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# Drinking and Driving Among College Students

## The Influence of Alcohol-Control Policies

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**Background:** Studies have reported high rates of heavy episodic drinking and alcohol-related problems, including drinking and driving, among college students. However, most studies have been conducted in single colleges or states. This study used a national sample to examine policy factors associated with alcohol-involved driving.

**Methods:** A random sample of full-time students (N=10,904) attending a nationally representative sample of 4-year colleges in 39 states ( $n=119$ ) completed self-administered questionnaires. The questionnaire examined driving after consuming any alcohol, driving after  $\geq 5$  drinks, and riding with a high or drunk driver. Individual-level data about driving after  $\geq 5$  drinks were linked to information on the policy environment at both local and state levels and to ratings of enforcements for drunk driving laws.

**Results:** Drinking and driving behaviors are prevalent among a minority of college students and differ significantly among student subgroups. Students who attend colleges in states that have more restrictions on underage drinking, high volume consumption, and sales of alcoholic beverages, and devote more resources to enforcing drunk driving laws, report less drinking and driving.

**Conclusion:** The occurrence of drinking and driving among college students differs significantly according to the policy environment at local and state levels and the enforcement of those policies. Comprehensive policies and their strong enforcement are promising interventions to reduce drinking and driving among college students.  
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### Introduction

During the year 2001, over 16,000 motor vehicle fatalities and 310,000 injuries in the United States involved alcohol,<sup>1</sup> and a high proportion of these events involved adolescents and young adults. Although the percentage of alcohol-related motor vehicle fatalities decreased from the early 1970s through the 1980s, the downward trend stabilized in the past decade, and recent evidence suggests that it may be reversing.<sup>1,2</sup> Despite the relative stability in the national rate of alcohol-involved traffic fatalities, significant variability exists in the rate of alcohol-involved traffic fatalities across states.<sup>3-5</sup> Significant variations also exist in the levels of binge drinking in the general U.S. population<sup>6</sup> and in the policy environment regarding alcohol consumption and sales as well as the resources available for enforcing those policies in each state.<sup>7</sup>

Stronger drinking and driving countermeasures at the state policy level are associated with lower rates of alcohol-impaired driving.<sup>8</sup>

College students are particularly susceptible to alcohol-impaired driving. Higher rates of heavy drinking occur in this population compared with same-aged peers who do not attend college.<sup>9,10</sup> Heavy episodic alcohol use or "binge drinking" among college students is a nationally recognized health problem,<sup>11,12</sup> occurring among two in five students nationally.<sup>13-16</sup> More than half of the students who engage in frequent binge drinking experience five or more different alcohol-related problems during the school year, a rate of problems significantly greater than that for those who drink but do not binge.<sup>13-16</sup> Perhaps the most dangerous of these problems is drinking and driving. The number of college students that sustained fatal injuries in alcohol-related traffic crashes for the calendar year 1998 is estimated to be approximately 1100.<sup>17</sup>

Studies of college students' drinking habits have often been limited to single schools or a few schools from the same state,<sup>18</sup> a design limitation that has been documented in epidemiology.<sup>19</sup> There is also an absence of work on the impact of alcohol-control policies on college student drinking and driving on a national

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scale. As a result of the reliance on restricted and opportunistic, rather than representative sampling, less attention has been given to environmental factors in developing intervention strategies to address this heavy drinking population. A few researchers have looked at environmental factors in the context of community-based prevention efforts, such as the physical environment<sup>20</sup> and the impact of control policies.<sup>21–23</sup> While these areas are generally underrepresented in current research, they hold much promise for reducing alcohol use and alcohol-impaired driving practices among college students.<sup>18,22</sup>

The current study examines alcohol-impaired driving practices using the Harvard School of Public Health (HSPH) College Alcohol Study (CAS), a nationally representative sample of 4-year colleges in the United States. Drawing on this dataset provided an opportunity to examine drinking and driving behaviors as they relate to the alcohol control policy environments that exist where students attend college.

