (OR = 1.70 and OR = 2.88).

The final multivariate models show ethnicity and sexual orientation are associated with risk for sexual assault, although the particular nature of associations differ between the sexes. In addition, the fact of having been victim in the past is also a risk factor for sexual assault in females (OR = 6.70) and in males (OR = 12.00). Finally, cannabis use is a risk factor for sexual assault in women (OR = 1.60) only. All these data are presented in Table 5.

Regarding physical assault, our final models also showed that cannabis use (OR = 1.35 in females and OR = 1.40 in males) and having been a victim in the past (OR = 5.82 and OR = 3.21) are risk factors in both sexes. Finally, ethnicity and sexual orientation are associated with physical assault, but just in females. These data are shown in Table 6.

Discussion

Our results show a strong association between alcohol abuse and alcohol dependence and the risk of victimization of both sexual assault and physical assault, in both women and men. Moreover, multivariate models showed that cannabis use, and several sociodemographic variables, such as ethnicity and sexual orientation, are associated with these outcomes. Finally, having been a victim in the past of both sexual assault and physical assault is an important risk factor for victimization, in both men and women.

We found higher prevalence of physical assault among males than females, while women are approximately two times more likely than men to experience sexual assault, which is consistent with the extant literature (Bellis et al., 2015; Breslau et al., 1998; Finkelhor et al., 2005; Frans, Rimmö, Aberg, & Fredrikson, 2005). In our sample, incidence rates of both types of assaults are clearly higher in the first 6 months of university, for both men and women. A phenomenon known as “the red zone” describes the increased risk of sexual assault for first-year students at the start of the school year and has been described as lasting from as short as the first week of classes to as long as the first semester for both first- and second-year students. Limited research has demonstrated that the red zone exists for female first year (Kimble, Neacsiu, Flack, & Horner, 2008) and second year (Flack et al., 2008) students in the fall semester; however, our results show this risk period is true for both men and women, and includes physical assault. To explore these significant findings, future

research should explore how males' experiences with victimization may differ from those of females, and the gender differences in the mechanisms of the relationship between victimization and problematic drinking.

In addition, results from the present study show that previous experience of both sexual and physical assault are risk factors for new episodes of assault. These results are consistent with multiple studies (Classen et al., 2005; Coid et al., 2001; Cogle et al., 2009; Waldron et al., 2014). This suggests that there are additional variables explaining sexual and physical violence risk not included in our models (Rothman & Greenland, 1998). Regardless, this underscores the importance of trauma-informed violence-prevention efforts tailored to students who step foot on campus already survivors of violence and, thus, at risk for revictimization.

Multiple studies have revealed that substance use constitutes a risk factor for sexual and physical victimization (Anderson et al., 2017), even when prior history of physical victimization was controlled for, as we also found in our study. It has been proposed that the use of substances, mainly alcohol and cannabis, limits the ability of the participant to identify the threats and increases their vulnerability to an assault (Gidycz et al., 2007). As for alcohol, our results have shown a dose-response effect, both for sexual assault and for physical assault across genders, multiplying the risk by practically three in the case of participants with alcohol problems. Most interventions to decrease sexual violence do not focus on problematic alcohol use; however, a recent promising exception showed the effectiveness of combining sexual assault risk and alcohol use reduction into the same intervention (Gilmore, Lewis, & George, 2015). While it is important to make sure that education and programming should not focus solely on the victim, contributing to the ubiquitous victim-blaming rape culture, programs that realistically explore salient risk factors, such as alcohol abuse for all genders, should be investigated.

Alcohol consumption is associated with different demographic and environmental characteristics, such as race (Looby, Luger, & Guartos, 2017) or sexual orientation (Gidycz et al., 2007; Williams et al., 2013), and both variables could constitute risk factors to sexual and physical assault; therefore, we controlled for both variables in our analyses.

In relation to sexual assault, our results show African American women and Hispanic men are twice as likely to experience sexual assault. For risk for physical assault, race is a significant risk factor for females only. Finally, regarding sexual orientation, women who identify as bisexual and homosexual men experience a greater risk for sexual assault than their heterosexual counterparts. In addition, sexual orientation is also significant for physical assault among females. That men are more often victims of physical aggression than women has been previously found in other studies (Bellis et al., 2015). This may help understanding the lack of a specific victim profile of physical aggression among men, but the specific profile regarding race and sexual orientation among women victims of physical aggression. Previous studies have shown similar associations among undergraduate students and sexual assault (Coulter et al., 2017). In this line, discrimination against young people because of their sexual orientation may create an unsafe environment for them, increasing their vulnerability to hate crimes (Coulter et al., 2017; Williams et al., 2013). Some of the classic

motivations of sexual assaults referred by Groth, Burgess, and Holmstrom (1977) are power and anger. These motivations could explain the increased risk of suffering these aggressions according to race or sexual orientation that we have found. Finally, taking in to account that alcohol consumption has been measured only with three categories, we cannot discard that part of the effect could be due to the residual confusion associated with the measurement of alcohol consumption.

There are four main limitations to this study: (a) This study was carried out in one large, urban and public university, which should be taken into account when generalizing results; (b) the data are part of a larger longitudinal study, and therefore, the data and measurements used were not specifically designed for this study; (c) selection bias, because of the loss of participants at follow-up—however, the absence of significant differences between the initial samples and the follow-up samples suggest the absence of this bias; and (d) self-reported data may be skewed due to inconsistent personal feelings or memories.

