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The Age-varying Association of Student Status with Excessive Alcohol Use: Ages 18 to 30 Years

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Abstract

Background—There is a well-known link between attending college and engaging in excessive alcohol use. This study examines in a national sample how the association between student status and excessive alcohol use changes from late adolescence through young adulthood and whether the association of student status with excessive alcohol use is different for students residing with versus away from parents during the school year.

Methods—This study used cross-sectional data from the National Epidemiologic Study on Alcohol and Related Conditions, a nationally representative sample of noninstitutionalized civilian adults residing in the United States. Our analyses included non-high school young adults who were ages 18 to 30 years ($n=8,645$). Excessive alcohol use included past year (1) *high-intensity drinking* (men: 10 standard drinks; women: 8) and (2) *exceeding weekly drinking guidelines* (men: >14 drinks per week; women: >7). Students who resided away from their parents and students who lived with their parents during the school year were compared to non-students.

Results—Analyses using time-varying effect modeling (TVEM) showed that the relationship of student status with excessive alcohol use varied as a function of age. Overall student status lost its association with excessive alcohol use in the early 20s, after controlling for demographics and other adult social roles. The association between student status and excessive alcohol use also varied considerably across age and depending on whether the student was residing with or away from parents.

Conclusions—The association of student status with excessive alcohol use is heterogeneous in terms of both age and living arrangements, suggesting opportunities for interventions targeting problematic alcohol use. Future research should examine additional sources of heterogeneity of students in their risk for excessive alcohol use.

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Keywords

alcohol; high-intensity drinking; college; time-varying effect models

INTRODUCTION

Excessive alcohol use is responsible for 88,000 deaths annually in the U.S. (Centers for Disease Control and Prevention, 2004). Acute consequences of excessive alcohol use include motor vehicle accidents and alcohol toxicity, and long-term negative consequences include heart and liver disease and certain cancers leading to significant morbidity and premature mortality (e.g., Bouchery et al., 2006; Rehm et al., 2009). Young adults are at particularly high risk of engaging in excessive alcohol use (e.g., White et al., 2006). In 2014, for instance, 38% of young adults 18 to 25 years old reported engaging in heavy episodic drinking (HED; 4+/5+ drinks on a single occasion) in the past month and 11% reported heavy alcohol use, defined as five or more drinks on five or more occasions in the past 30 days (Li et al., 2015). Excessive alcohol use, especially at this age, is concerning given this is a period of continued brain development (Brown et al., 2008; Spear, 2007), and a time when risk for onset of an alcohol use disorder and alcohol-related injury is high (Hingson et al., 2003; Li et al., 2004).

The uptick in excessive alcohol use during the late teens and early twenties is often attributed to college matriculation (Staff et al., 2014). Theoretically, the positive association between excessive alcohol use and college going may reflect: (1) a change to an environment in which social norms that discourage excessive alcohol use are relaxed and may encourage excessive alcohol use (e.g., Weitzman et al., 2003); (2) an overall absence of social roles and obligations to family and work that would otherwise conflict with substance use; (3) distance from capable guardians (i.e., parents, relatives, teachers) who limit or prevent excessive alcohol use; (4) an increase in access to alcohol (Weitzman et al., 2003; Wechsler et al., 2002); or (5) a general increase in risk-taking behavior during the late teen years (Carter et al., 2010). Empirically, some studies show that excessive alcohol use, as well as illicit drug use, increases during periods of college attendance (Staff et al., 2014; White et al., 2006), whereas others find only small differences in substance use between students and non-students (Chen and Dufour, 2004; Lanza and Collins, 2006; O'Malley and Johnston, 2002).