## Methods

The participants in the current study were drawn from the 2001 HSPH CAS, a nationally representative sample of undergraduate students at U.S. 4-year colleges. The participant schools (N=140) were selected from a list of accredited universities provided by the American Council on Education, using probability sampling proportionate to size. Of the original 140 colleges that participated in the 1993 CAS, 120 were re-surveyed. The loss of 20 schools was due primarily to the inability of these schools to provide a random sample of students and their addresses within the time requirements of the study. One college with a response rate that was substantially lower than the others was excluded, leaving 119 schools. Further details on the sample and research design are published elsewhere.<sup>13–16</sup>

A self-administered questionnaire asked students to report on their alcohol use, driving practices, and demographic characteristics. A drink was defined as a 12-oz (360 mL) bottle or can of beer, a 4-oz glass of wine (120 mL), a 12-oz (360 mL) bottle or can of wine cooler, or a shot of liquor (1.25 oz or 37 mL) either straight or in a mixed drink. Drinking and driving behaviors were measured by asking respondents, "In the past 30 days, how many times did you do each of the following drinking driving behaviors?" (1) Driving after drinking any alcohol, (2) Driving after having  $\geq 5$  drinks, and (3) Riding with a driver who was high or drunk. Dichotomized variables (not at all versus once or more) were used for the analyses. The riding with an intoxicated driver variable included all respondents to the questionnaire except for 95 who did not answer the question (N=10,809), while the two drinking and driving variables were limited to only those respondents who reported driving a motor vehicle  $\geq 1$  times per week in the past 30 days ( $n=7941$ ).

The analyses were limited to those students who regularly drove a motor vehicle, as one precondition of drinking and driving was having access to a vehicle. In addition to reporting drinking and driving prevalence figures for this subgroup of

students, the overall figures for students who drove less frequently or not at all are included.

State alcohol laws and policies were obtained from a report by the University of Minnesota (Personal communication, AC Wagenaar, University of Minnesota, 2000). Local laws and policies were obtained by directly contacting local city halls. These laws were combined into two groupings according to their emphasis on underage access and high volume sales. Instead of focusing on the presence or absence of single laws, whether or not multiple laws were in effect was examined. Two aggregate measures were created using a criterion of more than half of the laws in each group to examine the relationship between the presence of laws and driving after consuming  $\geq 5$  drinks. While it is unlikely that a single law would have a major impact on drinking and driving behaviors, a comprehensive set of related laws may be more likely to have an effect.<sup>8</sup>

The laws included in the study were in effect for at least 1.5 years before conducting the survey. These reflect the most comprehensive data available before the CAS survey, and this time period helped to ensure that the laws enacted were fully implemented. The underage laws considered were: prohibitions against using a false identification, restrictions on attempting to buy or consume for those under the legal drinking age, minimum age to be a clerk, minimum age of 21 years to sell alcohol (local), minimum age of 21 years to sell alcohol (state), and mandatory postings of warning signs to potential underaged buyers for retailers. Laws that pertained to the minimum legal drinking age were examined for underaged students only. Laws addressing zero tolerance (.02 g/dL per se blood alcohol concentration for drivers under the legal drinking age), selling alcohol to those under the legal drinking age, and possessing alcohol by those under the legal age were not included in the analyses because these laws were in effect in all or nearly all states. Laws pertaining to volume alcohol sales were: keg registration, a statewide .08 g/dL per se blood alcohol concentration law, and restrictions on happy hours, open alcohol containers, beer sold in a pitcher, and billboards and advertising.

The authors added a rating of law enforcement—a measure designed to reflect state-level investments in resources for law enforcement agencies with the equipment and personnel necessary for effective enforcement efforts—to the set of laws enacted in each state and community. Ratings were taken from a report developed by Mothers Against Drunk Driving (MADD), entitled "Rating the States 2000."<sup>7</sup> Dichotomized variables were used for the analyses (A or A– versus B+ or lower). We chose this cutoff to examine a sufficient number of states where an independent rater considers the enforcement capability to conform to a high standard.

