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## The Relationship Between Alcohol Use, Eating Habits and Weight Change in College Freshmen

Elizabeth E. Lloyd-Richardson, PhD, Monica L. Lucero, MD, Julia R. DiBello, MA, Amanda E. Jacobson, BA, and Rena R. Wing, PhD

Department of Psychiatry and Human Behavior, Warren Alpert Medical School of Brown University, Weight Control and Diabetes Research Center, The Miriam Hospital, Providence, Rhode Island

### Abstract

**Purpose**—This study aims to improve understanding of how alcohol consumption in college freshmen affects eating patterns before, during, and after drinking, as well as its relation to body weight change.

**Methods**—282 college freshmen (61% female; 59% Caucasian) completed measures of alcohol use, measured body mass index (BMI), and eating and activity habits before, during and following drinking episodes. Students were categorized by drinking status (non-drinker, low-risk, and moderate/high-risk) in order to explore group differences.

**Results**—75% of the sample reported past-month alcohol consumption, with 65% (N=134) of these categorized as “low-risk” drinkers and 35% (N=72) as “moderate-risk” drinkers. Moderate-risk drinkers were more likely than low-risk drinkers to report increases in appetite after drinking, with nearly half of students reporting overeating and making unhealthy food choices following drinking. Moderate-risk drinkers also demonstrated significant increases in 1<sup>st</sup> semester BMI change, relative to non-drinkers and low-risk drinkers.

**Conclusions**—Eating patterns for a significant number of college students are altered before, during, and following drinking episodes, which related to change in freshman year BMI. Keywords: eating habits; binge drinking; alcohol consumption; college freshman

Limited research suggests that students gain five to seven pounds during their first year of college (Graham & Jones, 2002; Hodge CN, 1993; Levitsky, Halbmaier, & Mrdjenovic, 2004). The role of the college environment and behaviors common to the college experience remains largely understudied for their influence on weight gain (Levitsky et al., 2004). The prevalence of alcohol consumption is high among college students (Ham & Hope, 2003; Wechsler, Lee, Nelson, & Kuo, 2002). Indeed, 63% of students reported drinking alcohol in the past 30 days, with 42% reporting drinking to excess, or binge drinking (Wechsler et al., 2000).

Better understanding of the relationship between college drinking habits and their effect on eating and activity habits and weight change is needed. By categorizing college freshmen by drinking status (non-drinker, low-risk, and moderate/high-risk), we explored group differences

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Address correspondence and reprint requests to: Elizabeth E. Lloyd-Richardson, Ph.D., University of Massachusetts Dartmouth, Department of Psychology, 285 Old Westport Road, North Dartmouth, MA 02747. Tel: 508.910.6954. Fax: 508.999.9169. Email: Erichardson@umassd.edu.

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in eating and activity behaviors taking place before, during, and following drinking events. We also explored differences between drinking status and freshman year weight change.

## Methods

### Participants

Freshmen (N=282) at a university in the northeast participated in this study of freshman health behaviors. Sex and racial/ethnic composition of the sample was generally reflective of the larger freshman class, as reported in university published statistics. All students lived on campus, as required by the university. The study was approved by the University's institutional review board, and all participants provided written informed consent.

### Measures

**Eating and Alcohol Use Questionnaire (EAUQ)**—Based upon formative qualitative research with college freshmen, the EAUQ was developed by the authors to assess past thirty-day eating and activity habits taking place before, during and following drinking episodes. Consisting of 15 closed-format items, students were asked about their knowledge of calories contained in alcoholic beverages, whether they limit their drinking because of concerns about calories, and whether their eating and exercise habits change before, during, or following drinking episodes (relative to non-drinking periods). Items were rated on a likert scale, with higher ratings indicative of greater changes in behavior attributed to drinking. Factor analysis yielded five components, which consistently replicated across two administrations of the EAUQ (see Table 1). Overall reliability of the EAUQ is good, with internal consistency Cronbach's  $\alpha = .79$ , two-week test-retest reliability  $\alpha = .80$ , and individual item reliability ranging from 0.3 – 0.9.

**Alcohol Use Disorders Identification Test (AUDIT)**—The AUDIT (Saunders, 1993) was used to assess drinking habits over the 2nd semester, freshman year. It is a widely used self-administered screening questionnaire designed by the World Health Organization (WHO) to identify individuals engaging in high-risk drinking. Individual items are summed for a total score (range 0–40; scores  $\geq 8$  indicative of problematic drinking). The AUDIT has been well-validated across numerous populations, including college students (Allen, 1995; Allen, Litten, Fertig, & Babor, 1997; Kokotailo et al., 2004; Reinert & Allen, 2002).

