

# Watering Down the Drinks: The Moderating Effect of College Demographics on Alcohol Use of High-Risk Groups

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Heavy episodic or “binge” drinking has been recognized as a major public health problem on many American college campuses. A study sponsored by the National Institute on Alcohol Abuse and Alcoholism estimated that 1400 college students die each year from alcohol-related injuries.<sup>1</sup> Several national studies have found that approximately 2 of every 5 college students are binge drinkers.<sup>2–7</sup> Binge drinking has been associated with harms to the drinker as well as to others on campus through secondhand effects, including physical assaults, property damage, unwanted sexual advances, and disruptions of sleep and study.<sup>5,7–10</sup>

In recent years, much emphasis has been placed on normative influences on college student drinking behavior.<sup>11</sup> Social learning theories<sup>12–14</sup> stress the importance of the interaction and identification with as well as the imitation of the behavior of others in acquiring new and reinforcing old behaviors.

Although various interventions have been attempted to lower the level of binge drinking,<sup>11,15,16</sup> to our knowledge, colleges have not yet examined housing and admissions policies and student demographics to that end. Yet binge drinking rates vary among student subgroups. African American and Asian, female, and older students have lower rates of binge drinking than do White, male, and younger students.<sup>5,8,17</sup>

Johnson and Hoffmann<sup>18</sup> examined the relationship of cigarette smoking rates to the proportion of minority students. They found that as the percentage of racial/ethnic minority students increases, rates of smoking decrease among African American students, but rates do not decrease among White students. However, the schools studied were primarily composed of minority students.

The purpose of the present study was to examine whether an increased presence of students from groups in which alcohol is less heavily consumed tends to moderate the

**Objectives.** This study examined whether colleges with larger enrollments of students from demographic groups with lower rates of binge drinking exert a moderating effect on students from groups with higher binge drinking rates.

**Methods.** The study analyzed data from 114 colleges included in the 1993, 1997, 1999, and 2001 College Alcohol Study surveys.

**Results.** The binge drinking rates of White, male, and underage students were significantly lower in schools that had more minority, female, and older students. Students who do not binge drink in high school are more likely to start binge drinking at colleges with fewer minority and older students.

**Conclusions.** Student-body composition and demographic diversity should be examined by colleges wishing to reduce their binge drinking problems. (*Am J Public Health.* 2003;93:1929–1933)

level of binge drinking in high-*binge drinking demographic subgroups.* Having more minority students, older students, and women should provide more models of abstinence and responsible drinking and should lower the overall binge drinking rate.

In the present study, we hypothesized that (1) binge drinking rates of White, male, and underage students would be lower at schools with higher enrollments of minority, female, and older students; (2) White, male, and underage students who did not binge drink in high school would be less likely to take up binge drinking at schools with more minority, female, and older students; (3) White, male, and underage students who were binge drinkers in high school would be less likely to continue binge drinking at schools with more minority, female, and older students.

## METHODS

### Study Population

The study used data from the 1993, 1997, 1999, and 2001 College Alcohol Study surveys.<sup>5,7,19,20</sup> Of the 140 colleges surveyed in 1993, 120 participated in all 4 surveys. For each survey, the administrators at each college were asked to provide a random sample of undergraduates drawn from the total enrollment of full-time students.

The attrition of 20 schools was primarily due to the inability of these colleges to provide a sample of students and mailing addresses to meet the time constraints of the survey. We excluded 1 school with a response rate that was substantially lower than that of the other schools, leaving 119 schools. Details of the sampling design have been published elsewhere.<sup>5,7,19,20</sup>

College response rates differed by school year: 52% in 2001 (range: 22% to 86%); 59% in 1999 (range: 27% to 83%); 59% in 1997 (range: 29% to 88%); and 70% in 1993 (range: 48% to 100%). However, response rates at individual colleges were not associated with binge rates at those schools. The Pearson correlation coefficient of the associations between a college’s binge rate and its response rate was  $-0.057$  ( $P=.536$ ) in 1993,  $0.044$  ( $P=.635$ ) in 1997,  $0.002$  ( $P=.984$ ) in 1999, and  $0.170$  ( $P=.064$ ) in 2001.

### Measures

Heavy episodic or binge drinking was defined as the consumption of at least 5 drinks in a row for men or 4 drinks in a row for women during the 2 weeks preceding their completion of the questions.<sup>7,21</sup> A college’s binge drinking rate is the percentage of students classified as binge drinkers on the basis of the aggregated self-report responses

of students at that school to the binge drinking questionnaire. We calculated the college binge drinking rates for total students and for high-risk subgroups (White, male, and underage [ $<21$  years] students).