An important limitation of most prior research on college attendance/enrollment and excessive alcohol use is the focus on college students who are between 18 and 22 years old and who attend post-secondary institutions where living away from parents during periods of school attendance is the norm. However, increasingly, there is heterogeneity in whether and when individuals participate in post-secondary education (Bell et al., 2007; Schulenberg et al., 2003). Currently, over a third of postsecondary students are age 25 or older, and this age group of older students is expected to continue to increase (Snyder and Dillow, 2013). In addition, the proportion of young adults residing with their parents has increased to 36%, approximately a third of whom are college students (Fry, 2013).

Focusing on heterogeneous samples of young adults in varied student and residential statuses is important because the link between attending college and engaging in excessive alcohol use may vary depending on the age and context of the individual (Wechsler et al., 1995). The association of student status with excessive alcohol use may vary across developmental age due to normative developmental changes in the prevalence and meaning of being a student, as well as the frequency and norms of alcohol use across the late teens and the twenties. For instance, mid to late 20s college students may have a lower risk of excessive alcohol use compared to more “traditional” late adolescent first-year students. Those who have already joined the workforce, married, or become a parent, for example, may be less likely to engage in excessive alcohol use regardless of their student status.

In addition, the risk of excessive alcohol use may be lower among college students who reside with their parents while attending school. For instance, college students who reside with their parents may face a lower risk of excessive alcohol use due to reduced contact with the college campus environment and social context as well as potentially increased levels of parental monitoring or knowledge. Research based on samples of college students has shown that students living at home with their parents engage in less excessive alcohol use compared to students living on campus (Dawson et al., 2004; Gfroerer et al., 1997; Harford et al., 2002; Valliant and Scanlan, 1996), though only one study compared the relative risk of excessive alcohol use among more or less traditional students to nonstudents and none examined how these differences might change across age. Considering both the social and developmental context in which being a student occurs is important for understanding its influence on excessive alcohol use more fully.

This study examines in a national sample how the association between student status and excessive alcohol use changes from late adolescence to young adulthood. We then separately examine this age-varying association by contrasting students who reside with parents and students who live away from their parents, each with non-students, to determine whether there is a different association of student status with excessive alcohol use for these two student groups.

METHODS

Study population and design

This study used data from the first wave of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a nationally representative study of non-institutionalized civilian adults in the United States that used a multistage stratified probability sampling method (Grant and Dawson, 2006; Grant et al., 2003). Face-to-face interviews conducted by trained interviewers achieved a response rate of 81%, providing a sample of 43,093 individuals. The NESARC study received full ethical review and approval by the U.S. Census Bureau and U.S. Office of Management and Budget. Due to the focus on alcohol use across the transition to adulthood, the current study focused on individuals aged 18 to 30 years who were not currently enrolled in high school ($N=8,645$). NESARC wave 1 was used because it contained key information about student residential status. The data are cross-sectional not allowing us to fully disentangle age, period, and cohort effects; however,

the span of ages included in this analysis enables us to examine differences in associations across the young adult years.

Measures

We first examined *student status* by contrasting those who were currently enrolled in post-secondary education (either part- or full-time) to those who were not. We then compared three groups of young adults, contrasting non-students with students living away from parents and with students residing with parents. Students living away from parents included those who lived in: a dormitory, an apartment or house on or off campus, or a Greek residence.

Excessive alcohol use was measured with two indicators: *high-intensity drinking*, defined as one or more past-year occasions in which men consumed 10 standard drinks (8 for women; Patrick et al., 2016; White et al., 2006) and *exceeding weekly drinking guidelines*, defined as >14 drinks per week on average for men (>7 for women; National Institute of Alcoholism and Alcohol Abuse, 2004). A standard drink was defined as 0.6 fluid ounces of alcohol, which is the equivalent of 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of distilled spirits. Outcomes were chosen to represent two modes of at-risk drinking: a minimum of a single occasion (in the past year) of at-risk drinking with potential acute and long-term consequences (high-intensity drinking) and a more regular pattern of at-risk drinking that is associated with greater long-term physical health risks (cancer, etc.) as well as a heightened risk of developing an alcohol use disorder (National Institute on Alcohol Abuse and Alcoholism, 2004). High-intensity drinking was assessed rather than the more common outcome of heavy episodic drinking (4+/5+ drinks for women/men) because of recent research suggesting that higher thresholds more accurately reflect at-risk drinking occasions among young adults and pose even greater concern to public health (Naimi et al., 2010; Patrick et al., 2016). We compared the overlap in the two indicators of at risk drinking and found that only approximately one-half of those who reported engaging in high-intensity drinking also reported exceeding weekly drinking guidelines; conversely, approximately two-thirds of those who reported exceeding weekly guidelines also reported engaging in high-intensity drinking.

