Does Attending a College With More Heavy Drinking Peers Increase Risk of Heavy Drinking and Consequences? A Prospective National Analysis

Allecia E. Reid
Colby College and University of Massachusetts, Amherst

David W. Hancock
University of Massachusetts, Amherst

Caroline Minott
Colby College

Stephanie E. Moser
University of Michigan School of Medicine

Heavy drinking in college increases risk for negative consequences. Among a national sample of high school abstainers and moderate drinkers, we hypothesized that the extent of heavy drinking among students on campus would be among the strongest predictors of first semester heavy drinking and consequences, relative to personal approval of alcohol use and sociability and impairment outcome expectancies. We expected these psychological factors to moderate effects of campus heavy drinking. Data from 90,455 abstainers and 97,168 moderate drinkers matriculating at 245 and 242 universities, respectively, were drawn from AlcoholEdu (EverFi, 2013), a web-based intervention completed by most first-year students at participating universities. Students reported alcohol use, approval, expectancies, and covariates prior to enrollment (Time 1). During the first semester (Time 2), abstinence, moderate drinking, or heavy drinking, and negative consequences experienced were reassessed. Campus heavy drinking reflected the percentage of other students attending the same school who engaged in heavy drinking at Time 2. In multilevel multinomial logistic regression models, campus heavy drinking was consistently among the strongest predictors of heavy drinking and consequences: It predicted an 83% and 82% increase in risk of heavy drinking and a 106% and 91% increase in risk of consequences among students who were abstainers and moderate drinkers at Time 1, respectively. There were few interactions among campus heavy drinking and psychological factors. Post hoc analyses supported that students did not self-select into heavier drinking environments. Campus heavy drinking is a key predictor of first semester alcohol use and an important intervention target.

Keywords: social influence, attitudes, heavy drinking, alcohol abuse, college students

Supplemental materials: http://dx.doi.org/10.1037/adb0000639.supp

The transition from high school to college is often marked by increased alcohol use (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016; Sher & Rutledge, 2007). This includes engagement in heavy drinking, typically defined in the United States as five or more drinks in a sitting for men and four or more drinks in a sitting for women. Following college matriculation, 42% of students report heavy drinking, surpassing the prevalence of heavy drinking among their noncollege attending peers (Johnston et al., 2016; Slutske et al., 2004). Heavy drinking in college is associated with greater risk of injuries and later diagnosis of alcohol and substance use disorders (Chassin, Pitts, & Prost, 2002; Hingson, Zha, & Weitzman, 2009). Moreover, the transition into college is a particularly critical time, as most who engage in heavy drinking in the first semester maintain heavy drinking for the remainder of college (Sher, Jackson, & Steinley, 2011). Consequently, identifying the factors that promote heavy drinking and, by extension, experiencing negative alcohol-related consequences during the transition into college remains an important step toward the development of interventions to address these factors.

Theories of behavior suggest that the extent of heavy drinking among others in the social environment is likely to affect personal engagement in heavy drinking (Bandura, 1998; Bronfenbrenner, 1992). However, we have limited knowledge of whether heavy drinking is influenced by the actual, rather than perceived, behav-

ior of peers. The present research sought to address this gap in the literature by examining the role of heavy drinking on one's campus in personal engagement in heavy drinking in the first semester of college among a large national sample of students. We also examined theoretical moderators of campus heavy drinking.

Most research to date has examined perceived peer behavior. Insight into the effect of peers' actual behavior is provided by sociocentric social network studies, which examine peers' reports of their own behavior, and experimental research on conformity, which exposes participants to a heavy drinking peer in a laboratory setting (Barnett et al., 2014; Quigley & Collins, 1999). Both approaches may overestimate the influence of peers given that individuals self-select into social networks that fit their intended level of alcohol consumption and that experiments occur in a novel environment, which may heighten conformity (Cialdini & Trost, 1998; Lau-Barraco, Braitman, Leonard, & Padilla, 2012). Given ethical constraints on alcohol consumption in research, laboratory-based approaches also cannot demonstrate substantial shifts in behavior (e.g., from abstention to heavy drinking; National Institute of Alcohol Abuse and Alcoholism [NIAAA], n.d.). Social psychological research has examined conformity to broader community-level norms in field contexts by manipulating and making salient others' implied behavior (Cialdini, Reno, & Kallgren, 1990). An open question, however, is to what extent individuals detect and conform to behavioral norms, such as campus-level heavy drinking, as they naturally occur in the social environment. Thus, research is needed on whether the extent to which students on one's campus engage in heavy drinking, as defined by peers' reports of their own behavior, is associated with meaningful change in alcohol use.

Research on the role of campus-level heavy drinking has practical implications for intervention development and refinement. Normative feedback, the dominant strategy for addressing social influences on alcohol use (Prestwich et al., 2016), seeks to correct misperceptions of peer behavior (Perkins & Berkowitz, 1986). Although efficacious overall, norm correcting feedback is less efficacious among students who consume high quantities of alcohol (Reid & Carey, 2015), perhaps because heavy drinking friends contradict the norm of moderate drinking presented in the feedback. On campuses marked by high levels of heavy drinking, alternative intervention strategies may be needed for managing heavy drinking peers.

The extent to which others engage in heavy drinking may especially affect drinking and consequences during the college transition and may do so via multiple avenues. As noted in the preceding text, conformity is heightened in novel situations, in which the best course of action is often unclear to newcomers, such as first-year students (Chartrand & Lakin, 2013; Cialdini & Trost, 1998). Likewise, many students establish new friendships upon arriving on campus, and conformity is heightened when motivations to be liked and accepted are activated (Robinson et al., 2016). Ecological systems models indicate the proximal and distal avenues through which social factors affect behavior (Bronfenbrenner, 1992). On campuses marked by more heavy drinking, students may be more likely to live near and form friendships with heavier drinkers. However, in the absence of direct contact, students may nonetheless observe and conform to a campus norm favoring heavy consumption. Indeed, attending a middle or high school where more students misuse alcohol predicts personal misuse, over

and above that of close friends (Ennett et al., 2008). In addition, community-level stigma predicts sexual minorities' substance use, further supporting effects of the social environment on individual outcomes in the absence of direct contact (Pachankis, Hatzenbuehler, & Starks, 2014).

Although peer behavior may be salient during the transition to college, psychological factors are likely to also play a role in alcohol use and consequences. Expectations that alcohol increases sociability have emerged as a robust predictor of increased alcohol use throughout the first year (Del Boca, Darkes, Greenbaum, & Goldman, 2004). Impairment expectancies, capturing likelihood of cognitive and physical impairment (e.g., clumsiness) and personal approval of alcohol use have received less attention in the literature. However, low impairment expectancies and high approval are both associated with higher levels of consumption and consequences, and the effect of personal approval may be stronger than that of perceived peer drinking (DiBello, Miller, Neighbors, Reid, & Carey, 2018; Fromme & D'Amico, 2000). A number of researchers have proposed that psychological beliefs and social norms may interact (Rimal, 2008; Sheeran & Conner, 2017). When personal beliefs and social norms are aligned, such as when expectancies are positive and peer heavy drinking is high, this coherence of motivational forces should lead easily to engagement in heavy drinking. Conversely, misalignment of these forces should produce internal conflict, reducing an effect of campus heavy drinking on consumption. Indeed, Rimal, Lapinski, Cook, and Real (2005) found that perceived peer behavior was not associated with personal consumption when individuals held negative attitudes toward drinking. Thus, in addition to their main effects, low sociability expectancies, high impairment expectancies, and low approval may also protect against effects of campus heavy drinking.