**Anthropometrics**—Measured height and weight were obtained by trained study staff at three time points: beginning of the 1st semester, freshman year (September); beginning of the 2nd semester (January); and end of the 2nd semester (May). BMI was then calculated (kilograms / height in meters squared). Statistical Analysis. Results presented in this manuscript are based upon EAUQ and AUDIT questionnaires administered at the end of the freshman 2nd semester (May). Body mass index (BMI) was measured at three points during the freshman year. Participants were categorized into one of three drinking status categories based upon total AUDIT score: “*nondrinkers*” were defined as those who denied consuming alcohol in the past 30 days; “*low-risk drinkers*” were those who endorsed drinking alcohol in the past 30 days, scoring between 1–7 on the AUDIT, who typically reported drinking alcohol an average of 1–2 times per month, consuming 2–3 drinks per occasion; and “*moderate-risk drinkers*” were classified based on a score of  $\geq 8$  on the AUDIT. These individuals typically reported drinking an average of 4–5 drinks per episode on 1–3 days per week, with approximately monthly binge drinking episodes (defined by the AUDIT as  $\geq 6$  drinks).

Differences by drinking status category across sociodemographic characteristics were examined using ANOVA and chi-square tests. Limiting analyses to the subsample (N=206) that endorsed past 30-day alcohol consumption, we then used ANCOVA to examine

differences between low- and moderate-risk drinking groups on the EAUQ. Differences between drinking status categories on past semester alcohol intake, baseline BMI, and 1st (September to January) and 2nd (January to May) semester change in BMI were examined via ANCOVA. All statistical analyses were conducted using SPSS for Windows, v14.0.

## Results

### Description of the Study Sample

Sixty one percent (N=172) of participants were female, with a mean age of 18.6 years (SD=0.04). The mean baseline BMI was 22.9 (SD=3.1). Males represented a larger proportion of the moderate-risk drinking group, than the non-drinking and low-risk drinking groups ( $p < .01$ ). The proportion of European-Americans increased with increasing level of drinking group risk ( $p < .01$ ). Thus, gender and race were controlled for in all subsequent analyses.

### Relationship Between Eating and Activity Patterns and Risky Drinking

Among students reporting drinking in the past month (N=206; 73%), 65.7% were unaware of the calorie content of the alcoholic beverages they typically consumed. One-third (32.5%) of students reporting past thirty-day drinking indicated that alcohol increased their appetite. Similarly, 36.1% of students described eating large amounts following alcohol consumption (a pattern students ubiquitously label “drunk munchies”) on at least half of drinking episodes, and 39% reported being less healthy in their food choices after drinking, as compared to when they abstained from drinking.

Differences between the moderate-risk and low-risk drinking groups were found on four of the five EAUQ subscales: Eating Habits After Drinking ( $F(1,201) = 11.37, P=.001$ ); Exercise Habits ( $F(1,201) = 7.78, P=.006$ ); Eating Habits Before and During Drinking ( $F(1,201) = 9.06, P=.003$ ); and Eating Habits the Following Day ( $F(1,200) = 5.13, P=.03$ ).

As shown in Table 1, moderate-risk drinkers were more likely than low-risk drinkers to endorse eating more food after drinking, to eat junk food and make less healthy food choices, to have “drunk munchies”, and to indicate that alcohol increased their appetite. Moderate-risk drinkers were also more likely to endorse eating food before, during, and the day after drinking.

### Relationship Between Weight Change, the EAUQ, and Risky Drinking

Correlation analyses found the Eating Habits After Drinking subscale was positively related to change in 1st semester BMI ( $r=.16, P=.02$ ) and change in overall freshman year BMI ( $r=.14, P=.04$ ). No other EAUQ factors were correlated with BMI. A priori planned contrasts demonstrated a significant effect of drinking group on 1st semester change in BMI ( $F(2, 258) = 3.3, P=0.04$ ) and 2nd semester change in BMI ( $F(2, 259) = 3.2, P=0.04$ ). As illustrated in Figure 1, controlling for sex and race, during the 1st semester, moderate-risk drinkers had greater increases in BMI than low-risk drinkers ( $1.25 \pm 0.15$  vs.  $0.77 \pm 0.11$ , respectively;  $p=0.03$ ). During the 2nd semester, moderate-risk drinkers showed a decrease in BMI compared to non-drinkers ( $-0.15 \pm 0.11$  vs.  $0.21 \pm 0.11$ , respectively;  $p=0.04$ ). The proportion of individuals who were overweight/obese by the end of their 2nd semester suggests a trend ( $p=.06$ ), with moderate-risk drinkers more likely to be overweight (22.0% of non-drinkers; 25.6% of low-risk drinkers; 27.0% of moderate-risk drinkers).