## Data Analysis

Data were weighted to account for the population distribution of each school in terms of gender, age, and race/ethnicity. Weighted percentages and directly standardized rates of outcomes of interest were reported for all analyses. The details of the weighting and standardization procedure are described elsewhere.<sup>16</sup>

Comparisons of prevalence rates and bivariate associations between categorical variables were performed using SAS (SAS Institute Inc., Cary NC, 1994). SUDAAN version 7.5 (Research Triangle Institute, Research Triangle Park NC, 1997) was used for multiple logistic regression analyses to model prevalence of the three outcome variables. SUDAAN employs a Taylor series linearization to approximate correct standard errors for sample estimates given the multistage sampling design of the survey and the effects of sample weighting. Odds ratios are presented for the outcomes of interests. Bivariate odds ratios are shown for individual and college characteristics, and multivariate odds ratios (controlling for age, gender, race/ethnicity, and school response rates) are reported for analyses examining alcohol control policies.

## Results

Among all college students in the sample, 3 of 10 (29.0%) drove after drinking any amount of alcohol, and 1 of 10 (10.8%) drove after consuming  $\geq 5$  drinks; about 1 of 4 students (23.2%) rode with a driver who was high or drunk. Analyses limited to students who drove at least once a week in the past 30 days indicated that 1 of 3 (35.5%) reported driving after any consumption of alcohol, while about 1 in 7 students (13.3%) reported driving after consuming  $\geq 5$  drinks.

### Student Characteristics

The prevalence of drinking and driving varied significantly among demographic subgroups (Table 1). A higher percentage of men, white students, and members of Greek organizations drove after drinking and rode with a driver who was high or drunk. The percentage of students aged 21–23 years who drove after drinking any alcohol and after having  $\geq 5$  drinks was higher than students under the legal drinking age. Although a higher percentage of students aged  $\geq 24$  years drove after drinking any alcohol, compared to those under the legal drinking age, no differences between these groups existed in reports of driving after consuming  $\geq 5$  drinks; also a smaller proportion of students older than age 24, compared to their younger peers, rode with an intoxicated driver.

Drinking and driving was strongly associated with living arrangements. A smaller percentage of students who lived in dormitories reported drinking and driving and riding with a high or drunk driver than students who lived in Greek houses. The lowest rates of drinking and driving occurred among residents of substance-free halls. Among off-campus residents, those who lived with parents had lower rates of drinking and driving than those who lived alone or with a roommate.

Pre-college drinking patterns were strongly associated with drinking and driving behaviors. High school

binge drinkers had much higher rates of each of three measures of drinking and driving than their peers who did not binge drink in high school.

### College Characteristics

Students at certain colleges were more likely to drink and drive, and these data are summarized in Table 2. Higher rates of driving after consuming any alcohol were reported at large schools, but occurred less often at schools in the Northeast. Students at medium-sized, public, and southern and north-central schools more often reported driving after consuming  $\geq 5$  drinks. Rates of riding with a high or drunk driver were higher among students attending public and southern and north-central schools, but lower among students attending commuter and competitive schools. Each of the drinking and driving behaviors occurred at a higher rate at schools with high rates of binge drinking.

### Alcohol-Control Policies

The rates of drinking  $\geq 5$  alcoholic beverages and driving were significantly lower among underage students who attended college in states that had a majority of control laws (4 of 7) pertaining to underage drinking [8.2% for  $\geq 4$  laws ( $n=33$  schools) v 11.6% for  $< 4$  laws ( $n=86$  schools); odds ratio (OR)=0.65; 95% confidence interval (CI), 0.47–0.91; ( $n=3491$ )]. Drinking and driving rates were lower in states and communities with a majority of control laws addressing volume sales (4 of 6) [10.0% for  $\geq 4$  laws ( $n=22$  schools) v 14.2% for  $< 4$  laws ( $n=97$  schools); OR=0.61; 95% CI, 0.33–1.11; ( $n=7941$ )], although they were not statistically significant.