The present study utilized data from AlcoholEdu, a product of EverFi (2013). AlcoholEdu is an alcohol risk-reduction intervention purchased by colleges for distribution to all incoming students. Students complete surveys in the summer before arriving on campus (Time 1) and during the first semester of college (Time 2), allowing for examination of predictors of first semester heavy drinking and consequences in a large national sample of students who were abstainers and light to moderate drinkers (henceforth referred to as *moderate drinkers*) prior to enrollment. As prior heavy drinking is typically the strongest predictor of heavy drinking in college (e.g., Sher & Rutledge, 2007; White et al., 2006), focusing on abstainers and moderate drinkers allows for examining the role of modifiable factors in initiation of heavy drinking and precludes reverse causality as an explanation for effects.

The primary outcomes were Time 2 heavy drinking and negative consequences. Campus heavy drinking reflected the prevalence of heavy drinking among other students on the same campus during the first semester. Self-report predictors were assessed in the summer prior to matriculation. Analyses controlled for individual and campus-level features of the social environment that increase risk of heavy drinking, including participation in Greek life or athletics, living on campus, low religious involvement, location in a state that consumes more alcohol, smaller student body, and attending a college at which a higher proportion of students are White or live on campus (Baer, 2002; NIAAA, 2002, 2016). Analyses also controlled for demographic factors associated with increased risk, including male gender, younger age, identify-

ing as White, and being a domestic, rather than international, student (Jackson, Sher, & Park, 2005; Karam, Kypri, & Salamoun, 2007; Sher & Rutledge, 2007).

To our knowledge, previous research has not examined whether the prevalence of heavy drinking on one's campus predicts individual behavior and, by extension, whether psychological dispositions moderate such effects. We hypothesized that the prevalence of heavy drinking on one's campus would be among the strongest predictors of engagement in heavy drinking and experiencing consequences relative to expectancies, approval of alcohol use, and social environment and demographic predictors. We further hypothesized that psychological dispositions would moderate the effect of campus heavy drinking, such that low approval of alcohol use, low sociability expectancies, or high impairment expectancies would reduce the association of campus heavy drinking with heavy drinking and consequences.

Method

The Colby College Institutional Review Board approved this study as exempt. AlcoholEdu is the most widely used computer-delivered alcohol intervention for first-year college students in the United States (Campbell & Hester, 2012). Participating schools often mandate completion of the program (e.g., by prohibiting course registration until completion), resulting in relatively low rates of attrition over time. As a part of the program, students report alcohol-related beliefs and behaviors approximately 3.5 weeks prior to arrival on campus (Time 1). A Time 2 survey is sent to students after arriving on campus, 4 to 6 weeks following completion of Time 1. In all, 95% of students completed Time 1 in July or August, and 88% completed Time 2 in September or October; an average of 8.62 weeks elapsed between the surveys. Thus, for most, Time 2 occurred within the first 2 months of their college career.

Participants

The dataset contained 312,187 students who matriculated to 248 U.S. colleges in Fall, 2013, were not transfer students, and were under age 21. Given differences in likelihood of heavy drinking and the psychological, social, and demographic predictors of their behavior (Huang, DeJong, Schneider, & Towvim, 2011; Huang, DeJong, Towvim, & Schneider, 2009; Jackson, Sher, Gotham, & Wood, 2001), Time 1 abstainers and moderate drinkers were examined in separate models. Inclusion in the present analyses thus required that participants had been abstainers ($n = 117,824$) or moderate drinkers ($n = 132,584$) prior to college (Time 1). Abstainers agreed on two separate Time 1 items that they had not had more than a sip of alcohol in the last 2 weeks and not in the last year. The raw data used to identify heavy drinkers were not available in the dataset. We therefore determined heavy drinking using AlcoholEdu's categorical designation of gender-specific engagement in heavy drinking (five or more drinks and four or more drinks for men and women, respectively) on at least one occasion in the previous 2 weeks. Consistent with previous research (Englund, Egeland, Oliva, & Collins, 2008), moderate drinkers were those students who were not classified as either abstainers or heavy drinkers.

Three campuses were excluded that had fewer than 30 abstainers and six campuses were excluded that contained fewer than 30

moderate drinkers (per Hox, 1998). The final analytic sample included 90,455 abstainers attending 245 colleges and universities and 97,168 moderate drinkers attending 242 colleges and universities, who provided complete data on all predictors and the Time 2 items used to construct the outcome. Campuses contained 31 to 2,217 abstainers ($M = 370$) and 32 to 2,050 ($M = 398$) moderate drinkers.

Measures

All predictors, except campus heavy drinking, were assessed at Time 1. Campus heavy drinking and the dependent variables were derived from the Time 2 survey. To facilitate interpretation and comparisons, all predictors were coded so that the least risky views or categories fell at the low end of the scale or served as the reference group.

Time 2 level of alcohol consumption. Students were classified with respect to whether they were abstainers, moderate drinkers, or heavy drinkers at Time 2, during the first semester. Consistent with the Time 1 identification of abstainers, students who still had not consumed any alcohol in the last two weeks or past year were classified as abstainers. Accordingly, Time 1 moderate drinkers could not be classified as abstainers given their alcohol consumption in the previous year. Heavy drinkers consumed five or more and four or more drinks (for men and women, respectively) on at least one occasion. Those who had consumed alcohol but had not engaged in heavy drinking were classified as moderate drinkers. This resulted in three categories of Time 2 consumption for those who were abstainers at Time 1 (abstainers, moderate drinkers, heavy drinkers) and two categories for those who were moderate drinkers at Time 1 (moderate drinkers, heavy drinkers).

Time 2 negative alcohol-related consequences. AlcoholEdu included 24 items assessing alcohol-related consequences. These items do not map onto any one published measure and some appear to be self-generated. We therefore selected the 12 items from the dataset that overlapped with those in the 24-item Brief Young Adult Alcohol Consequences Questionnaire (BYAACQ; Kahler, Strong, & Read, 2005). For example, participants rated how frequently they had a hangover, passed out, and drove after drinking in the last 2 weeks. Response options ranged from 1 (*never*) to 7 (*always*). Following the BYAACQ scoring, responses were dichotomized (never = 0, ever = 1) and summed to form a scale score (Cronbach's $\alpha_{abstainers} = .98$, $\alpha_{moderate\ drinkers} = .97$). As few Time 1 abstainers experienced any consequences at Time 2, responses were dichotomized into none (94%) versus any (6%). To facilitate comparisons, we dichotomized Time 1 moderate drinkers' consequences into none (66%) versus any (34%).

Campus heavy drinking. We calculated separate campus heavy drinking variables for Time 1 abstainers and moderate drinkers. Our goal was to examine whether the heavy drinking of other students on the same campus predicted an individual's own behavior. Thus, the individuals reflected in each campus heavy drinking variable were fully independent of those whose Time 2 outcomes were being predicted. When predicting the outcomes of students who were abstainers at Time 1, campus heavy drinking reflected the percent of Time 1 moderate and heavy drinkers at the same school who engaged in heavy drinking at Time 2. When predicting the outcomes of Time 1 moderate drinkers, campus heavy drinking reflected the percent of Time 1 abstainers and

heavy drinkers at the same school who engaged in heavy drinking at Time 2. Importantly, because Time 1 abstainers and moderate drinkers were examined in separate models, campus heavy drinking did not simply reflect the proportion of heavy drinkers admitted to the school.

Approval of alcohol use. Two items in the dataset captured approval of alcohol: "To what degree is it acceptable for people to drink underage?" and "To what degree is it acceptable for people to get drunk on a school night?" Response options ranged from 1 (*never*) to 7 (*always*). The items were averaged. Reliability was acceptable: Spearman-Brown $\rho_{abstainers} = .67$, $\rho_{moderate\ drinkers} = .63$ (Eisinga, Grotenhuis, & Pelzer, 2013).