## Discussion

Our results suggest that alcohol consumption has a significant influence on the eating habits of college freshmen. In particular, the Eating Habits After Drinking subscale of the EAUQ was significantly associated with greater risky drinking, as well as change in both 1st semester BMI

(the months associated with greatest weight change) and change in freshman year BMI. Students endorsed high levels of late-night eating and experienced the “drunk munchies”--disinhibition leading to the consumption of large quantities of usually high-fat foods--after as many as half of their drinking episodes.

While “late-night eating” among college students may be a routine component of the college experience(Lloyd-Richardson, 2007), this research suggests that late-night eating more commonly occurs on drinking nights than on non-drinking nights, and, importantly, includes both larger portion sizes and less healthy food choices by students. One can speculate that continued exposure to the excess calories obtained from alcohol, as well as consumption of high-fat foods after a drinking episode, can lead to weight gain(Tremblay et al., 1995).

We noted a significant effect of drinking group on change in BMI, with moderate-risk drinkers experiencing greater BMI increases than low-risk drinkers during the 1st semester. The mechanism behind this observation is unclear. One area worth exploring further is the role of disinhibition from alcohol on dietary restraint. Disinhibition of restraint has been documented in situations where an individual is aware that they are consuming alcohol(Hetherington, Cameron, Wallis, & Pirie, 2001; Polivy & Herman, 1976). In a highly restrained eater, it is possible that situations of elevated alcohol consumption or binge drinking increase the reward value of highly palatable foods(Krahn, Kurth, Demitrack, & Drewnowski, 1992; Krahn, Kurth, Gomberg, & Drewnowski, 2005), such as those commonly available on college campuses. Consistent with this, Krahn et al., (2005) found a strong relationship between dieting and bingeing severity with frequency and intensity of alcohol abuse. Research is needed examining level of drinking, weight change, and potential mediators of this relationship.

### Limitations

Research suggests the majority of freshman year weight gain takes place during the 1st semester (Hovell, Mewborn, Randle, & Fowler-Johnson, 1985; Lloyd-Richardson, 2007). In this study, the EAUQ and AUDIT were administered only at the end of the academic year, making it difficult to make proximal temporal connections between weight change, alcohol intake, and attitudes toward eating and alcohol use. Future research investigating longitudinal changes in and the relationship between these constructs is warranted.

### Conclusions

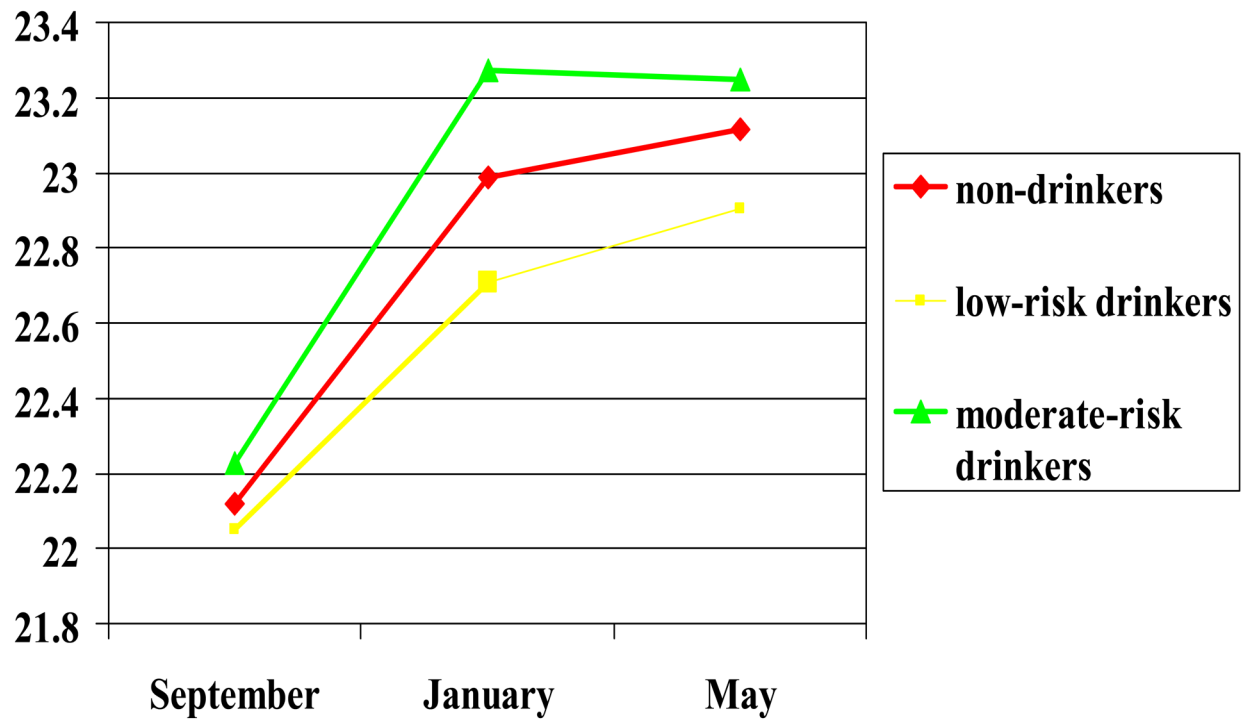
The college years are fraught with many public health challenges, including high rates of problematic drinking and freshman year weight gain (Ham & Hope, 2003). This research suggests that students’ alcohol consumption affects the quantity and quality of food choices made, particularly following drinking episodes. Existing research suggests that health-risk and health-promoting behaviors tend to cluster in adolescence (Anderson, Martens, & Cimini, 2005; Lowry et al., 2000; Rafiroiu, Sargent, Parra-Medina, Drane, & Valois, 2003). Future research efforts should examine whether intervention programs targeting healthful weight control strategies in college students can simultaneously reduce the prevalence of other health-risk behaviors, such as binge drinking.