Our study has shown that assault victimization is strongly related to alcohol abuse and alcohol dependence diagnoses in both males and females. In addition, several sociodemographic variables such as ethnicity and sexual orientation are also associated with sexual and physical violence victims. Finally, our results show that incidence rates of both types of assaults are clearly higher in the first 6 months of university, which can probably be attributed to a novel, potentially risky environment, and the fact of having been a victim in the past of both sexual assault and physical assault is an important risk factor for revictimization.

Acknowledgments

We would like to thank the Virginia Commonwealth University (VCU) students for making this study a success, as well as the many VCU faculty, students, and staff who contributed to the design and implementation of the project.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Spit for Science: The Virginia Commonwealth University Student Survey has been supported by Virginia Commonwealth University, P20 AA107828, R37AA011408, K02AA018755, and P50 AA022537 from the National Institute on Alcohol Abuse and Alcoholism (NIAAA), and UL1RR031990 from the National Center for Research Resources and National Institutes of Health Roadmap for Medical Research.

Author Biographies

Francisco Caamano-Isorna is a professor of preventive medicine and public health, master in design and statistics for health sciences (Universitat Autònoma of Barcelona), doctor in pharmacy, and master in health technology assessment (Universidade de Santiago de Compostela [USC]). His teaching and research activity took place at USC, the Pan American Health Organization (WHO) in Buenos Aires (Argentina), at Policlinico Universitario Gemelli, Rome (Italy), or at Virginia Commonwealth University (Richmond, Virginia). He led projects in collaboration with professional associations, technology companies, and the pharmaceutical industry. He has been a principal investigator since 2001 and has led 10 projects and contracts. His research is oriented toward alcohol consumption in young people and pharmaco-epidemiology.

Amy Adkins is an assistant professor and director of undergraduate research at the College Behavioral and Emotional Health Institute. She received her PhD in 2012 from Virginia Commonwealth University. Her primary research interests focus on understanding genetic and environmental risk factors underlying risky alcohol use and related problems, and the etiology of college behavioral and emotional health outcomes, and has several publications regarding these. Through her work with the College Behavioral and Emotional Health Institute, she seeks to integrate research findings into prevention/intervention programming and university policy. She is the principal investigator of “Understanding Connections Between Behavioral and Emotional Health, Co-Curricular Engagement and Student Success” a project granted with the Virginia Commonwealth University Quest Innovation Programmatic Fund.

Lucía Moure-Rodríguez, is a research technique at the Instituto Biomédico Galicia Sur, at the Innovation Area of the Complejo Hospitalario Universitario de Ourense, She completed her PhD in epidemiology and public health in 2017 from the Universidade de Santiago de Compostela. Her primary research interests focus on alcohol consumption by college students; she published several articles of a 9-year follow-up college student cohort.

Abigail H. Conley is an assistant professor of counselor education and an affiliate faculty member with the Institute of Women’s Health at Virginia Commonwealth University. She is also the coordinator for the college student development and counseling concentration of the MEd in counselor education program. In addition to her work with the School of Education, Conley serves as the assessment committee chair for the Campus Alliance to End Violence, an inter-institutional collaboration between Virginia Commonwealth University (VCU) and the University of Richmond, funded by the Office of Violence Against Women Grant to Reduce Sexual Assault, Domestic Violence, Dating Violence, and Stalking on Campus Program. Her research interests are interpersonal violence (IPV) prevention, survivorship, and healing; stereotype threat and underrepresentation in STEM (science, technology, engineering, and mathematics) fields; spiritual diversity and spiritual development; and best practices in program evaluation and research methodology. She also currently serves as the associate editor of quantitative research for the journal *Counseling and Values*.

Danielle Dick focuses her research on how genetic and environmental influences contribute to the development of patterns of substance use (drinking and smoking) and related behaviors, such as antisocial behavior and depression. She studies questions such as the following: How important are genetic and environmental influences on various aspects of substance use and related disorders? Does the importance of genetic and environmental influences change across development? How do environmental risk factors, such as parental monitoring and home atmosphere, peers, and neighborhood influences, interact with genetic predispositions? Research opportunities involve working on the population-based Finnish Twin studies—the Collaborative Study of the Genetics of Alcoholism and/or the Irish Alcohol Dependence Sample—two projects with the goal of identifying genes involved in alcohol dependence and related disorders. She heads the genotyping component of the Child Development Project, a sample of ~500 children followed with intensive annual assessments from kindergarten through age 25 (ongoing) in which we are studying how identified genes

contribute to trajectories of risk across development. Particularly interested in substance use and mental health outcomes in youth and young adults, she runs a large longitudinal project at VCU called Spit for Science (spit4science.vcu.edu), in which they have enrolled nearly 10,000 VCU students, and are following them longitudinally to study risk and protective factors for substance use and emotional health outcomes across the college years and beyond. She also directs an interdisciplinary institute focused on promoting behavioral and emotional health in college communities through the integration of research with coursework, programming, and policy.