In addition, to rule out the change in binge drinking rates that is attributable to the changes in demographic characteristics in each survey year, estimation of the binge rate in each survey year was standardized based on a direct standardization procedure over 8 strata (gender by 2 age groups [ $<22$  years vs others] by 2 ethnic groups [White vs others]), using each school's true demographic characteristic in 1993 as the reference. We then not only could compare the binge rate over time, given the assumption that demographic characteristics remained constant, but also could reduce the potential selection bias in the prevalence rate of each survey year. The adjusted rates can therefore be reliably interpreted over time.

Demographic distributions at each school, including the percentages of minority, female, and older (aged  $\geq 22$  years) students, were obtained from the Integrated Postsecondary Education Data System.<sup>21</sup> School enrollment size was obtained from the Integrated Postsecondary Education Data System as well. We further categorized the enrollment size into small/medium schools and large schools. The small/medium schools are those schools whose student population is less than or equal to 10 000. The large schools are those schools whose student population is more than 10 000.

### Data Analysis

We excluded from these analyses 2 historically Black colleges and 3 religious colleges that prohibit alcohol use. Thus, the college-level analyses included 114 colleges at 4 time points ( $n=456$ ). The total numbers of participating students in the 114 colleges were 10 446 in 2001, 13 396 in 1999, 13 846 in 1997, and 14 624 in 1993.

Pearson correlation coefficients were used to examine the univariate associations between the proportions of demographic characteristics and college binge drinking rates among total students and high-risk subgroups by each survey year. The correlation coefficients also were weighted by the school

size. Both unweighted and weighted correlation coefficients were presented.

We also performed longitudinal multiple regression analyses to simultaneously examine the effects of the percentages of minority, female, and older (aged  $\geq 22$  years) students in the school, as well as 3 dummy variables indicating 1993, 1997, and 1999 survey years (i.e., 2001 being the comparison year). The General Estimating Equations approach<sup>23,24</sup> with a working independence correlation structure was used to fit the longitudinal regression models to appropriately handle the longitudinal repeated measures of the college-level outcomes over 4 survey years. These regression models were stratified by school size ( $\leq 10\,000$  vs  $>10\,000$ ) to demonstrate how the associations vary by school size. All of the variables in the model were standardized with the mean equal to 0 and the standard deviation equal to 1 so that the resulting regression coefficients could be on the same scale as the correlation coefficients.

Multiple logistic regression was used to examine how these demographic characteristics predict the individual students' binge drinking in college stratified by their drinking status in high school. Adjusted odds ratios and their 95% confidence intervals are reported. The General Estimating Equations approach was used to fit the logistic regression models.

## RESULTS

The mean college binge drinking rate was  $44.4 \pm 14.2\%$  (range: 13.2% to 83.1%) for all students,  $48.6 \pm 14.3\%$  (range: 18.6% to 85.9%) for White students,  $49.8 \pm 14.4\%$  (range: 5.9% to 91.6%) for male students, and  $43.1 \pm 15.5\%$  (range: 0% to 82.5%) for underage students. The average percentage of minority students at each school was  $27.0 \pm 18.3\%$  (range: 2.8% to 82.2%), the average percentage of female students was  $54.3 \pm 11.8\%$  (range: 20.6% to 100%), and the average percentage of students aged 22 years or older was  $32.8 \pm 15.1\%$  (range: 4.3% to 76.9%).

The correlation between binge drinking rates and demographic distribution by each survey year is shown in Table 1. The results

indicate that the binge drinking rates for total students and for high-risk subgroups (White, male, and underage) at each school were significantly correlated with the demographic distribution of the school. The higher the percentage of minority, female, and older (aged  $\geq 22$  years) students in a school, the lower the binge drinking rates for total students and high-risk subgroups. These correlations did not vary significantly by survey year. The weighted correlations associated with the percentages of minority students and older students appeared slightly stronger than the unweighted correlations, whereas the weighted correlation associated with the percentage of female students tended to become slightly weaker.

In the stratified multiple regression analyses (Table 2), the percentages of minority, female, and older students in school and the survey years were included in the models. The percentage of minority students was still significantly associated with lower binge drinking rates for total students and the high-risk subgroups after adjustment for other covariates except for the White binge rates in small/medium schools. The percentage of female students was significantly associated with binge drinking rates for total students and high-risk subgroups among small/medium schools except for male students. The percentage of female students had no significant effect on binge rates in large schools. This may have been because the gender distribution did not vary much among large schools. The percentage of students aged 22 years and older was also significantly associated with the binge drinking rates for total students and high-risk subgroups regardless of school size. In general, the binge drinking rate did not vary with the exception of lower binge rates for Whites in 1997 compared with 2001 in large schools and higher binge rates for underage students in all other survey years compared with 2001 in large schools.