We included *gender*, *race* (White vs. not), *marital status* (married vs. not), *parental status* (parent vs. not), and *employment status* (employed part- or full-time vs. not) as control variables. Age to the nearest year was assessed by self-report ($M=24.1$, $SD=3.8$). These variables are associated both with student status and with excessive alcohol use (e.g., Bachman et al., 1997; Chen and Dafour, 2004; Caetano and Kaskutas, 1995). We felt it particularly important to include other adult social roles prominent during young adulthood in order to isolate the association of student status with excessive alcohol use across age.

Analysis

Analyses were conducted using time-varying effect modeling (TVEM), a type of non-parametric spline regression that can be used to estimate regression coefficients as a function of continuous time (e.g., age; Li et al., 2015).

First, using TVEM, we separately estimated the odds of excessive alcohol use (high-intensity drinking, exceeding weekly drinking guidelines) as a function of age using intercept only models. This approach is similar in spirit to growth curve analysis but the change in rates across age need not be expressed as a parametric function (see e.g., Evans-Polce et al., 2015). The presentation of these first results show odds converted to prevalence rates to facilitate interpretation of the age trends in excessive alcohol use. Prevalence estimates are shown with solid lines and associated 95% confidence intervals with dashed lines. The remaining analyses described next show the age-varying main effects of student status (student vs. not) on excessive alcohol use for individuals at different ages throughout young adulthood, both with and without controls for gender, race, employment, marriage, and parenthood to the model. Finally, we compared three categories of student status in their age-varying association with excessive alcohol use, contrasting students living away from parents and students living with parents with nonstudents. All models were run in SAS 9.3 using the %TVEM macro (Li et al., 2015; TVEM SAS Macro Suite [Version 3.1.0], 2015). P-spline smoothing was used for all models; this approach automatically selects the optimal form of each coefficient function. TVEM results are presented as figures because the coefficients are estimated as a function of continuous time, making the number of coefficients across age too large to present in tables. In preliminary (unlisted) analyses, we examined potential moderation by gender in our analyses but did not find any evidence for gender differences. Similarly, we compared those attending school full-time versus part-time but did not find any differences in excessive alcohol use between the two groups.

RESULTS

Rates of excessive alcohol use across age

The overall prevalence of high-intensity drinking and exceeding weekly drinking guidelines across ages 18 to 30 years is shown in Figures 1a and 1b. For all TVEM figures, solid lines represent the prevalence or odds ratio estimate and dashed lines represent 95% confidence intervals. Both measures of excessive alcohol use evidenced an increase in prevalence from age 18 through the early 20s, peaking at more than 20% for any past-year high-intensity drinking and 15% for regularly exceeding weekly drinking guidelines, with a decrease in prevalence thereafter. While both measures of excessive alcohol use peak at a similar age, the increase from 18 to 21 is greater for high-intensity drinking (14.5% to 20.5%) than for exceeding weekly drinking guidelines (12.2% to 14.8%).