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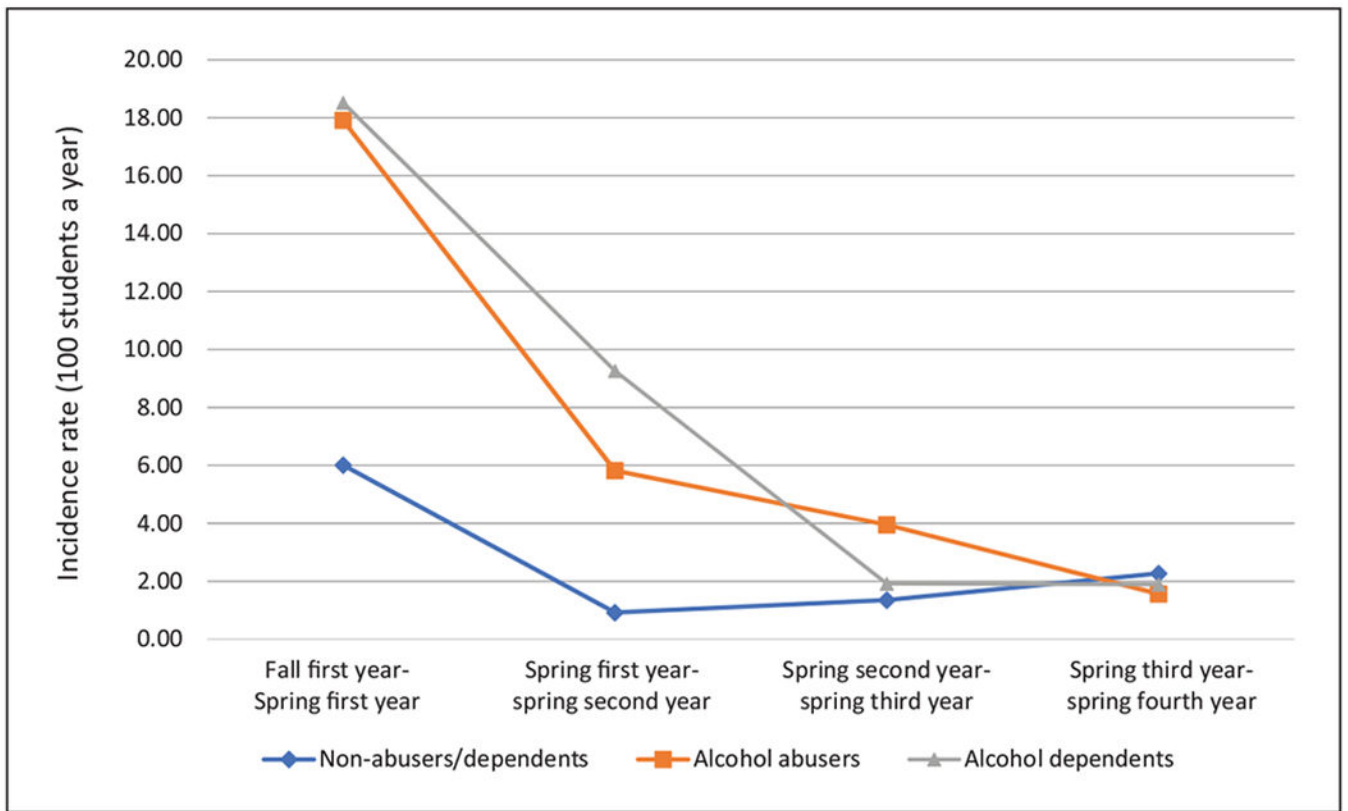


Figure 1. Incidence rate of sexual assault at the different periods by alcohol use of male victims.

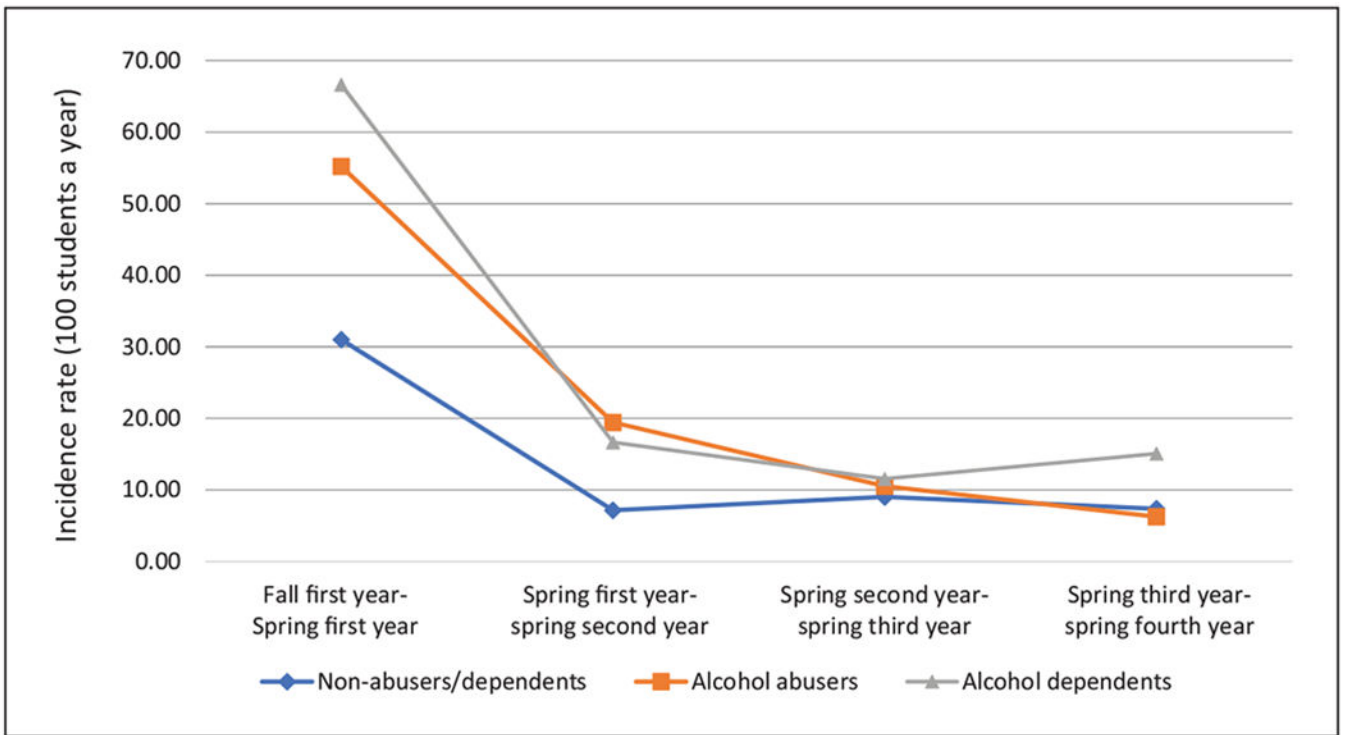


Figure 2.
Incidence rate of physical assault at the different periods by alcohol use of male victims.