Outcome expectancies. AlcoholEdu included 20 items assessing expectations of the outcomes associated with alcohol use. As these were not drawn from a single published scale and included self-generated items, we compared the assessed items with the subscales in three existing measures (Fromme & D'Amico, 2000; George et al., 1995; Leigh & Stacy, 1993). This led to identification of two 3-item subscales—sociability and impairment outcome expectancies. Principal axis factoring with oblimin rotation confirmed the distinction between the two factors. Sociability expectancy items assessed to what extent having three or four drinks would lead the individual to "be outgoing in social situations," "feel more confident or sure of yourself," and "feel connected with the people around me." Impairment expectancy items assessed whether having three or four drinks would lead the individual to "forget where you were or what you did," "feel out of control," and "feel clumsy." Response options ranged from 1 (*very unlikely*) to 7 (*very likely*). Impairment expectancy items were reverse coded, and items were averaged; high scores reflected high sociability expectancies (Cronbach's $\alpha_{abstainers} = .87$, $\alpha_{moderate\ drinkers} = .85$) and low impairment expectancies (Cronbach's $\alpha_{abstainers} = .87$, $\alpha_{moderate\ drinkers} = .83$). The two subscales were moderately correlated ($r_{abstainers} = .32$, $r_{moderate\ drinkers} = .40$).

Social environment predictors. Participants reported their plans for joining the Greek system (0 = no, 1 = yes), a varsity intercollegiate athletic team (0 = no, 1 = yes), or a student religious group (0 = yes, 1 = no). With respect to housing, participants indicated whether they would be living in a college residence hall, substance-free residence hall, fraternity or sorority, on-campus apartment or house, off-campus apartment or house, or at home with family. We created four categories—substance-free, off-campus apartment, at home with family, or on-campus residence. Housing was dummy coded with living at home with family (the lowest risk category) designated as the reference group, compared with each of the other housing options.

Demographic predictors. Participants self-reported the one race/ethnicity that best described them. Response options included Black non-Hispanic, White non-Hispanic, Hispanic, Asian, or Native American. "Other" was an option but was not selected by any participants in our subsample. Ethnicity was dummy coded with Asian students, who had the lowest Time 1 levels of heavy drinking in our sample, as the reference group, compared against each of the other racial/ethnic groups. Participants also reported their sex as male (1) or female (0; alternative gender identities were not solicited), whether they were a U.S. citizen (0 = no, 1 = yes), and how many "blood relatives have been a problem drinker or alcoholic, either now or in the past" (0 = none, 1 = 1 or more). Also, current age was reported and was reverse scored.

Campus-level covariates. Analyses controlled for state in which each campus was located, size of the first-year class, proportion of the class identifying as White, and proportion of the class living on campus. Given that 79% of students attend college in their home state (Sallie Mae, 2013), an item assessing the state in which students attended high school, in conjunction with other information in the dataset, allowed for classifying state in which the college was located. Five schools for which state could not be reliably determined were identified by a regional code (e.g., Northeast). West Virginia, the state in the dataset with the lowest per capita alcohol consumption (NIAAA, 2016), served as the reference group. Class size and proportion identifying as White and living on campus were calculated using the Time 1 data of all first-year students. Class size was reverse scored with higher scores reflecting smaller schools.

Data Analysis

All analyses were conducted in Stata Version 13.1 (StataCorp, 2013). The data were analyzed using multilevel multinomial logistic regression models to account for nonindependence due to students nested in schools. Four main effects models were estimated—two for Time 1 abstainers with Time 2 consumption and consequences as the dependent variables and two models for Time 1 moderate drinkers; all other individual- and campus-level variables served as independent variables. In models predicting Time 2 level of consumption, moderate drinkers served as the reference group to maintain similarity in the categories being differentiated for Time 1 abstainers (e.g., abstainer vs. moderate; moderate vs. heavy) and Time 1 moderate drinkers (moderate vs. heavy). In models predicting Time 2 consequences, those who experienced no consequences served as the reference. All models included a random intercept for school. A Laplace integration method was used after initial attempts at adaptive and nonadaptive Gauss-Hermite quadrature approximation methods failed to converge. Estimation of missing data is not permitted in these models in Stata, resulting in listwise deletion of participants who did not provide complete data. To examine the effect of campus heavy drinking while controlling for individual level factors, all variables in the main effects models were grand mean centered, which preserves correlations between the Level 2 (campus heavy drinking, state, smaller class size, proportion White students, proportion on campus) and Level 1 (all other) predictors (Enders & Tofighi, 2007). Given the meaning of a one-unit change, dichotomous variables typically appear to have much larger effects than continuous variables. We therefore conducted a main effects analysis in which the continuous variables were standardized by dividing by two standard deviations, which is equivalent to the number of standard deviations between 0 and 1 when the groups that comprise a binary variable are equal in size (Gelman, 2008). To aid with comparisons and interpretation, we identified the numerical top three predictors of each outcome and any constructs that were not significantly different from the top three, as indicated by their overlapping confidence intervals.

Four separate interaction models were estimated. Two models focused on Time 1 abstainers in which Time 2 consumption and consequences were the dependent variables; two models were also estimated for Time 1 moderate drinkers. The three interactions between campus heavy drinking and the psychological factors

(approval, sociability expectancies, and impairment expectancies) were tested simultaneously and served as independent variables, along with their main effects. All individual-level covariates (see Table 1) were included as independent variables in the interaction models. The Level 2 covariates—state, class size, and proportion White and living on campus—could not be included due to issues with convergence. However, in the main effects models, inclusion versus exclusion of Level 2 covariates only altered relative risk estimates by up to 0.06 and had no effect on p values. To facilitate probing significant interactions, the raw, unstandardized versions of continuous variables were utilized. Campus heavy drinking was grand mean centered and the psychological factors were group mean centered prior to forming the interaction (Enders & Tofighi, 2007). All other predictors were grand mean centered. To control for testing the three interactions five times, we used a Bonferroni adjusted p value of .003. Significant interactions were probed using the pooled within cluster standard deviation (C. Enders, personal communication, March 10, 2017), at 1 standard deviation above and below the mean of the psychological factor (Aiken & West, 1991).

Results

Sample Descriptives and Attrition

Table 1 reports means or frequencies for all predictors. Among those who were abstainers at Time 1, 76.9% ($n = 69,564$) remained abstainers, 18.5% ($n = 16,774$) engaged in moderate drinking, and 4.6% ($n = 4117$) engaged in heavy drinking at Time 2; only 5.8% ($n = 5228$) experienced at least one consequence. Among those who were moderate drinkers at Time 1, 70.2% ($n = 68,194$) remained moderate drinkers and 29.8% ($n = 28,974$) engaged in heavy drinking at Time 2. In all, 34% ($n = 32,214$) experienced at least one consequence.

Given the sample size, those retained at Time 2 ($n = 90,455$ abstainers, 77% of total; $n = 97,168$ moderate drinkers, 73% of total) were significantly different from those excluded ($n = 27,369$ abstainers; $n = 35,416$ moderate drinkers) on most individual-level predictors. However, differences were small in magnitude (abstainers: Cohen's ds: .007–.21, $d_{average} = .06$; moderate drinkers: Cohen's ds: .004–.11, $d_{average} = .05$) and were not singularly biased in a protective or risky direction. For example, among both groups, those excluded were lower in approval of drinking and sociability expectancies, yet less interested in religious groups.

Main Effects of Campus Heavy Drinking

In the following text, we focus on the main effects analyses in which continuous variables were standardized by dividing by two standard deviations to facilitate comparisons with categorical variables (see Tables 2 and 3). Superscript letters in the tables indicate constructs that were among, or equivalent in magnitude to, the top three predictors of each outcome. Unstandardized results are provided in the online supplementary materials. Given space constraints, Level 2 covariates are not shown in the tables. In all but one model, smaller first year class (i.e., attending a smaller school) predicted greater risk, and location in Massachusetts and Pennsylvania predicted lower risk of alcohol use and consequences. All other states, proportion White, and proportion living on campus inconsistently predicted outcomes.