Associations of student status with excessive alcohol use

Student status had a significant and age-varying association with both high-intensity drinking and exceeding weekly drinking guidelines. In terms of high-intensity drinking, before including controls (Figure 2a), being a student was positively associated with an increased odds of high-intensity drinking only from ages 21.0 to 22.7 years, with a peak in the association at age 21.8 years, when students had an estimated 1.25 greater odds of engaging in high-intensity drinking compared to non-students. At ages 18.0 to 18.6 years and 26.1 to 29.0 years there was a negative association such that students were less likely to engage in high-intensity drinking compared to non-students. After controlling for socio-demographics and other social roles, being a student was not positively associated with high-

intensity drinking at any age (Figure 2b); however, the negative association with high-intensity drinking remained at ages 18 to 19.6 years and 26.5 to 28.7 years.

Results were similar for exceeding weekly drinking guidelines: Before including controls, from ages 20.7 to 23.0 years being a student was associated with greater odds of exceeding these guidelines (Figure 3a). However, from ages 26.7 to 29.0 years being a student was associated with lower odds of exceeding weekly drinking guidelines. Between ages 23.0 and 26.7 years and after age 29.0 years, there was no association of student status with exceeding weekly drinking guidelines. Once demographic and other social roles were controlled, student status was associated with a decreased likelihood of exceeding weekly drinking guidelines between ages 18.0 to 19.3 years and ages 26.1 to 29.2 years compared to nonstudents (Figure 3b). Moreover, with covariates in the model, there was no age at which being a student was associated with an increased risk of exceeding weekly guidelines.

Examining heterogeneity of students

We then divided students into those residing with parents during the school year and those living away from parents. Even after controlling for demographic and other social roles, we found substantial differences when comparing each student group to non-students in terms of high-intensity drinking (Figure 4) and exceeding weekly drinking guidelines (Figure 5). These differences were largest in the early 20s. Students living with parents were less likely to engage in high-intensity drinking than non-students across a substantial portion of the age range from 18.0 to 26.5 years. In contrast, from ages 21.3 to 22.6 years students living away from parents were more likely to engage in high-intensity drinking compared to nonstudents. However, in the later 20s students living away from parents were more similar to those living with parents. From ages 27.3 to 28.7 students living away from parents had lower odds of engaging in high-intensity drinking compared to nonstudents.

Students living with parents were less likely to exceed weekly drinking guidelines compared to non-students between 18.0 to 27.8 years, whereas students living away from parents were significantly more likely to exceed weekly drinking guidelines compared to non-students at ages 20.4 to 22.2 years.

DISCUSSION

Consistent with previous research this study found that overall being a student was positively associated with excessive alcohol use, although this was true only at certain ages and for certain student groups. However, the present focus on a wider age range of students up to age 30, controlling for variation in family and employment roles, and contrasting students living with parents versus away from home led to major qualifications and even reversals of this conclusion. Thus, this study makes multiple unique contributions to this area of research.

Notably, a positive association between student status and excessive alcohol use was only evident during the traditional college ages of the early 20s and only prior to controlling for potential confounders. In the second half of this decade, the association with excessive alcohol use actually reversed direction such that being a student was associated with a lower

likelihood of both high-intensity drinking and exceeding weekly drinking guidelines. Prior studies examining the relationship between student status and drinking have tended to focus on students aged 18 to 24 years (e.g., Hingson et al., 2005). The present analyses demonstrate that by focusing on a wider range of ages that is becoming increasingly common in the current post-secondary population, we observe important age-related heterogeneity in the relationship between student status and excessive alcohol use. Being a student during the years immediately following high school may present the most opportunities and risk for engaging in excessive alcohol use, due to a confluence of individual, family, peer, and cultural risk factors (Schulenberg and Maggs, 2002). After age 22 years, the prevalence of excessive alcohol use in the general population declines and student status may exert less, or a different, influence in the presence of increased personal and social maturity, different social norms, and competing and more responsible social roles. For individuals over age 22 years, instead of creating opportunities for excessive alcohol use, being a student may present time constraints that impede the ability to engage in excessive alcohol consumption. We note that, although we focused on high-intensity drinking and exceeding weekly drinking guidelines as two distinct indicators with strong public health importance, we also conducted parallel (results not shown) analyses predicting heavy episodic drinking. Results were similar, although student status showed an even stronger positive relationship with HED in the early 20s; which is consistent with prior research on heavy drinking among traditional-aged college students (Staff et al., 2014; White et al., 2006).