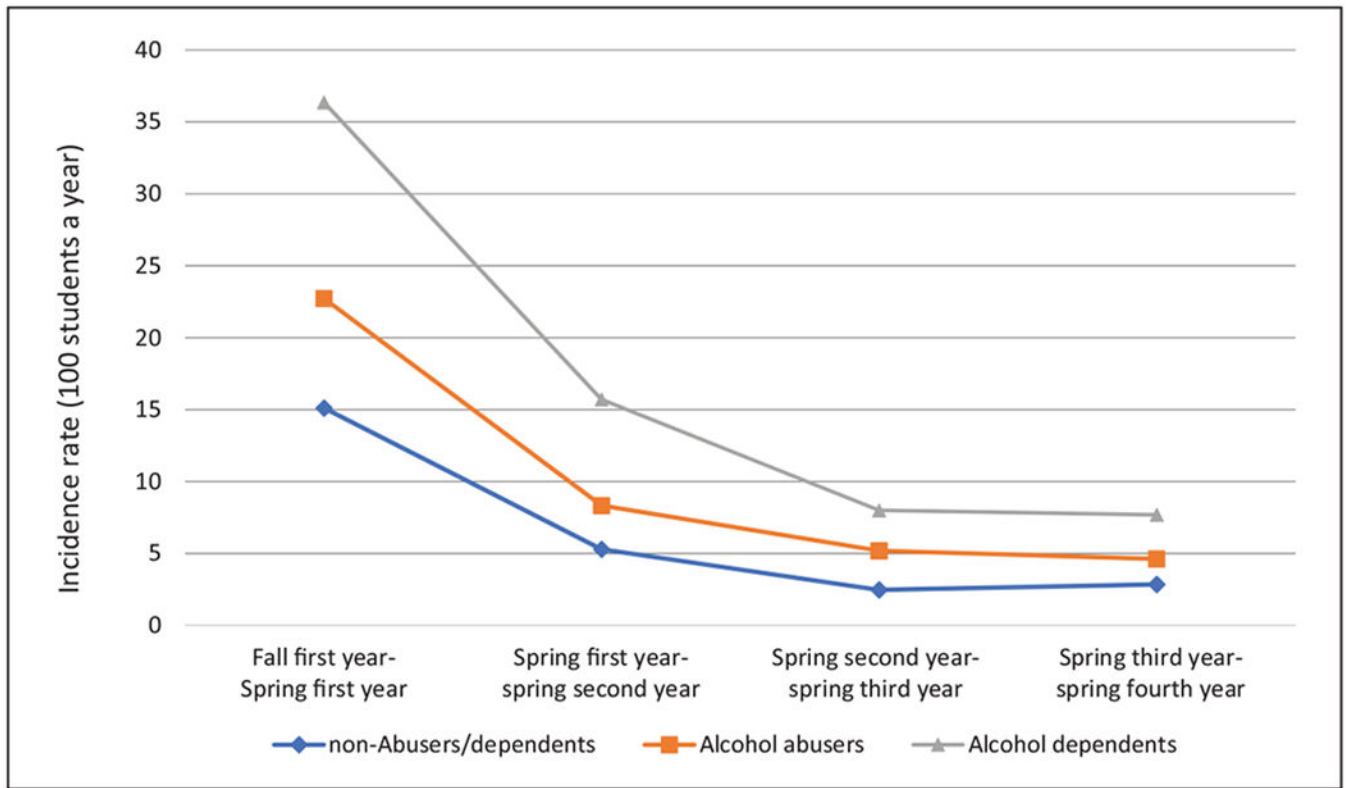


Figure 3. Incidence rate of sexual assault at the different periods by alcohol use of female victims.