Among Time 1 abstainers, campus heavy drinking did not strongly predict remaining abstinent at Time 2 relative to engaging in moderate drinking (see superscripts in Table 2 indicating the top predictors). Rather, high approval of drinking, high sociability expectancies, low impairment expectancies, and living on or off campus (relative to at home) were significantly stronger predictors given that their confidence intervals did not overlap with that of campus heavy drinking. For example, a two standard deviation

Table 1
Sample Demographics Prior to College Enrollment at Time 1

Predictor	Abstainers M (SD) or N (%)	Moderate drinkers M (SD) or N (%)
Campus heavy drinking (percentage)[a]	41.13 (11.13)	27.38 (10.38)
Approval of alcohol[a]	1.62 (0.86)	2.56 (1.07)
Sociability expectancies[a]	3.54 (1.58)	4.36 (1.43)
Impairment expectancies[a]	3.61 (1.78)	4.74 (1.50)
Greek interest	15,247 (16.9%)	30,494 (31.4%)
Varsity athlete interest	4,497 (5.0%)	6,195 (6.4%)
Religious club interest	24,385 (27.0%)	15,580 (16.0%)
Live on campus	73,201 (80.9%)	85,973 (88.5%)
Chemical-free housing	5,924 (6.5%)	3,331 (3.4%)
Live at home	8,514 (9.4%)	4,853 (5.0%)
Live off campus	2,816 (3.1%)	3,011 (3.1%)
White	57,482 (63.5%)	71,937 (74.0%)
Black	8,322 (9.2%)	6,687 (6.9%)
Hispanic	8,222 (9.1%)	8,437 (8.7%)
Asian	15,595 (17.2%)	9,392 (9.7%)
Native American	485 (0.5%)	430 (0.4%)
Male	37,293 (41.2%)	40,312 (41.5%)
Age (raw)[a]	18.15 (0.54)	18.18 (0.53)
U.S. citizen	84,715 (93.7%)	92,813 (95.5%)
Family history of alcohol abuse	9,727 (10.8%)	12,508 (12.9%)

[a] Means and standard deviations are presented for continuous variables.

Table 2

Relative Risk of Moderate Drinking Relative to Abstinence and Heavy Drinking With Continuous Variables Standardized

	T1 abstainers						T1 moderate drinkers		
	T2 moderate (0) vs. abstainers (1)			T2 moderate (0) vs. heavy (1)			T2 moderate (0) vs. heavy (1)		
Variable	RR	SE	95% CI	RR	SE	95% CI	RR	SE	95% CI
Campus heavy drinking	0.75	0.03	[0.70, 0.80]***	1.83_{ab}	0.11	[1.63, 2.06]***	1.82_{bc}	0.07	[1.69, 1.97]***
Psychological factors									
Approval of alcohol	0.53_b	0.01	[0.51, 0.55]***	1.22	0.04	[1.15, 1.29]***	1.88_b	0.03	[1.82, 1.93]***
Sociability expectancies	0.54_{bc}	0.01	[0.52, 0.56]***	1.39_d	0.06	[1.28, 1.51]***	1.79_{bd}	0.03	[1.73, 1.85]***
Low impairment expectancies	0.46_a	0.01	[0.44, 0.48]***	1.44_{cd}	0.06	[1.32, 1.57]***	1.66_c	0.03	[1.61, 1.72]***
Social environment factors									
Greek interest	0.59_c	0.01	[0.56, 0.62]***	1.43_{cd}	0.06	[1.32, 1.55]***	1.49	0.03	[1.44, 1.54]***
Varsity athlete interest	0.78	0.03	[0.72, 0.84]***	1.09	0.08	[0.95, 1.25]	1.21	0.04	[1.14, 1.29]***
Low religious club interest	0.71	0.02	[0.68, 0.74]***	1.11	0.05	[1.01, 1.21]*	1.13	0.02	[1.09, 1.18]***
Chemical-free housing	0.76	0.04	[0.68, 0.85]***	1.95_{abcd}	0.29	[1.46, 2.61]***	1.82_{bc}	0.12	[1.60, 2.06]***
Live on campus	0.50_{ab}	0.02	[0.46, 0.54]***	2.17_a	0.27	[1.71, 2.77]***	2.33_a	0.11	[2.12, 2.56]***
Live off campus	0.53_{abc}	0.03	[0.46, 0.60]*	1.87_{abcd}	0.31	[1.35, 2.59]***	1.93_{abc}	0.13	[1.70, 2.19]***
Demographic factors									
Black	0.86	0.03	[0.80, 0.93]***	1.04	0.09	[0.87, 1.24]	1.00	0.04	[0.92, 1.09]
Hispanic	0.78	0.03	[0.72, 0.84]***	1.25_d	0.11	[1.05, 1.47]**	1.38	0.05	[1.28, 1.49]***
White	0.84	0.03	[0.79, 0.89]***	1.46_{bcd}	0.09	[1.29, 1.66]***	1.66_{cd}	0.05	[1.56, 1.77]***
Native American	0.74_c	0.09	[0.58, 0.94]*	1.26_{abcd}	0.32	[0.77, 2.07]	1.33	0.16	[1.04, 1.69]*
Male	1.16	0.02	[1.12, 1.20]***	1.08	0.04	[1.01, 1.16]*	0.99	0.02	[0.96, 1.03]
Younger age	1.01	0.02	[0.98, 1.05]	1.11	0.04	[1.03, 1.19]**	1.07	0.02	[1.04, 1.11]***
U.S. citizen	0.81	0.04	[0.75, 0.88]***	1.95_{abc}	0.23	[1.55, 2.45]***	2.01_{ab}	0.10	[1.83, 2.22]***
Family history	0.89	0.03	[0.84, 0.94]***	0.97	0.05	[0.87, 1.08]	1.08	0.02	[1.04, 1.13]***

Note. Subscript letters indicate the numerical top three predictors in each analysis and any constructs that were not significantly different from the top three. Coefficients in the same column bearing different letters are significantly different from one another. T1 = Time 1; T2 = Time 2; RR = relative risk; SE = standard error; CI = confidence interval.
* $p < .05$. ** $p < .01$. *** $p < .001$.

increase in approval of alcohol reduced likelihood of abstinence by 47%, whereas the same increase in campus heavy drinking only reduced likelihood of abstinence by 25%.

In contrast, for both Time 1 abstainers and moderate drinkers, campus heavy drinking was among the top predictors of Time 2 engagement in heavy drinking, relative to moderate drinking. A two standard deviation increase in the proportion of heavy drinkers on campus increased risk of Time 2 heavy drinking by 83% and 82% among Time 1 abstainers and moderate drinkers, respectively. Among Time 1 abstainers, the effect of campus heavy drinking was equivalent to the risks associated with living away from home and that of other factors, as indicated by their overlapping confidence intervals. Moreover, for Time 1 abstainers, campus heavy drinking had a significantly larger effect than each of the psychological factors; a two standard deviation increase in the psychological factors only increased risk of Time 2 heavy drinking by 22% to 44%. Among Time 1 moderate drinkers, the effect of campus heavy drinking was equivalent in magnitude to the three psychological factors as indicated by their overlapping confidence intervals; these similarly increased risk of heavy drinking by 66% to 88%. Only living on campus relative to at home had a significantly larger effect on Time 2 heavy drinking among Time 1 moderate drinkers. Thus, attending a college with a high proportion of heavy drinkers strongly predicted risk of heavy drinking for those who had been abstainers and moderate drinkers prior to college.

With respect to consequences, campus heavy drinking was likewise among the top predictors of experiencing consequences at Time 2 for both groups (see Table 3). A two standard deviation increase in campus heavy drinking was associated with a 106% and 91% increase in risk of experiencing consequences among Time 1 abstainers and moderate drinkers, respectively. The housing variables, reflecting living on campus, in chemical-free housing, or off campus, were consistently the three strongest predictors of Time 2 consequences. However, given their overlapping confidence intervals, campus heavy drinking was equivalent in magnitude to the effects of sociability expectancies and U.S. citizenship for both groups, which were similarly associated with a 96% to 124% and a 67% to 82% increase in risk of consequences among Time 1 abstainers and moderate drinkers, respectively (see Table 3 for unique predictors for Time 1 abstainers vs. moderate drinkers). These results support that attending a college with a high proportion of heavy drinkers is strongly associated with greater risk of experiencing consequences.