Second, this study also demonstrated that once other social roles and demographic characteristics were controlled, the positive association of student status with excessive alcohol use in the early 20s was no longer statistically significant; however, the negative association in the later 20s remained. This suggests that other major social roles such as marriage, employment, and parenthood, as well as demographic characteristics, may explain the association between being a student and excessive alcohol use. Thus, it may not be student status *per se* that is related to higher odds of excessive alcohol use in the early 20s but rather an absence of the demands of other social roles such as the commitments of full-time employment, marriage, and parenthood (Maggs et al., 2012).

Finally, we found that the age-varying association between student status and excessive alcohol use was considerably different depending on whether the student lived at home with parents or lived away from home. Other health behaviors have been shown to vary as a function of living situation among traditional aged students, including sleep quality (Stuber and Galea, 2009), nutrition and physical activity (Small et al., 2013), and weight gain (Kapinos and Yakusheva, 2011). Current trends toward later financial and residential independence may pose challenges for young adults and their parents sharing a living space (e.g., Danziger and Rouse, 2007; Settersten et al., 2005), but the present findings suggest they may also reduce risk for hazardous alcohol use as well as other unhealthy behaviors. We argue that research on college students in general, and on links between student status and alcohol use in particular, should better reflect the increasing age, socioeconomic, ethnic, geographic, and other heterogeneity in student populations (Snyder and Dillow, 2013). The positive relationship typically found in studies does not seem to hold for all students, but

rather a subset of students of traditional college age who move away from home after high school to attend college.

Taken together, the findings suggest that being a student is not a risk factor for excessive alcohol use across all ages and for all types of students. This is particularly important to consider in the coming years when enrollment in postsecondary education is projected to rise faster among those over (vs. under) age 25 years (Snyder and Dillow, 2013). Developers of prevention programs aiming to improve health of those in post-secondary education should thus look beyond the major health risks facing traditional students. For example, the rapidly increasing popularity of online courses and degree programs is likely to further differentiate the contextual college experience, with potentially very different implications for drinking and for other health behaviors.

Despite important strengths such as leveraging data from a large, nationally-representative sample of young adults and flexibly examining the age-varying effects of student status, this study has several limitations. First, we used cross-sectional data and thus did not prospectively examine the association of student status with later excessive alcohol use. However, previous longitudinal research suggests that the direction of influence is from student status to drinking rather than the reverse (Staff et al., 2014). Second, although we controlled for gender, race/ethnicity, marriage, employment, and parenthood in our analyses, additional third variables may confound the association between student status and excessive alcohol use. Third, due to small numbers we did not distinguish between types of residence among those living away from parents such as those living in Greek residences in which rates of excessive alcohol use may be higher than other types of living situations on college campuses (Wechsler et al., 1997). Similarly, we were not able to disentangle 2-year and 4-year college or undergraduate and graduate students. However, we feel that our broad inclusion of student is a strength in these analyses and allows the examination of student status beyond the “traditional” 4-year undergraduate college student. Fourth, the NESARC dataset is based on a sample of young adults in 2001 and 2002, and thus underrepresents the number of current college students who are older or who are residing with their parents. The historical context of the data is particularly important given the fact that rates of excessive alcohol use among young adults (though not high-intensity drinking; Terry-McElrath & Patrick, 2016) have decreased in recent years and perceived harm of drinking has increased (Johnston et al., 2015). Still, the relationship between student status and excessive alcohol use may not have changed. This should be examined in more contemporary data.