When the set of control laws in place was comprehensive (i.e., a majority of laws) and a high level of resources were devoted to enforcement of the restrictions, a strong relationship emerged. Among underage students, attending college in a state with comprehensive laws addressing underage drinkers and strong ratings of drinking and driving enforcement was associated with lower rates of driving after  $\geq 5$  drinks [5.4% for  $\geq 4$  laws plus strong enforcement ( $n=14$  schools) v 10.7% ( $n=105$  schools); OR=0.48; 95% CI, 0.27–0.86; ( $n=3491$ )]. Students attending schools in states where comprehensive volume and sales laws were in effect and the state received a high rating of enforcement reported less drinking and driving [7.9% for  $\geq 4$  laws plus strong enforcement ( $n=15$  schools) v 14.2% ( $n=104$  schools); OR=0.54; 95% CI, 0.40–0.73; ( $n=7941$ )].

## Discussion

Drinking and driving occurs among a sizable minority of U.S. college students. Nearly one in four (23.2%) reported riding with a driver who was high or drunk, and one in three students who drive regularly (35.5%)

**Table 1.** Drinking and driving behaviors by student characteristics, 2001<sup>a</sup>

Student Characteristic	Drove after any alcohol (n=7941)		Drove after ≥5 drinks (n=7924)		Rode with high or drunk driver (n=10,809)	
	Prevalence %	OR (95%CI)	Prevalence %	OR (95%CI)	Prevalence %	OR (95%CI)
<b>Total</b>	35.5		13.3		23.2	
<b>Gender</b>						
Female	30.7	1	8.7	1	21.2	1
Male	40.9	1.56 (1.41–1.73)***	18.5	2.36 (2.01–2.76)***	25.5	1.27 (1.14–1.41)***
<b>Ethnicity</b>						
Non-Hispanic	35.7	1	13.5	1	23.3	1
Hispanic	33.5	0.91 (0.75–1.11)	10.8	0.79 (0.57–1.09)	21.3	0.88 (0.74–1.06)
White	37.4	1	14.4	1	24.7	1
Black/African American	27.1	0.63 (0.46–0.85)**	7.7	0.50 (0.32–0.78)**	20.5	0.77 (0.62–0.97)*
Asian/Pacific Islander	24.9	0.55 (0.42–0.72)***	8.6	0.56 (0.36–0.85)**	14.2	0.50 (0.38–0.65)***
Other	32.7	0.82 (0.66–1.01)	11.1	0.68 (0.51–0.91)*	20.9	0.80 (0.68–0.94)**
<b>Age (years)</b>						
<21	26.0	1	10.2	1	23.7	1
21–23	46.8	2.50 (2.18–2.86)***	17.9	1.92 (1.60–2.29)***	25.7	1.11 (0.99–1.25)
≥24	32.1	1.35 (1.11–1.65)**	10.1	0.99 (0.74–1.32)	14.0	0.52 (0.43–0.62)***
<b>Year in school</b>						
Freshman	22.8	1	9.3	1	22.6	1
Sophomore	27.4	1.28 (1.06–1.54)*	11.4	1.25 (0.97–1.60)	23.5	1.05 (0.91–1.22)
Junior	39.2	2.19 (1.81–2.63)***	14.6	1.65 (1.26–2.18)***	22.8	1.01 (0.86–1.17)
Senior	40.6	2.32 (1.90–2.82)***	13.5	1.52 (1.18–1.95)***	23.3	1.03 (0.88–1.22)
<b>Living arrangements</b>						
Nonsubstance-free dorm	27.1	1	9.8	1	21.8	1
Substance-free dorm	21.6	0.74 (0.58–0.93)*	7.4	0.75 (0.51–1.11)	17.1	0.74 (0.58–0.95)*
Fraternity/sorority house (vs. others)	44.6	1.47 (1.07–2.03)*	21.3	1.78 (1.17–2.71)**	35.5	1.87 (1.42–2.47)***
Live independently off-campus	36.8	1	13.9	1	24.0	1
Live with parents off-campus	31.1	0.78 (0.68–0.90)***	11.2	0.79 (0.61–1.02)	19.1	0.74 (0.64–0.85)***
<b>Fraternity/sorority   member (v others)</b>	47.3	1.77 (1.49–2.11)***	19.1	1.67 (1.13–2.10)***	31.7	1.65 (1.41–1.93)***
<b>High school binge</b>						
No	26.2	1	6.7	1	14.9	1
Yes	54.3	3.34 (2.91–3.83)***	25.0	4.66 (3.9–5.55)***	40.8	3.95 (3.47–4.49)***

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .<sup>a</sup>Unadjusted bivariate analyses.