Moderation of Campus Heavy Drinking by Psychological Variables

Among students who were abstainers at Time 1, only the approval by peer modeling interaction was significant when predicting Time 2 abstinence versus moderate drinking (relative risk [RR] = 1.00, SE = 0.001, z = −3.35, p < .001); it also met our

Table 3

Relative Risk of No Alcohol Consequences Relative to One or More With Continuous Variables Standardized

| | T1 abstainers | | | T1 moderate drinkers | | |
| | T2 none (0) vs. 1+ (1) | | | T2 none (0) vs. 1+ (1) | | |
Variable	RR	SE	95% CI	RR	SE	95% CI
Campus heavy drinking	2.06$_b$	0.12	[1.84, 2.30]***	1.91$_{bc}$	0.07	[1.78, 2.04]***
			Psychological factors			
Approval of alcohol	1.93	0.05	[1.84, 2.02]***	1.76$_c$	0.03	[1.70, 1.81]***
Sociability expectancies	2.24$_b$	0.08	[2.09, 2.39]***	1.82$_{bc}$	0.03	[1.76, 1.89]***
Low impairment expectancies	1.78	0.06	[1.66, 1.91]***	1.08	0.02	[1.05, 1.12]***
			Social environment factors			
Greek interest	2.09$_b$	0.07	[1.95, 2.23]***	1.60	0.03	[1.55, 1.65]***
Varsity athlete interest	1.12	0.07	[0.99, 1.27]	1.06	0.03	[1.00, 1.13]*
Low religious club interest	1.33	0.05	[1.25, 1.44]***	1.14	0.02	[1.10, 1.19]***
Chemical-free housing	2.62$_{ab}$	0.32	[2.07, 3.32]***	1.92$_{bc}$	0.12	[1.70, 2.16]***
Live on campus	3.65$_a$	0.37	[2.99, 4.45]***	2.46$_a$	0.11	[2.25, 2.69]***
Live off campus	3.20$_a$	0.44	[2.44, 4.20]***	2.06$_{ab}$	0.13	[1.82, 2.33]***
			Demographic factors			
Black	1.19	0.08	[1.03, 1.37]*	1.02	0.04	[0.94, 1.11]
Hispanic	1.47	0.10	[1.28, 1.68]***	1.14	0.04	[1.06, 1.23]***
White	1.44	0.08	[1.30, 1.60]***	1.50	0.04	[1.42, 1.59]***
Native American	1.23	0.28	[0.79, 1.92]	1.08	0.13	[0.85, 1.37]
Male	0.81	0.03	[0.76, 0.86]***	0.85	0.01	[0.83, 0.88]***
Younger age	1.01	0.03	[0.95, 1.08]	1.04	0.02	[1.01, 1.07]*
U.S. citizen	1.97$_b$	0.18	[1.64, 2.36]***	1.67$_{bc}$	0.07	[1.53, 1.82]***
Family history	1.05	0.05	[0.96, 1.15]	1.09	0.02	[1.04, 1.14]***

Note. Subscript letters indicate the numerical top three predictors in each analysis and any constructs that were not significantly different from the top three. Coefficients in the same column bearing different letters are significantly different from one another. T1 = Time 1; T2 = Time 2; RR = relative risk; SE = standard error; CI = confidence interval.
* $p < .05$. *** $p < .001$.

predetermined cutoff for significance ($p \leq .003$). Supporting our hypothesis that risky behavior is less likely when personal beliefs and campus heavy drinking conflict, campus heavy drinking was associated with a slightly steeper reduction in likelihood of remaining an abstainer among those high in approval ($RR = 0.983$, $SE = 0.002$, $z = -11.24$, $p < .001$) relative to those low in approval ($RR = 0.988$, $SE = 0.002$, $z = -7.40$, $p < .001$; see Figure 1). All other interactions predicting Time 2 consumption and consequences were nonsignificant among those who had abstained at Time 1.
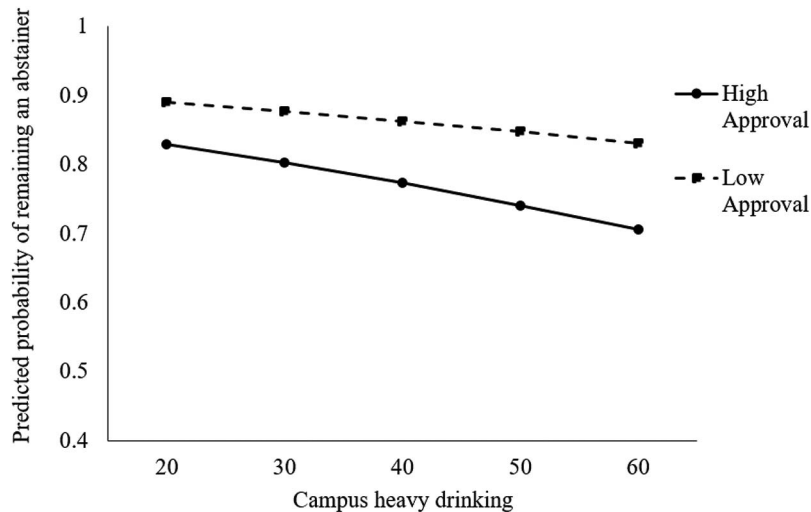

Figure 1. Interaction between campus heavy drinking and personal approval of alcohol use shown as the predicted probability of remaining an abstainer relative to becoming a moderate drinker.

In analyses focused on those who were moderate drinkers at Time 1, only the impairment expectancies by campus heavy drinking interaction predicting Time 2 consequences met our adjusted p value ($RR = 0.998$, $SE = 0.001$, $z = -3.01$, $p = .003$). Contrary to hypotheses, simple slopes indicated that the effect of campus heavy drinking was slightly stronger when impairment expectancies were high ($RR = 1.035$, $SE = 0.002$, $z = 18.57$, $p < .001$), and therefore protective, relative to when impairment expectancies were low ($RR = 1.030$, $SE = 0.002$, $z = 16.12$, $p < .001$). All other interactions predicting Time 2 consumption and consequences either did not meet our adjusted p value or were nonsignificant among those who had been moderate drinkers at Time 1. However, for the two interactions that did meet the adjusted p value, the relatively minor changes in relative risk at low versus high levels indicates that the interactions were small in magnitude. Accordingly, the strong effects observed of campus heavy drinking on risk of heavy drinking and consequences at Time 2 were generally independent of whether students held risky or protective personal beliefs prior to college.

Post Hoc Analysis of Selection Effects

It is possible that the observed associations of campus heavy drinking with outcomes reflect self-selection, such that students who already possessed risk factors chose colleges where a higher number of students engaged in heavy drinking. Because failing to account for clustering does not bias coefficient estimates (Moulton, 1986; Tate & Wongbundhit, 1983), the magnitude of the bivariate correlations between the psychological factors and campus heavy drinking provides insight into whether students self-selected into riskier environments. Among Time 1 abstainers, the correlations were .12, .05, and .001 between campus heavy drinking and approval, sociability expectancies, and impairment expectancies respectively; these values were .11, .04, and −.02 among Time 1 moderate drinkers. As these were within the range of Cohen's (1992) definition of a small correlation, there was little evidence that precollege psychological risk was associated with the level of heavy drinking on campus.