In conclusion, this study’s key finding is that that student status does not universally confer similar risk for excessive alcohol use across the ages of 18 to 30 years or across living situations. Outside the “traditional” four years of college attendance immediately following high school, and for those who live with parents, the likelihood of excessive alcohol use was not higher among students than non-students. Future research should examine the importance of living situation among non-student young adults with regard to risk for excessive alcohol use. These findings demonstrate the pivotal importance of considering developmental age as well as context when examining factors associated with alcohol use. This research also suggests that while postsecondary educational institutions remain important venues for alcohol prevention efforts, particularly for traditionally-aged young

adult students and those living away from their parents, health promotion efforts for the increasingly heterogeneous population of students may require a wider focus.

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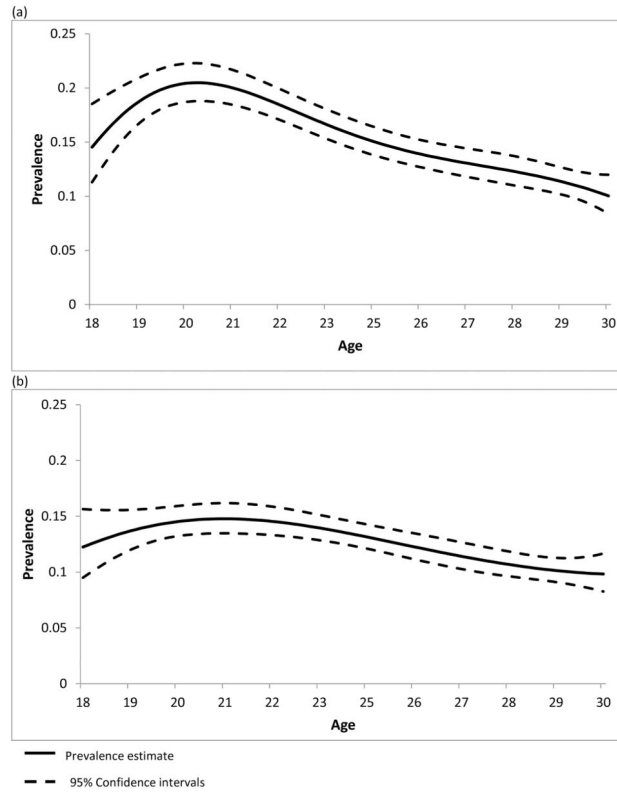


Figure 1. Prevalence of (a) high-intensity drinking and (b) exceeding weekly drinking guidelines across age.

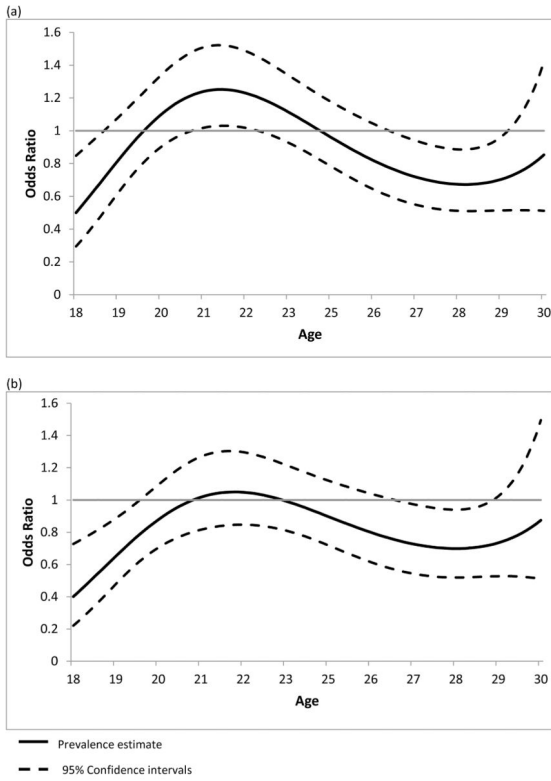


Figure 2. Age-varying association of student status with high-intensity drinking (a) unadjusted and (b) adjusted.