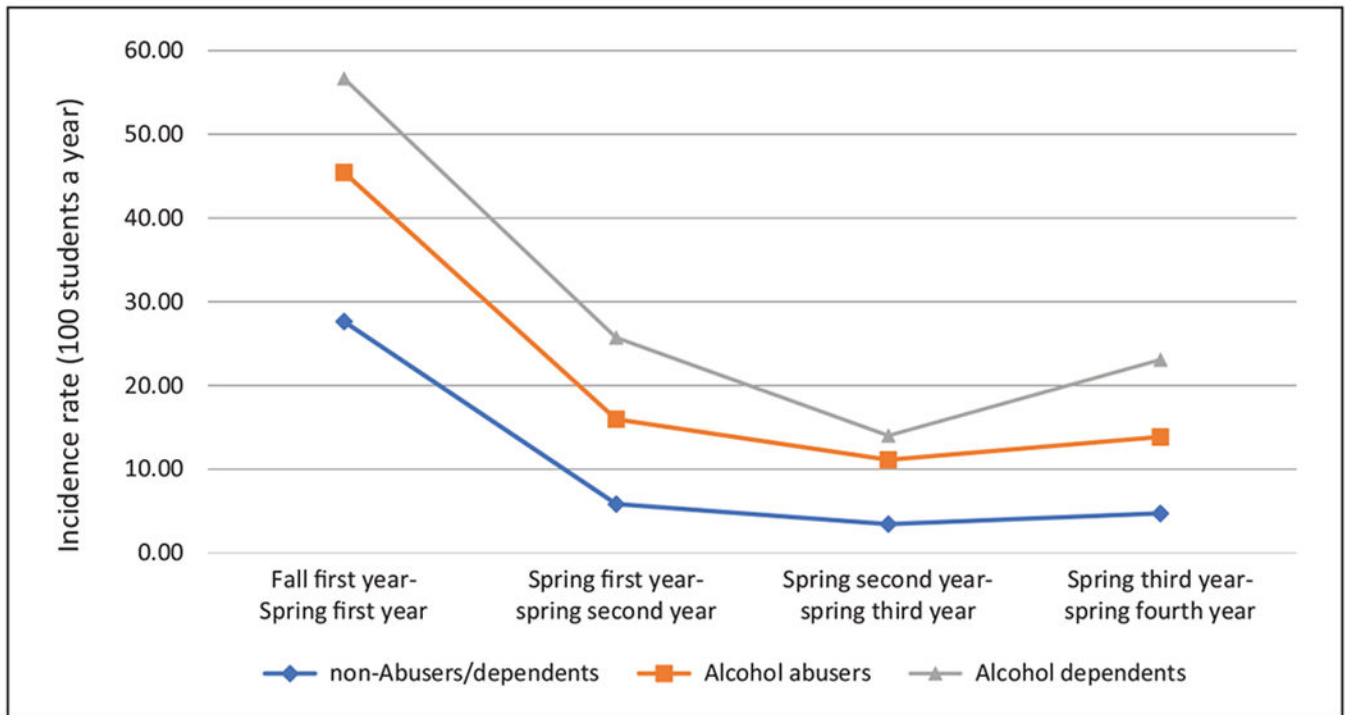


Figure 4. Incidence rate of physical assault at the different periods by alcohol use of female victims.

Table 1.

Characteristics of Female Samples at the Beginning of the Study.

| | Percentage or Mean | | | | <i>p</i> Value |
|--|-----------------------------|---|---|---|-------------------------------------|
| | Initial <i>n</i> = 3,113 | 1-Year Follow-Up <i>n</i> = 1,667 | 2-Year Follow-Up <i>n</i> = 1,315 | 3-Year Follow-Up <i>n</i> = 1,112 | |
| Diagnostic of alcohol use according to <i>DSM-IV</i> | | | | | |
| No abuse and no dependence | 78.8 | 81.8 | 80.6 | 81.2 | |
| Abuse | 14.1 | 12.5 | 13.9 | 12.8 | |
| Dependence | 7.0 | 5.7 | 5.5 | 6.0 | .394 |
| Cannabis consumption | | | | | |
| No | 66.0 | 67.5 | 69.1 | 69.6 | |
| Yes | 34.0 | 32.5 | 30.9 | 30.4 | 0.105/0.010 (lineal association) |
| Ethnicity | | | | | |
| White | 48.9 | 43.7 | 42.7 | 42.5 | |
| Asian | 15.2 | 18.5 | 20.2 | 20.6 | |
| African American | 22.8 | 25.2 | 25.2 | 25.0 | |
| Hispanic | 5.9 | 5.1 | 5.6 | 5.9 | |
| More than one race | 6.7 | 7.0 | 6.7 | 6.0 | <.001 |
| Sexual orientation | | | | | |
| Heterosexual | 88.8 | 90.2 | 90.6 | 90.3 | |
| Homosexual | 2.1 | 2.1 | 1.9 | 1.6 | |
| Bisexual | 8.2 | 7.6 | 7.6 | 8.1 | .915 |
| Residence | | | | | |
| Parents' home | 6.3 | 6.1 | 6.5 | 7.0 | |
| Residence hall | 88.6 | 89.7 | 88.9 | 88.6 | |
| Off-campus housing | 5.2 | 4.2 | 3.9 | 4.4 | .580 |
| Work status | | | | | |
| Currently not working | 72.9 | 73.8 | 74.7 | 74.1 | |
| Part-time | 24.4 | 23.1 | 22.0 | 22.4 | |
| Full-time | 2.7 | 3.1 | 3.3 | 3.5 | .628 |

Note. Spit for Science, Cohorts 1 and 2, Virginia Commonwealth University. *DSM-IV* = *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994).

Table 2.

Characteristics of Male Samples at the Beginning of the Study.

| | Percentage or Mean | | | | <i>p</i> Value |
|--|-----------------------------|---------------------------------------|---------------------------------------|---------------------------------------|-------------------------------------|
| | Initial <i>n</i> = 2,057 | 1-Year Follow-Up <i>n</i> = 883 | 2-Year Follow-Up <i>n</i> = 644 | 3-Year Follow-up <i>n</i> = 540 | |
| Diagnostic of alcohol use according to <i>DSM-IV</i> | | | | | |
| No abuse and no dependence | 74.6 | 75.5 | 76.9 | 73.3 | |
| Abuse | 17.7 | 16.6 | 15.8 | 19.1 | |
| Dependence | 7.8 | 7.6 | 7.3 | 7.6 | .913 |
| Cannabis consumption | | | | | |
| No | 56.9 | 57.7 | 60.7 | 62.9 | |
| Yes | 43.1 | 42.3 | 39.3 | 37.1 | 0.087/0.012 (lineal association) |
| Ethnicity | | | | | |
| White | 55.7 | 54.7 | 53.0 | 52.0 | |
| Asian | 17.7 | 20.9 | 21.8 | 21.8 | |
| African American | 14.9 | 14.6 | 16.7 | 16.3 | |
| Hispanic | 6.8 | 6.2 | 5.6 | 6.3 | |
| More than one race | 5.0 | 3.5 | 2.9 | 3.6 | .110 |
| Sexual orientation | | | | | |
| Heterosexual | 89.8 | 90.5 | 88.8 | 90.2 | |
| Homosexual | 7.1 | 6.7 | 7.8 | 6.2 | |
| Bisexual | 3.0 | 2.8 | 3.3 | 3.6 | .902 |
| Residence | | | | | |
| Parents' home | 7.1 | 7.1 | 5.7 | 6.4 | |
| Residence hall | 85.8 | 88.4 | 89.2 | 88.1 | |
| Off-campus housing | 7.1 | 4.6 | 5.1 | 5.5 | .171 |
| Work status | | | | | |
| Currently not working | 76.7 | 75.6 | 76.5 | 74.9 | |
| Part-time | 21.3 | 22.7 | 22.6 | 24.2 | |
| Full-time | 2.0 | 1.7 | 1.0 | 0.9 | .418 |