We also examined whether students who held similar beliefs were drawn to particular schools, explaining why there may have been more heavy drinking on certain campuses. The intraclass correlation coefficient (ICC) reflects the expected correlation between the scores of two individuals drawn from the same school. To calculate ICCs, multilevel models were estimated with only each psychological variable in the model; the between group variance attributable to schools was divided by the total variance (Raudenbush & Bryk, 2002). The ICCS were generally negligible among both Time 1 abstainers (ICC: approval = .06; sociability = .01; impairment = .01) and moderate drinkers (ICC: approval = .08; sociability = .01; impairment = .01) and all fell below what would be considered a small correlation (Cohen, 1992). Thus, students generally did not attend campuses with similar others. Given the small correlations between psychological beliefs and heavy drinking on campus and lack of clustering in psychological beliefs, it seems unlikely that, generally, students self-selected into campuses where alcohol consumption matched their alcohol-related beliefs.

Discussion

National data indicate that a substantial number of students adopt heavy drinking after transitioning into college (Johnston et al., 2016). This shift in behavior increases risk for short- and long-term negative outcomes, including injuries and later diagnosis with an alcohol or substance use disorder (Chassin et al., 2002; Hingson et al., 2009). The present research sought to add to the literature on factors that promote heavy drinking and negative consequences. To our knowledge, this is the first study to examine campus-level reports from peers of their own engagement in heavy drinking. Results indicated that campus heavy drinking was consistently strongly associated with heavy drinking and consequences, both among students who had been moderate drinkers prior to college and among abstainers. Having more protective psychological dispositions did not substantially dampen these effects. Although campus heavy drinking was associated with reduced likelihood of remaining an abstainer relative to engaging in moderate drinking, psychological factors were stronger predictors in this context.

The observed relationships between campus heavy drinking and Time 2 heavy drinking and consequences are somewhat remarkable considering that it is unclear to what extent students had contact with their heavy drinking peers. There are at least two explanations for the results. Consistent with the social network literature and experimental research on social modeling (Quigley & Collins, 1999; Rinker, Krieger, & Neighbors, 2016), there may be a higher likelihood of physical contact with heavy drinkers (e.g., living near, forming friendships with) on campuses with a higher proportion of heavy drinking peers. Alternatively, the norms literature suggests that in the absence of contact with heavy drinking peers, students may nonetheless observe that the norm favors heavy rather than moderate alcohol consumption and adjust their behavior accordingly (Borsari & Carey, 2001). Either possibility suggests the need for intervention strategies that address the reality of managing alcohol use in an environment where heavy drinking is not uncommon.

With respect to interventions, although students may misperceive the norms for consumption on heavier drinking campuses, normative feedback may be less efficacious in these settings due to regular encounters with heavy drinking. Indeed, normative feedback appears to be less efficacious among the heaviest drinkers (Reid & Carey, 2015). A primary takeaway of the present results is the potential of teaching college students coping skills for managing high risk social environments. Coping skills are a common feature of interventions for substance-dependent populations (e.g., mindfulness; Bowen et al., 2014), but their utility has not been broadly examined among young adults and other nondependent individuals. As peer influence cannot be studied via self-report, recent lab-based experimental research highlights a potential method for testing whether intervention strategies reduce peer influence (Reid, Field, Jones, DiLemma, & Robinson, 2019). Thus, a promising avenue for future research is to use lab-based methods to test whether coping skills, or other intervention strategies, dampen the influence of heavy drinking peers.

None of the assessed psychological variables altered the associations of campus heavy drinking with Time 2 heavy drinking and only impairment expectancies moderated the effect on Time 2 consequences. In addition, campus heavy drinking was not a

strong predictor of engagement in moderate drinking relative to remaining abstinent. That most students did not become heavy drinkers suggests that unidentified individual differences likely amplify or dampen the effect of campus heavy drinking. For example, highly impulsive students may be especially attuned and responsive to cues signaling heavy drinking (Larsen et al., 2010). Conversely, students who remain abstainers may negatively evaluate heavy drinkers, and this negative prototype may protect against peer influence (Berger & Rand, 2008). Negative prototypes of drinkers and other internal motivations may be especially strong among abstainers, potentially explaining the weak effect of campus heavy drinking on likelihood of abstinence versus moderate drinking. Identification of the psychological factors that promote resistance to peer behavior will both enhance our ability to deliver interventions to those at greatest risk and inform which active ingredients might prove beneficial.

The present analysis also yielded insights into additional modifiable factors that are associated with increased alcohol use and consequences and should be targeted in interventions. Our results indicate the importance of targeting sociability expectancies in interventions for first year students. Research is therefore needed on strategies that may alter expectancies and are scalable for mass delivery, given that most research has used the resource-intensive expectancy challenge approach for altering expectancies (Scott-Sheldon, Terry, Carey, Garey, & Carey, 2012). Likewise, approval was consistently associated with risk among those who were moderate drinkers at Time 1 but has not yet been successfully targeted in interventions (Reid & Carey, 2015). Results also highlight the continued risk associated with interest in joining the Greek system. Generally, alcohol interventions have been unsuccessful among those involved in Greek life (Scott-Sheldon, Carey, Kaiser, Knight, & Carey, 2016). Given the social nature of Greek life, interventions that alter or harness features of the social network may be well-suited for this context (Valente, 2012).

Our results should be considered in light of the study limitations. The psychometric properties of the items assessed by AlcoholEdu are unknown. However, given the strong role of at least one psychological factor in each analysis, it seems unlikely that alternative measures would substantially alter the results. In addition, the anonymous nature of the dataset limited ability to control for factors on which students do select into colleges. Class size is an imperfect proxy for private versus public schools, and private colleges draw higher socioeconomic students, have higher workloads, and have lower classroom student-to-faculty ratio, all of which influence drinking behavior (Berman & Martinetti, 2017; Moore et al., 2005; Skidmore & Murphy, 2011). The point in the semester when students completed Time 2 is also an unexplained source of measurement error. Likewise, in the absence of long-term data both pre- and postmatriculation, we could not rule out prior heavy drinking among Time 1 moderate drinkers and could not verify whether Time 2 drinking patterns were sustained. However, that psychological factors, which reflect past behavior (Bem, 1972), did not overpower the other predictors suggests that the majority of Time 1 moderate drinkers were accurately classified, and previous research supports that first semester drinking typically persists well into college (Sher et al., 2011). In addition, results may not generalize to those with a history of heavy drinking, among whom past behavior likely outweighs psychosocial factors (Sher & Rutledge, 2007). Finally, it is worth noting that

colleges were not randomly selected and reflect the subset of schools that chose to require completion of AlcoholEdu among their first-year students. These limitations are countered by the strengths of our analysis. Notably, we used peer reports of their own alcohol use and prospectively demonstrated effects of the social environment on risk of heavy drinking and consequences in a large, national sample of experienced and inexperienced drinkers.

Heavy drinking among college students remains a serious concern, given its association with risk for serious negative consequences, such as injury, assault, and substance use disorders. The present results support that the prevalence of heavy drinking among peers on one's campus plays a prominent role in engagement in heavy drinking and experiencing consequences. Techniques that might help students to manage their heavy drinking peers have been underexplored thus far. Developing and testing active ingredients designed to mitigate peer influence is a crucial step toward the goals of enhancing the efficacy of alcohol-focused interventions and ultimately, fostering engagement in moderate rather than heavy alcohol consumption.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: SAGE.