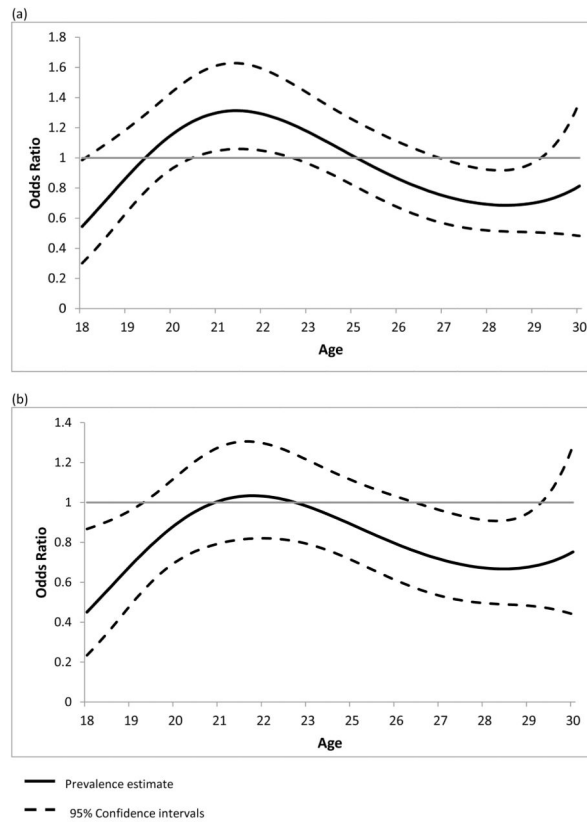
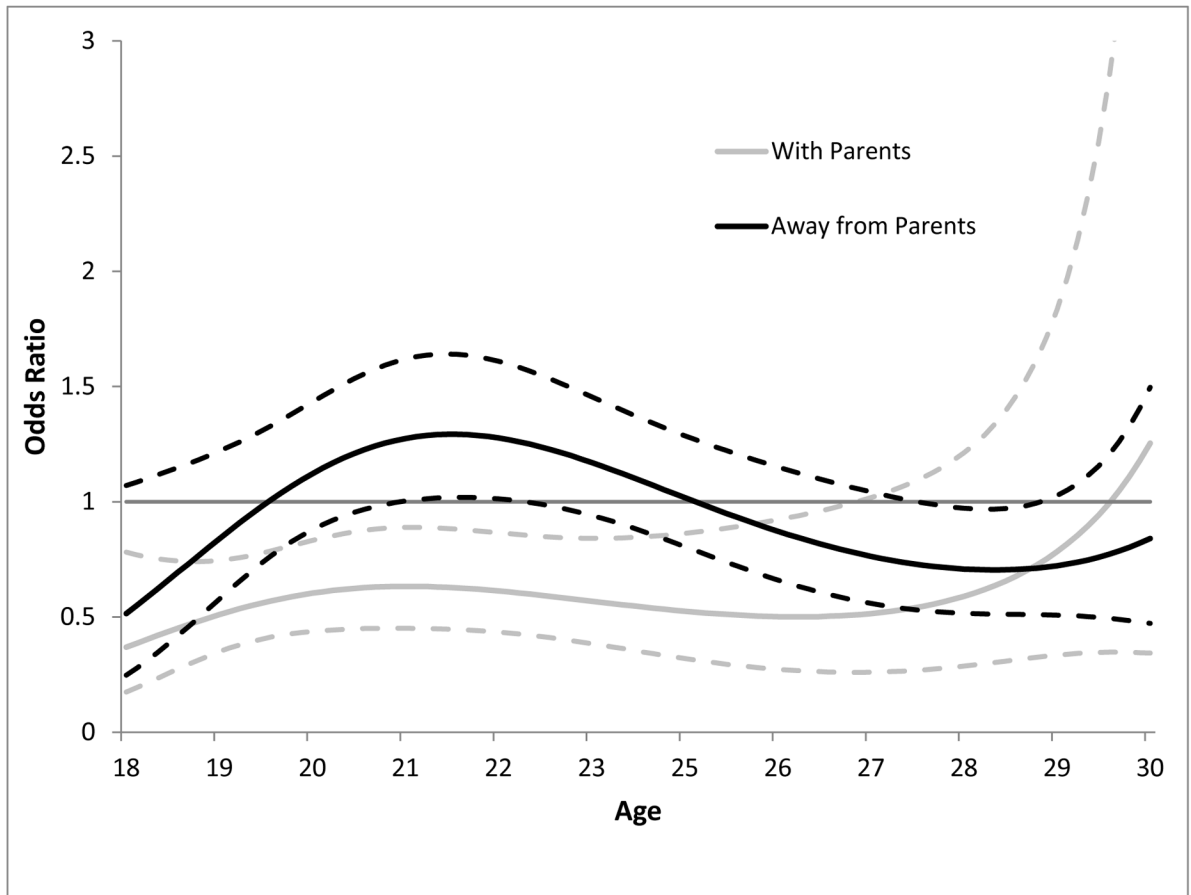