Note. Spit for Science, Cohorts 1 and 2, Virginia Commonwealth University. *DSM-IV* = *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994).

Table 3.

Main Characteristics of the Female Participants and Cumulative Incidence of Sexual Assault and Physical Assault.

| | Percentage | | | | | | | | | | | | | | | | | |
|--|------------------|-------|---------------------|-------|--------------------|-------|---------------------|-------|------------------|--------|--------------------|--|---------------------|--|--------------------|--|---------------------|--|
| | Sexual Assault | | | | | | Physical Assault | | | | | | | | | | | |
| | First Year, Fall | | Second Year, Spring | | Third Year, Spring | | Fourth Year, Spring | | First Year, Fall | | First Year, Spring | | Second Year, Spring | | Third Year, Spring | | Fourth Year, Spring | |
| Diagnostic of alcohol use according to DSM-IV | | | | | | | | | | | | | | | | | | |
| No abuse and no dependence | 5.0 | 7.6 | 5.3 | 2.5 | 2.9 | 8.7 | 13.8 | 5.9 | 3.4 | 4.8 | | | | | | | | |
| Abuse | 8.8 | 11.4 | 8.5 | 5.3 | 4.6 | 10.9 | 22.7 | 16.1 | 11.3 | 13.8 | | | | | | | | |
| Dependence | 12.1* | 18.2* | 16.1* | 8.3** | 7.8** | 30.0* | 26.2* | 26.9* | 14.6* | 23.5* | | | | | | | | |
| Cannabis consumption since attending university | | | | | | | | | | | | | | | | | | |
| No | 4.1 | 4.1 | 3.0 | 1.6 | 1.4 | 10.0 | 10.0 | 5.5 | 3.4 | 3.5 | | | | | | | | |
| Yes | 9.5* | 9.5* | 8.4* | 4.4* | 6.3* | 14.7* | 14.7* | 10.8* | 7.0* | 10.9* | | | | | | | | |
| Ethnicity | | | | | | | | | | | | | | | | | | |
| White | 4.9 | 4.9 | 4.6 | 2.8 | 3.1 | 9.0 | 9.0 | 7.8 | 5.4 | 6.2 | | | | | | | | |
| Asian | 3.2 | 3.2 | 4.0 | 1.6 | 1.0 | 12.0 | 12.0 | 7.2 | 4.9 | 2.9 | | | | | | | | |
| African American | 7.4 | 7.4 | 7.3 | 3.5 | 3.9 | 14.1 | 14.1 | 6.3 | 4.4 | 6.5 | | | | | | | | |
| Hispanic | 5.8 | 5.8 | 2.2 | 1.5 | 3.1 | 12.6 | 12.6 | 9.0 | 4.6 | 12.5 | | | | | | | | |
| More than one race | 5.7** | 5.7** | 8.9 | 3.6 | 6.2 | 9.6* | 9.6* | 8.9 | 3.5 | 10.9** | | | | | | | | |
| Sexual orientation | | | | | | | | | | | | | | | | | | |
| Heterosexual | 5.0 | 5.0 | 4.6 | 2.1 | 3.0 | 10.3 | 10.3 | 6.6 | 4.3 | 5.9 | | | | | | | | |
| Homosexual | 2.5 | 2.5 | 14.7 | 4.8 | 0.0 | 12.5 | 12.5 | 23.5 | 9.1 | 17.6 | | | | | | | | |
| Bisexual | 7.7 | 7.7 | 10.0* | 10.2* | 7.0 | 14.7 | 14.7 | 9.8* | 10.3** | 11.5** | | | | | | | | |
| Residence | | | | | | | | | | | | | | | | | | |
| Parents' home | 6.3 | 6.0 | 1.4 | 1.5 | 2.5 | 15.6 | 14.0 | 3.6 | 2.3 | 8.4 | | | | | | | | |
| Residence hall | 5.7 | 5.5 | 5.6 | 2.0 | 2.9 | 12.1 | 11.3 | 7.1 | 4.5 | 6.6 | | | | | | | | |
| Off-campus housing | 8.9 | 8.0 | 5.6 | 3.5 | 3.3 | 16.9 | 15.7 | 8.2 | 5.4 | 6.1 | | | | | | | | |
| Previous victim of the same assault (sexual or physical) | | | | | | | | | | | | | | | | | | |
| No | 3.7 | 2.8 | 3.6 | 1.1 | 1.8 | 9.2 | 3.8 | 3.9 | 2.8 | 3.3 | | | | | | | | |
| Yes | 16.4* | 23.3* | 18.2* | 13.9* | 11.9* | 17.5* | 34.9* | 18.4* | 10.4* | 15.0* | | | | | | | | |
| Total | 5.4 | 5.4 | 5.3 | 2.8 | 3.2 | 10.9 | 10.9 | 7.3 | 4.8 | 6.5 | | | | | | | | |

Note. Spitz for Science, Cohorts 1 and 2, Virginia Commonwealth University. DSM-IV = *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994).