Baer, J. S. (2002). Student factors: Understanding individual variation in college drinking. *Journal of Studies on Alcohol Supplement, 14,* 40–53. http://dx.doi.org/10.15288/jsas.2002.s14.40

Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology & Health, 13,* 623–649. http://dx.doi.org/10.1080/08870449808407422

Barnett, N. P., Ott, M. Q., Rogers, M. L., Loxley, M., Linkletter, C., & Clark, M. A. (2014). Peer associations for substance use and exercise in a college student social network. *Health Psychology, 33,* 1134–1142. http://dx.doi.org/10.1037/a0034687

Bem, D. J. (1972). Self-perception theory. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 6, pp. 1–62). New York, NY: Academic Press. http://dx.doi.org/10.1016/S0065-2601(08)60024-6

Berger, J., & Rand, L. (2008). Shifting signals to help health: Using identity signaling to reduce risky health behaviors. *The Journal of Consumer Research, 35,* 509–518. http://dx.doi.org/10.1086/587632

Berman, H. L., & Martinetti, M. P. (2017). The effects of next-day class characteristics on alcohol demand in college students. *Psychology of Addictive Behaviors, 31,* 488–496. http://dx.doi.org/10.1037/adb0000275

Borsari, B., & Carey, K. B. (2001). Peer influences on college drinking: A review of the research. *Journal of Substance Abuse, 13,* 391–424. http://dx.doi.org/10.1016/S0899-3289(01)00098-0

Bowen, S., Witkiewitz, K., Clifasefi, S. L., Grow, J., Chawla, N., Hsu, S. H., . . . Larimer, M. E. (2014). Relative efficacy of mindfulness-based relapse prevention, standard relapse prevention, and treatment as usual for substance use disorders: A randomized clinical trial. *Journal of the American Medical Association Psychiatry, 71,* 547–556. http://dx.doi.org/10.1001/jamapsychiatry.2013.4546

Bronfenbrenner, U. (1992). Ecological systems theory. In R. Vasta (Ed.), *Six theories of child development: Revised formulations and current issues* (pp. 187–249). Greenwich, CT: Jessica Kingsley.

Campbell, W., & Hester, R. K. (2012). Computerized Interventions. In C. J. Correia, J. G. Murphy, & N. P. Barnett (Eds.), *College student alcohol abuse: A guide to assessment, intervention, and prevention* (pp. 246–267). Hoboken, NJ: Wiley.

Chartrand, T. L., & Lakin, J. L. (2013). The antecedents and consequences of human behavioral mimicry. *Annual Review of Psychology, 64,* 285–308. http://dx.doi.org/10.1146/annurev-psych-113011-143754

Chassin, L., Pitts, S. C., & Prost, J. (2002). Binge drinking trajectories from adolescence to emerging adulthood in a high-risk sample: Predictors and substance abuse outcomes. *Journal of Consulting and Clinical Psychology, 70,* 67–78. http://dx.doi.org/10.1037/0022-006X.70.1.67

Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology, 58,* 1015–1026. http://dx.doi.org/10.1037/0022-3514.58.6.1015

Cialdini, R. B., & Trost, M. R. (1998). Social influence: Social norms, conformity, and compliance. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (4th ed., Vol. 2, pp. 151–192). New York, NY: McGraw-Hill.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112,* 155–159. http://dx.doi.org/10.1037/0033-2909.112.1.155

Del Boca, F. K., Darkes, J., Greenbaum, P. E., & Goldman, M. S. (2004). Up close and personal: Temporal variability in the drinking of individual college students during their first year. *Journal of Consulting and Clinical Psychology, 72,* 155–164. http://dx.doi.org/10.1037/0022-006X.72.2.155

DiBello, A. M., Miller, M. B., Neighbors, C., Reid, A., & Carey, K. B. (2018). The relative strength of attitudes versus perceived drinking norms as predictors of alcohol use. *Addictive Behaviors, 80,* 39–46. http://dx.doi.org/10.1016/j.addbeh.2017.12.022

Eisinga, R., Grotenhuis, M., & Pelzer, B. (2013). The reliability of a two-item scale: Pearson, Cronbach, or Spearman-Brown? *International Journal of Public Health, 58,* 637–642. http://dx.doi.org/10.1007/s00038-012-0416-3

Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods, 12,* 121–138. http://dx.doi.org/10.1037/1082-989X.12.2.121

Englund, M. M., Egeland, B., Oliva, E. M., & Collins, W. A. (2008). Childhood and adolescent predictors of heavy drinking and alcohol use disorders in early adulthood: A longitudinal developmental analysis. *Addiction, 103*(Suppl. 1), 23–35. http://dx.doi.org/10.1111/j.1360-0443.2008.02174.x

Ennett, S. T., Foshee, V. A., Bauman, K. E., Hussong, A., Cai, L., Reyes, H. L. M., . . . Durant, R. (2008). The social ecology of adolescent alcohol misuse. *Child Development, 79,* 1777–1791. http://dx.doi.org/10.1111/j.1467-8624.2008.01225.x

EverFi. (2013). *AlcoholEdu for college.* Retrieved from https://everfi.com/courses/higher-education/alcoholedu-awareness-prevention-undergraduate/

Fromme, K., & D'Amico, E. J. (2000). Measuring adolescent alcohol outcome expectancies. *Psychology of Addictive Behaviors, 14,* 206–212. http://dx.doi.org/10.1037/0893-164X.14.2.206

Gelman, A. (2008). Scaling regression inputs by dividing by two standard deviations. *Statistics in Medicine, 27,* 2865–2873. http://dx.doi.org/10.1002/sim.3107

George, W. H., Frone, M. R., Cooper, M. L., Russell, M., Skinner, J. B., & Windle, M. (1995). A revised Alcohol Expectancy Questionnaire: Factor structure confirmation, and invariance in a general population sample. *Journal of Studies on Alcohol, 56,* 177–185. http://dx.doi.org/10.15288/jsa.1995.56.177

Hingson, R. W., Zha, W., & Weitzman, E. R. (2009). Magnitude of and trends in alcohol-related mortality and morbidity among U.S. college students ages 18–24, 1998–2005. *Journal of Studies on Alcohol and Drugs Supplement, 16,* 12–20. http://dx.doi.org/10.15288/jsads.2009.s16.12

Hox, J. (1998). Multilevel modeling: When and why. In I. Balderjahn, R. Mathar, & M. Schader (Eds.), *Classification, data analysis, and data*

highways (pp. 147–154). New York, NY: Springer-Verlag. http://dx.doi.org/10.1007/978-3-642-72087-1_17

Huang, J. H., DeJong, W., Schneider, S. K., & Towvim, L. G. (2011). Endorsed reasons for not drinking alcohol: A comparison of college student drinkers and abstainers. *Journal of Behavioral Medicine, 34,* 64–73. http://dx.doi.org/10.1007/s10865-010-9272-x

Huang, J.-H., DeJong, W., Towvim, L. G., & Schneider, S. K. (2009). Sociodemographic and psychobehavioral characteristics of U.S. college students who abstain from alcohol. *Journal of American College Health, 57,* 395–410. http://dx.doi.org/10.3200/JACH.57.4.395-410

Jackson, K. M., Sher, K. J., Gotham, H. J., & Wood, P. K. (2001). Transitioning into and out of large-effect drinking in young adulthood. *Journal of Abnormal Psychology, 110,* 378–391. http://dx.doi.org/10.1037/0021-843X.110.3.378

Jackson, K. M., Sher, K. J., & Park, A. (2005). Drinking among college students. In M. Galanter, C. Lowman, G. M. Boyd, V. B. Faden, E. Witt, D. &Lagressa (Eds.), *Alcohol problems in adolescents and young adults. Recent developments in alcoholism* (pp. 85–117). Boston, MA: Springer.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Miech, R. A. (2016). *Monitoring the future national survey results on drug use, 1975–2015: Vol. II. College students and adults ages 19–55.* Ann Arbor: Institute for Social Research, University of Michigan.