Figure 3. Age-varying association of student status with exceeding weekly drinking guidelines (a) adjusted and (b) unadjusted.



— Prevalence estimate
- - 95% Confidence intervals

Figure 4. Adjusted age-varying association of students living with parents and students living away from parents compared to nonstudents with high-intensity drinking.

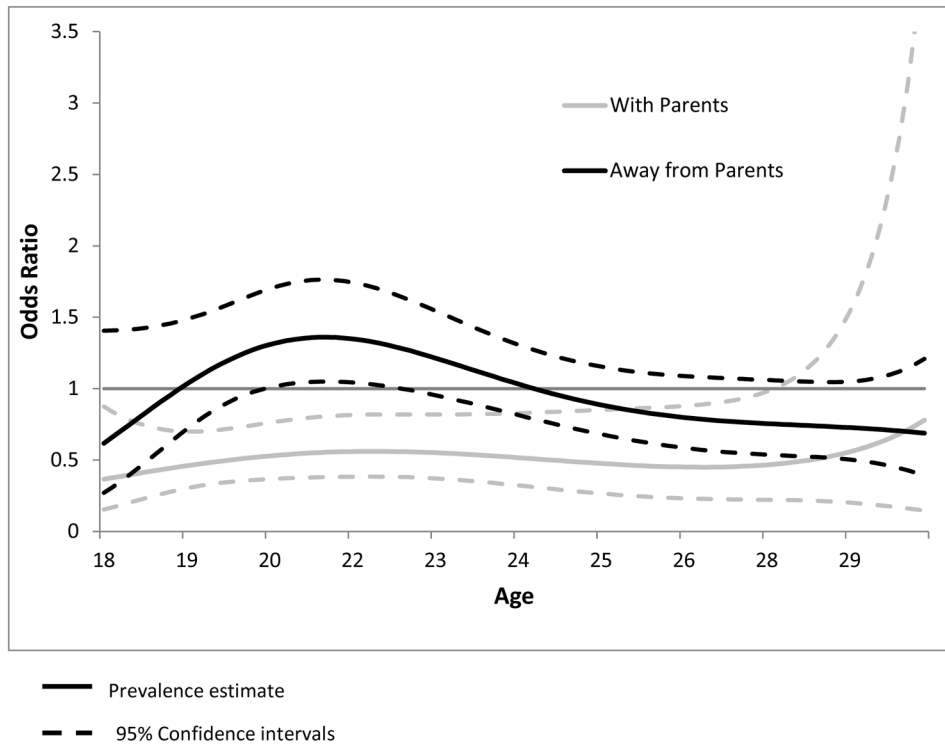


Figure 5. Adjusted age-varying association of students living with parents and students living away from parents compared to nonstudents with exceeding weekly drinking guidelines.