CI, confidence interval; OR, odds ratio.

reported driving after drinking during the school year. These behaviors represent a major health risk for this population. However, drinking and driving behaviors are not distributed equally within the population of college students; this study found that personal characteristics and policies related to the sale and use of alcohol had a major effect. Attending college in states or localities that had laws restricting high volume sales or laws targeting underage drinking, in combination with a strong investment in enforcement countermeasures, were associated with lower rates of alcohol-involved driving. These results are consistent with previous related work in the general U.S. population.<sup>8</sup>

The results of the present study are consistent with previous findings and indicate more frequent heavy

drinking among college students who recently reached the legal drinking age than among underage students.<sup>24,25</sup> Together, these results suggest a greater propensity to engage in heavy drinking and drinking and driving behaviors once alcohol can be legally obtained. Legal age students are less subject to strict drinking and driving laws, such as the zero tolerance laws enacted in all 50 U.S. states, and these students may experience less perceived threats of consequences for driving after consuming alcohol. Underage drinking and driving appears to be reduced by the enforcement of strict laws (i.e., zero tolerance laws, sobriety check points). Alternatively, underage students rode with a drunk driver as much as did students aged 21–23 years. This finding may indicate that riding with an

**Table 2.** Drinking and driving behaviors by college characteristics, 2001<sup>a</sup>

College Characteristic	n	Drove after any alcohol <sup>b</sup> (n=7941)		Drove after ≥5 drinks <sup>b</sup> (n=7924)		Rode with high or drunk driver <sup>c</sup> (n=10,809)	
		Prevalence %	OR (95%CI)	Prevalence %	OR (95%CI)	Prevalence %	OR (95%CI)
<b>Total</b>	119	22.2		13.3		23.2	
<b>Residential/commuter</b>							
Noncommuter	104	22.3	1	13.6	1	23.6	1
Commuter	15	23.3	1.06 (0.89–1.27)	11.6	0.84 (0.64–1.11)	20.3	0.81 (0.67–0.99)*
<b>Affiliation</b>							
Nonreligious	103	22.9	1	13.6	1	23.9	1
Religious	16	18.4	0.75 (0.45–1.26)	11.4	0.76 (0.44–1.29)	18.0	0.71 (0.46–1.09)
<b>Size of enrollment</b>							
Small <5000	38	19.5	1	11.3	1	21.0	1
Medium 5,001–10,000	28	21.4	1.11 (0.86–1.43)	16.3	1.49 (1.08–2.07)*	24.5	1.21 (0.93–1.59)
Large >10,000	53	24.3	1.40 (1.11–1.76)**	12.9	1.13 (0.85–1.48)	23.6	1.22 (0.97–1.59)
<b>Admission criteria</b>							
Less competitive	66	22.0	1	13.9	1	22.8	1
Competitive	53	23.2	1.04 (0.86–1.25)	12.4	0.88 (0.66–1.17)	24.0	0.83 (0.69–1.00)*
<b>Region</b>							
West	29	23.6	1	7.6	1	18.3	1
Northeast	37	21.4	0.77 (0.60–0.98)*	10.5	1.28 (0.88–1.88)	21.4	1.08 (0.87–1.36)
South	33	20.9	0.79 (0.62–1.01)	14.4	2.06 (1.43–2.97)***	24.7	1.41 (1.11–1.79)**
North-central	20	23.8	1.01 (0.78–1.33)	17.4	2.56 (1.75–3.76)***	25.8	1.56 (1.18–2.07)**
<b>Type of school</b>							
Private	38	20.2	1	10.6	1	18.8	1
Public	81	23.1	1.19 (0.89–1.58)	14.1	1.41 (1.00–2.0)*	24.8	1.42 (1.12–1.81)**
<b>Location</b>							
Suburban/urban	87	23.2	1	12.7	1	22.6	1
Rural/small town	32	20.2	0.84 (0.68–1.03)	15.1	1.25 (0.91–1.70)	24.8	1.13 (0.90–1.41)
<b>School binge-drinking rate</b>							
Low (≤35%)	41	17.4	1	8.9	1	17.3	1
Medium (<35–50%)	40	23.4	1.47 (1.14–1.91)**	13.6	1.63 (1.20–2.20)***	22.9	1.46 (1.19–1.79)***
High (>50%)	38	26.4	1.75 (1.37–2.23)***	17.4	2.17 (1.60–2.95)***	28.5	1.99 (1.60–2.48)***