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Note: BMI values adjusted for gender and race.

**Figure 1.**  
Mean BMI over the freshman year, by end-of-year drinking status.

**Table 1**

Principal Components Analysis of Eating and Alcohol Use Items and Rate of Item Endorsement Among Low-Risk and Moderate-Risk Drinkers (N(%)).

	Low-Risk Drinkers, % (N = 134)	Moderate-Risk Drinkers, % (N = 72)
<b><i>Eating Habits After Drinking</i></b>		
Ate more food after drinking episodes than when not drinking	29.1	49.3 <sup>b</sup>
Ate junk food after drinking on half of drinking episodes or more	62.7	83.1 <sup>b</sup>
Made less healthy food choices after drinking on half of drinking episodes or more	58.2	77.5 <sup>b</sup>
Ate later that night ('drunk munchies') on half of drinking episodes or more	61.2	81.4 <sup>b</sup>
Felt that drinking increased their appetite	23.1	50.7 <sup>c</sup>
<b><i>Calorie Knowledge</i></b>		
Knew how many calories were in alcoholic drinks	37.3	31.9
Limited the number of alcoholic drinks because of calorie concerns	28.4	25.0
Knew how many calories were in the alcoholic drinks they <i>typically drink</i>	35.1	32.9
<b><i>Exercise Habits</i></b>		
Exercised more before starting to drink alcohol	3.0	9.9 <sup>a</sup>
Exercised less the following day after drinking	14.2	25.7 <sup>a</sup>
<b><i>Eating Habits Before and During Drinking</i></b>		
Ate more food <i>before</i> a drinking episode, relative to when not drinking	12.7	22.5 <sup>a</sup>
<b>Ate more food <i>during</i> a drinking episode, relative to when not drinking</b>	<b>19.4</b>	<b>33.8<sup>a</sup></b>
<b><i>Eating Habits the Day Following Drinking</i></b>		
Ate more food the day following a drinking episode, relative to when not having drunk alcohol	3.7	5.7 <sup>a</sup>

*Note:* For these analyses, the sample was limited to those who reported consuming alcohol in the past 30 days (N=206). Analyses adjusted for gender and race. Groups differ significantly at the

<sup>a</sup>P<.05 level;

<sup>b</sup>P<.01 level;

<sup>c</sup>P<.001 level.

**Table 2**

Characteristics of College Drinkers and Non-Drinkers on Demographic and Weight Variables.

	Non-drinkers <i>N</i> = 76	Low-risk drinkers <i>N</i> = 134	Moderate-risk drinkers <i>N</i> = 72
<b>Gender, n (% female)</b> **	49(64.5)	91(67.9)	31(43.1)
<b>Age, m(se)</b> **	18.5(0.06)	18.6(0.06)	18.7(0.11)
<b>Race, n(%)</b> **			
European-American	32(42.7)	82(62.1)	52(74.3)
Asian-American	23(30.7)	25(18.9)	8(11.4)
African-American	7(9.3)	4(3.0)	1(1.4)
Other/multiracial	13(17.3)	21(15.9)	9(12.9)
<b>AUDIT, m(se)</b> ***	0.5(0.3) <sup>a</sup>	4.0(0.2) <sup>b</sup>	10.8(0.3) <sup>c</sup>

Note: "Non-drinkers" defined as those participants denying alcohol consumption in the past 30 days and scoring  $\leq 2$  on the AUDIT; "low-risk drinkers" defined as those scoring 1–7 on the AUDIT; and "moderate-risk drinkers" defined as scoring  $\geq 8$  on the AUDIT. Percentages or standard error presented in parentheses. Groups differ significantly at the

\*  
p<.05,

\*\*  
p<0.01 and

\*\*\*  
p<0.001 level. Analyses of AUDIT data are adjusted for gender and race.

<sup>abc</sup> Row values with different superscripts are significantly different from each other.