* $p < .01$.

$p < .05$
**

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Table 4.

Main Characteristics of the Male Participants and Cumulative Incidence of Sexual Assault and Physical Assault.

| | Sexual Assault | | | | | Physical Assault | | | | |
|--|------------------|--------------------|---------------------|--------------------|---------------------|------------------|--------------------|---------------------|--------------------|---------------------|
| | Period | | | | | Period | | | | |
| | First Year, Fall | First Year, Spring | Second Year, Spring | Third Year, Spring | Fourth Year, Spring | First Year, Fall | First Year, Spring | Second Year, Spring | Third Year, Spring | Fourth Year, Spring |
| Diagnostic of alcohol use according to DSM-IV | | | | | | | | | | |
| No abuse and no dependence | 2.7 | 3.0 | 0.9 | 1.4 | 3.3 | 10.0 | 15.6 | 7.3 | 9.2 | 7.5 |
| Abuse | 2.7 | 9.0 | 5.9 | 4.1 | 1.6 | 19.0 | 27.8 | 19.6 | 10.8 | 6.5 |
| Dependence | 12.9* | 9.3* | 10.0* | 2.1 | 1.9 | 22.2* | 33.3* | 17.6* | 12.2 | 15.7 |
| Cannabis consumption since attending university | | | | | | | | | | |
| No | 4.0 | 4.0 | 1.8 | 1.3 | 1.5 | 12.4 | 12.4 | 5.4 | 5.3 | 5.2 |
| Yes | 2.5 | 2.5 | 1.8 | 2.1 | 3.2 | 17.1** | 17.1** | 10.9** | 12.9* | 11.9* |
| Ethnicity | | | | | | | | | | |
| White | 2.5 | 2.5 | 1.3 | 1.8 | 2.3 | 13.6 | 13.6 | 10.0 | 9.9 | 8.8 |
| Asian | 3.9 | 3.9 | 3.6 | 0.8 | 2.9 | 13.8 | 13.8 | 5.9 | 6.4 | 5.7 |
| African American | 3.2 | 3.2 | 1.7 | 2.0 | 1.3 | 14.0 | 14.0 | 9.4 | 9.1 | 10.7 |
| Hispanic | 3.0 | 3.0 | 6.1 | 3.0 | 3.0 | 9.7 | 9.7 | 6.1 | 5.9 | 12.1 |
| More than one race | 2.2 | 2.2 | 3.6 | 5.9 | 0 | 15.1 | 15.1 | 14.3 | 11.8 | 0 |
| Sexual orientation | | | | | | | | | | |
| Heterosexual | 2.9 | 2.9 | 2.0 | 1.5 | 2.0 | 14.4 | 14.4 | 9.1 | 8.1 | 8.6 |
| Homosexual | 4.1 | 4.1 | 3.6 | 4.3 | 3.3 | 5.5 | 5.5 | 8.9 | 18.8 | 3.3 |
| Bisexual | 12.9* | 12.9* | 8.7 | 4.8 | 5.6 | 12.9 | 12.9 | 8.7 | 4.8** | 11.1 |
| Residence | | | | | | | | | | |
| Parents' home | 2.9 | 2.5 | 1.3 | 2.1 | 7.0 | 12.5 | 11.5 | 3.8 | 12.2 | 9.1 |
| Residence hall | 3.5 | 3.3 | 1.9 | 0.8 | 0.0 | 15.9 | 15.0 | 9.6 | 6.0 | 3.3 |
| Off-campus housing | 2.0 | 1.7 | 2.5 | 2.1 | 2.0 | 16.3 | 15.3 | 9.1 | 9.3 | 9.0 |
| Previous victim of the same assault (sexual or physical) | | | | | | | | | | |
| No | 2.8 | 1.5 | 1.3 | 0.7 | 1.5 | 12.5 | 5.3 | 5.5 | 6.0 | 5.1 |
| Yes | 6.2 | 32.2* | 19.0* | 15.2* | 8.3** | 15.9 | 31.1* | 16.0* | 14.2* | 14.1* |
| Total | 3.1 | 3.1 | 2.3 | 1.8 | 2.2 | 13.3 | 13.4 | 9.1 | 8.8 | 8.3 |

Note. Spitz for Science, Cohorts 1 and 2, Virginia Commonwealth University. DSM-IV = *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994).

* $p < .01$.

** $p < .05$.

Table 5.

Characteristics of Participants and Risk of Sexual Assault: Generalized Linear Mixed Models.