Kahler, C. W., Strong, D. R., & Read, J. P. (2005). Toward efficient and comprehensive measurement of the alcohol problems continuum in college students: The brief young adult alcohol consequences questionnaire. *Alcoholism, Clinical and Experimental Research, 29,* 1180–1189. http://dx.doi.org/10.1097/01.ALC.0000171940.95813.A5

Karam, E., Kypri, K., & Salamoun, M. (2007). Alcohol use among college students: An international perspective. *Current Opinion in Psychiatry, 20,* 213–221. http://dx.doi.org/10.1097/YCO.0b013e3280fa836c

Larsen, H., van der Zwaluw, C. S., Overbeek, G., Granic, I., Franke, B., & Engels, R. C. (2010). A variable-number-of-tandem-repeats polymorphism in the dopamine D4 receptor gene affects social adaptation of alcohol use: Investigation of a gene-environment interaction. *Psychological Science, 21,* 1064–1068. http://dx.doi.org/10.1177/0956797610376654

Lau-Barraco, C., Braitman, A. L., Leonard, K. E., & Padilla, M. (2012). Drinking buddies and their prospective influence on alcohol outcomes: Alcohol expectancies as a mediator. *Psychology of Addictive Behaviors, 26,* 747–758. http://dx.doi.org/10.1037/a0028909

Leigh, B. C., & Stacy, A. W. (1993). Alcohol outcome expectancies: Scale construction and predictive utility in higher order confirmatory models. *Psychological Assessment, 5,* 216–229. http://dx.doi.org/10.1037/1040-3590.5.2.216

Moore, A. A., Gould, R., Reuben, D. B., Greendale, G. A., Carter, M. K., Zhou, K., & Karlamangla, A. (2005). Longitudinal patterns and predictors of alcohol consumption in the United States. *American Journal of Public Health, 95,* 458–465. http://dx.doi.org/10.2105/AJPH.2003.019471

Moulton, B. R. (1986). Random group effects and the precision of regression estimates. *Journal of Econometrics, 32,* 385–397. http://dx.doi.org/10.1016/0304-4076(86)90021-7

National Institute of Alcohol Abuse and Alcoholism. (n.d.). *Administering alcohol in human studies.* Retrieved from https://www.niaaa.nih.gov/Resources/ResearchResources/job22.htm

National Institute on Alcohol Abuse and Alcoholism. (2002). *High-risk drinking in college: What we know and what we need to learn.* Retrieved from https://www.collegedrinkingprevention.gov/media/finalpanel1.pdf

National Institute on Alcohol Abuse and Alcoholism. (2016). *Apparent alcohol consumption for states, census regions, and the United States, 2016.* Retrieved from https://pubs.niaaa.nih.gov/publications/surveillance110/tab2_16.htm

Pachankis, J. E., Hatzenbuehler, M. L., & Starks, T. J. (2014). The influence of structural stigma and rejection sensitivity on young sexual

minority men's daily tobacco and alcohol use. *Social Science & Medicine, 103,* 67–75. http://dx.doi.org/10.1016/j.socscimed.2013.10.005

Perkins, H. W., & Berkowitz, A. D. (1986). Perceiving the community norms of alcohol use among students: Some research implications for campus alcohol education programming. *The International Journal of the Addictions, 21,* 961–976. http://dx.doi.org/10.3109/10826088609077249

Prestwich, A., Kellar, I., Conner, M., Lawton, R., Gardner, P., & Turgut, L. (2016). Does changing social influence engender changes in alcohol intake? A meta-analysis. *Journal of Consulting and Clinical Psychology, 84,* 845–860. http://dx.doi.org/10.1037/ccp0000112

Quigley, B. M., & Collins, R. L. (1999). The modeling of alcohol consumption: A meta-analytic review. *Journal of Studies on Alcohol and Drugs, 60,* 90–98. http://dx.doi.org/10.15288/jsa.1999.60.90

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods.* Thousand Oaks, CA: SAGE.

Reid, A. E., & Carey, K. B. (2015). Interventions to reduce college student drinking: State of the evidence for mechanisms of behavior change. *Clinical Psychology Review, 40,* 213–224. http://dx.doi.org/10.1016/j.cpr.2015.06.006

Reid, A. E., Field, M., Jones, A., DiLemma, L. C. G., & Robinson, E. (2019). Social modelling of health behaviours: Testing self-affirmation as a conformity-reduction strategy. *British Journal of Health Psychology, 24,* 651–667. http://dx.doi.org/10.1111/bjhp.12374

Rimal, R. N. (2008). Modeling the relationship between descriptive norms and behaviors: A test and extension of the theory of normative social behavior (TNSB). *Health Communication, 23,* 103–116. http://dx.doi.org/10.1080/10410230801967791

Rimal, R. N., Lapinski, M. K., Cook, R. J., & Real, K. (2005). Moving toward a theory of normative influences: How perceived benefits and similarity moderate the impact of descriptive norms on behaviors. *Journal of Health Communication, 10,* 433–450. http://dx.doi.org/10.1080/10810730591009880

Rinker, D. V., Krieger, H., & Neighbors, C. (2016). Social network factors and addictive behaviors among college students. *Current Addiction Reports, 3,* 356–367. http://dx.doi.org/10.1007/s40429-016-0126-7

Robinson, E., Oldham, M., Sharps, M., Cunliffe, A., Scott, J., Clark, E., . . . Field, M. (2016). Social imitation of alcohol consumption and ingratiation motives in young adults. *Psychology of Addictive Behaviors, 30,* 442–449. http://dx.doi.org/10.1037/adb0000150

Sallie Mae. (2013). *How America pays for college.* Retrieved from https://www.salliemae.com/assets/Core/how-America-pays/howamericapays2013.pdf

Scott-Sheldon, L. A. J., Carey, K. B., Kaiser, T. S., Knight, J. M., & Carey, M. P. (2016). Alcohol interventions for Greek letter organizations: A systematic review and meta-analysis, 1987 to 2014. *Health Psychology, 35,* 670–684. http://dx.doi.org/10.1037/hea0000357

Scott-Sheldon, L. A. J., Terry, D. L., Carey, K. B., Garey, L., & Carey, M. P. (2012). Efficacy of expectancy challenge interventions to reduce college student drinking: A meta-analytic review. *Psychology of Addictive Behaviors, 26,* 393–405. http://dx.doi.org/10.1037/a0027565

Sheeran, P., & Conner, M. (2017). Improving the translation of intentions into health actions: The role of motivational coherence. *Health Psychology, 36,* 1065–1073. http://dx.doi.org/10.1037/hea0000553

Sher, K. J., Jackson, K. M., & Steinley, D. (2011). Alcohol use trajectories and the ubiquitous cat's cradle: Cause for concern? *Journal of Abnormal Psychology, 120,* 322–335. http://dx.doi.org/10.1037/a0021813

Sher, K. J., & Rutledge, P. C. (2007). Heavy drinking across the transition to college: Predicting first-semester heavy drinking from precollege variables. *Addictive Behaviors, 32,* 819–835. http://dx.doi.org/10.1016/j.addbeh.2006.06.024

Skidmore, J. R., & Murphy, J. G. (2011). The effect of drink price and next-day responsibilities on college student drinking: A behavioral economic analysis. *Psychology of Addictive Behaviors, 25,* 57–68. http://dx.doi.org/10.1037/a0021118

Slutske, W. S., Hunt-Carter, E. E., Nabors-Oberg, R. E., Sher, K. J., Bucholz, K. K., Madden, P. A., . . . Heath, A. C. (2004). Do college students drink more than their non-college-attending peers? Evidence from a population-based longitudinal female twin study. *Journal of Abnormal Psychology, 113,* 530–540. http://dx.doi.org/10.1037/0021-843X.113.4.530

StataCorp. (2002). Stata Statistical Software (Version 13. 1) [Computer software]. College Station, TX: StataCorp LP.

Tate, R. L., & Wongbundhit, Y. (1983). Random versus nonrandom coefficient models for multilevel analysis. *Journal of Educational Statistics, 8,* 103–120. http://dx.doi.org/10.3102/10769986008002103

Valente, T. W. (2012). Network interventions. *Science, 337,* 49–53. http://dx.doi.org/10.1126/science.1217330

White, H. R., McMorris, B. J., Catalano, R. F., Fleming, C. B., Haggerty, K. P., & Abbott, R. D. (2006). Increases in alcohol and marijuana use during the transition out of high school into emerging adulthood: The effects of leaving home, going to college, and high school protective factors. *Journal of Studies on Alcohol, 67,* 810–822. http://dx.doi.org/10.15288/jsa.2006.67.810