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .<sup>a</sup>Unadjusted bivariate analyses.<sup>b</sup>Analyses limited to students who drove any car at least once a week.<sup>c</sup>All students included in the analyses.

CI, confidence interval; OR, odds ratio.

intoxicated driver is a different dimension of risky behavior than driving after drinking.<sup>26</sup> Riding with an intoxicated driver itself is not a violation of law. It may also be that underaged students have more limited access to vehicles or defer to older students in a social setting by allowing them to drive.

Most anti-drinking and driving campaigns target the behavior of the drinking driver rather than the passenger's behavior. Additional efforts to educate potential passengers of the risks of riding with an intoxicated driver and to establish accountability among those passengers may be necessary to curb riding with an intoxicated driver.

The data presented in the current report should be interpreted with caution. The CAS survey consists of self-reported responses to a mailed questionnaire and is subject to sources of error associated with this approach. Intentional or unintentional response distortion may occur, although evidence suggests that self-reports of alcohol use are valid.<sup>27</sup> Sample attrition or

nonresponse may bias results, although statistical controls used to examine potential bias revealed no association between rates of student response and rates of drinking and driving.

The measure of riding with a driver who was high or drunk requires the respondent to make a subjective judgment about whether the driver was impaired. However, most passengers would have to rely on their own subjective judgment to determine whether it was safe to ride in that vehicle. A passenger who judges that the driver of the vehicle they are riding in is intoxicated is engaging in risky behavior.

It was assumed that policy had equal effectiveness, regardless of the experience with that policy (i.e., age of policy). Although the authors attempted to address this factor in the analyses by requiring that a law be in effect for at least 1.5 years before the survey, in reality a policy may be more effective in a state that has had sufficient experience with the policy. It is unlikely that a single law addressing underage drinking or volume

sales would have a major impact on drinking and driving outcomes by itself; for this reason, only a more comprehensive set of implemented laws was examined in the present analysis.

Cracking down on drinking and driving may be most effective when all of the related components are employed. Although the combined influence of laws and enforcement of laws were included in the current analysis, a law's synergistic effect with other components of anti-drinking and driving systems (e.g., education, public awareness) was not considered. Finally, the data for the present study were cross-sectional. Laws may not directly cause lower rates of drinking and driving. Both measures may be a function of a third variable such as strong public sentiment against drinking and driving. Future research should examine the changes in the distribution of alcohol-impaired driving over time in relation to policy changes.

The data presented in this report provide evidence for the influence of environmental factors on drinking and driving on multiple levels. Physical and living environments and alcohol control policies are associated with drinking and driving. Each of these areas provides a potential prevention strategy and suggests efforts for multiple stakeholders. Community-based efforts to address these problems are effective in reducing drinking and driving, and the morbidity and mortality associated with it<sup>28,29</sup>; these are promising strategies for college communities.<sup>30</sup>

Students, parents, and community members can advocate for policies and greater enforcement of current laws and regulations, and college administrators and local or state policymakers can pass these measures. Enacting a comprehensive set of regulations that control the sale and consumption of alcohol plus provide penalties that reflect the magnitude of the violation can shape environments to discourage both alcohol use and drinking and driving and may help reduce drinking and driving. The potential for alcohol control policies and the enforcement capacity at local and state levels to influence drinking and driving among college students may not be fully recognized because of the lack of inclusion of these factors in previous research.<sup>18</sup> Increased efforts to implement evidence-based interventions<sup>31</sup> may yield lower rates of these risky behaviors and, in turn, decrease the morbidity and mortality as a result of alcohol-involved motor vehicle crashes.

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