| | Sexual Assault | | | |
|--|---------------------|---------------------------|----------------------|---------------------------|
| | Females | | Males | |
| | Odds Ratio [95% CI] | | Odds Ratio [95% CI] | |
| | Bivariate | Multivariate ^a | Bivariate | Multivariate ^a |
| Diagnostic of alcohol use according to <i>DSM-IV</i> | | | | |
| No abuse and no dependence | 1 | 1 | 1 | 1 |
| Abuse | 1.75 [1.28, 2.38] | 1.27 [0.84, 1.93] | 2.97 [1.64, 4.38] | 2.21 [1.12, 4.35] |
| Dependence | 3.13 [2.17, 4.51] | 2.16 [1.34, 3.48] | 3.93 [2.28, 6.80] | 2.73 [2.22, 6.08] |
| Cannabis consumption in the last 12 months | | | | |
| No | 1 | 1 | 1 | |
| Yes | 2.73 [2.23, 3.41] | 1.60 [1.16, 2.20] | 0.82 [0.57, 1.18] | |
| Ethnicity | | | | |
| White | 1 | 1 | 1 | 1 |
| Asian | 0.59 [0.42, 0.83] | 0.91 [0.53, 1.54] | 1.50 [0.99, 2.26] | 2.24 [1.08, 4.64] |
| African American | 1.46 [1.16, 1.82] | 1.90 [1.34, 2.69] | 1.18 [0.73, -1.90] | 1.27 [0.54, -3.01] |
| Hispanic | 0.99 [0.63, 1.54] | 0.82 [0.39, 1.71] | 1.63 [0.90, 2.96] | 1.88 [1.36, 4.62] |
| More than one race | 1.41 [0.98, 2.03] | 2.61 [1.61, 3.43] | 1.15 [0.50, 2.65] | 1.36 [0.30, 6.36] |
| Sexual orientation | | | | |
| Heterosexual | 1 | 1 | 1 | 1 |
| Homosexual | 1.28 [0.60, 2.75] | 1.40 [0.59, 3.30] | 1.77 [0.93, 3.36] | 2.28 [1.01, 5.19] |
| Bisexual | 2.39 [1.76, 3.25] | 1.71 [1.15, 2.54] | 4.20 [2.18, 8.08] | 2.34 [0.84, -6.52] |
| Sexual assault: previous experience | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 8.00 [6.54, 9.78] | 6.70 [4.95, 9.05] | 15.60 [10.90, 22.27] | 12.00 [6.51, 22.11] |
| Period | | | | |
| First year, fall | 1 | 1 | 1 | |
| First year, spring | 1.00 [0.80, 1.25] | 1.44 [0.91, 2.27] | 1.00 [0.70, 1.43] | |
| Second year, spring | 0.99 [0.76, 1.30] | 1.10 [0.70, 1.74] | 0.74 [0.44, 1.24] | |
| Third year, spring | 0.51 [0.35, 0.73] | 0.45 [0.23, 0.76] | 0.57 [0.30, 1.10] | |
| Fourth year, spring | 0.59 [0.41, 0.86] | 0.53 [0.31, 0.90] | 0.70 [0.37, 1.34] | |

Note. Spit for Science, Cohorts 1 and 2, Virginia Commonwealth University. CI = confidence interval; *DSM-IV* = *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994).

^aAdjusted by all variables included in the column.

Table 6.

Characteristics of Participants and Risk of Physical Assault: Generalized Linear Mixed Models.

| | Physical Assault | | | |
|---|---------------------|---------------------------|---------------------|---------------------------|
| | Females | | Males | |
| | Odds Ratio [95% CI] | | Odds Ratio [95% CI] | |
| | Bivariate | Multivariate ^a | Bivariate | Multivariate ^a |
| Diagnostic of alcohol use according to DSM-IV | | | | |
| No abuse and no dependence | 1 | 1 | 1 | 1 |
| Abuse | 2.41 [1.90, 3.04] | 1.70 [1.27, 2.29] | 1.97 [1.51, 2.56] | 1.52 [1.14, 2.03] |
| Dependence | 4.73 [3.57, 6.25] | 2.88 [2.00, 4.14] | 2.21 [1.60, 3.07] | 2.03 [1.41, 2.93] |
| Cannabis consumption in the last 12 months | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 1.79 [1.53, 2.09] | 1.35 [1.07, 1.70] | 1.64 [1.36, 1.96] | 1.40 [1.10, 1.79] |
| Ethnicity | | | | |
| White | 1 | 1 | 1 | |
| Asian | 0.78 [0.53, 1.15] | 1.24 [0.87, 1.72] | 0.83 [0.67, 1.04] | |
| African American | 0.87 [0.64, 1.19] | 1.59 [1.22, 2.07] | 1.01 [0.80, 1.28] | |
| Hispanic | 1.05 [0.76, 1.45] | 1.72 [1.12, 2.63] | 0.73 [0.50, 1.05] | |
| More than one race | 1.09 [0.81, 1.47] | 1.36 [0.89, 2.10] | 1.11 [0.75, 1.63] | |
| Sexual orientation | | | | |
| Heterosexual | 1 | 1 | 1 | |
| Homosexual | 2.28 [1.44, 3.60] | 2.20 [1.25, 3.86] | 0.76 [0.50, 1.17] | |
| Bisexual | 1.76 [1.36, 2.28] | 1.18 [0.84, 1.66] | 0.91 [0.50, 1.65] | |
| Physical assault: previous experience | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 6.12 [5.29, 7.07] | 5.82 [4.66, 7.26] | 3.59 [3.04, 4.22] | 3.21 [2.56, 4.02] |
| Period | | | | |
| First year, fall | 1 | 1 | 1 | 1 |
| First year, spring | 1.00 [0.85, 1.17] | 1.37 [0.97, 1.93] | 1.00 [0.83, 1.20] | 1.45 [1.07, 1.96] |
| Second year, spring | 0.65 [0.52, 0.81] | 0.69 [0.47, 1.00] | 0.64 [0.49, 0.84] | 0.57 [0.39, 0.83] |
| Third year, spring | 0.43 [0.41, 0.55] | 0.35 [0.23, 0.54] | 0.52 [0.46, 0.84] | 0.63 [0.43, 0.94] |
| Fourth year, spring | 0.57 [0.43, 0.74] | 0.47 [0.32, 0.70] | 0.58 [0.41, 0.82] | 0.51 [0.33, 0.78] |

Note. Spit for Science, Cohorts 1 and 2, Virginia Commonwealth University. CI = confidence interval; *DSM-IV* = *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994).

^aAdjusted by all variables included in the column.