The results in Table 3 indicate that high school nonbinge drinkers at colleges with higher percentages of minority and older students were significantly less likely to engage in binge drinking in college, even after adjustment for survey year, gender, under-

**TABLE 1—Correlations Between College Binge Drinking Rate and Demographic Distribution, by Survey Year: United States, 1993–2001**

	Binge Drinking Rate									
	Total		1993		1997		1999		2001	
	Unweighted Correlation Coefficient	Correlation Weighted by Actual College Size	Unweighted Correlation Coefficient	Correlation Weighted by Actual College Size	Unweighted Correlation Coefficient	Correlation Weighted by Actual College Size	Unweighted Correlation Coefficient	Correlation Weighted by Actual College Size	Unweighted Correlation Coefficient	Correlation Weighted by Actual College Size
<b>Total Students</b>										
Percentage minority	-0.58	-0.68	-0.63	-0.73	-0.58	-0.63	-0.59	-0.70	-0.55	-0.66
Percentage female	-0.35	-0.30	-0.39	-0.34	-0.42	-0.33	-0.34	-0.28	-0.26	-0.26
Percentage ≥ 22 y	-0.53	-0.63	-0.57	-0.67	-0.54	-0.68	-0.51	-0.61	-0.51	-0.62
<b>White Students</b>										
Percentage minority	-0.43	-0.54	-0.48	-0.63	-0.40	-0.45	-0.45	-0.59	-0.37	-0.50
Percentage female	-0.33	-0.30	-0.33	-0.33	-0.44	-0.33	-0.30	-0.27	-0.26	-0.28
Percentage ≥ 22 y	-0.52	-0.63	-0.58	-0.68	-0.53	-0.61	-0.51	-0.60	-0.48	-0.63
<b>Male Students</b>										
Percentage minority	-0.54	-0.62	-0.63	-0.71	-0.49	-0.55	-0.60	-0.68	-0.42	-0.54
Percentage female	-0.14	-0.20	-0.12	-0.17	-0.17	-0.21	-0.15	-0.21	-0.11	-0.20
Percentage ≥ 22 y	-0.51	-0.54	-0.55	-0.59	-0.50	-0.51	-0.52	-0.55	-0.48	-0.52
<b>Underage Students</b>										
Percentage minority	-0.55	-0.62	-0.59	-0.66	-0.54	-0.61	-0.56	-0.64	-0.52	-0.60
Percentage female	-0.32	-0.26	-0.40	-0.33	-0.39	-0.29	-0.30	-0.21	-0.21	-0.22
Percentage ≥ 22 y	-0.48	-0.56	-0.47	-0.62	-0.46	-0.52	-0.49	-0.54	-0.50	-0.59

age, and race. Similarly, high school binge drinkers at colleges with higher percentages of minority and older students were found to be significantly less likely to continue binge drinking in college after adjustment for survey year, gender, underage, and race. The percentage of female students at each school was not significantly associated with binge drinking rates for both high school binge and nonbinge drinkers.

**DISCUSSION**

The results strongly suggest that significant moderating effects accrue from the large-scale presence of lower-risk subgroups on the binge drinking of the high-risk subgroups. The college binge drinking rates among White, male, and underage students were significantly lower in schools with larger enrollments of minority, female, and older students.

In general, the moderating effects were significant for small/medium and large schools with the exception of the effect of the percentage of female students. The effect of percentage of female students was significant for

the small/medium schools but not for the large schools. This finding may have been because there was not enough variation of gender distribution among large schools. (The mean female distribution was  $58 \pm 21\%$  for small/medium schools and  $51 \pm 5\%$  for large schools).

In addition, students who did not binge drink in high school were less likely to start binge drinking at colleges with larger enrollments of minority and older students, and students who were high school binge drinkers were less likely to continue drinking this way.

The findings may help to explain why fraternities and sororities and segregated freshmen dormitories that provide the highest concentrations of binge drinkers account for the bulk of alcohol problems on campus. Student-body composition, as well as the value of diversity at the college, organizational, and dormitory levels, should be considered by colleges wishing to reduce their binge drinking problems. Encouraging more older students to live on campus and in fraternity houses may be one practical application of these findings; another may be de-

creasing the heavy concentration of young, male, and White students in residential arrangements.

The results of this study must be viewed within the context of its limitations. First, the College Alcohol Study is subject to the limitations of self-report surveys. However, such surveys have been considered generally valid in examining alcohol responses.<sup>25,26</sup> Second, potential bias may have been introduced through nonresponse. However, several procedures were used to test for potential bias from nonresponse in both surveys, and we found no effect on the findings. Furthermore, the binge drinking rates reported in this study are almost identical to those found in other national surveys.<sup>2–4,6</sup>

Finally, because this is a correlational study, cause-and-effect relationships cannot be inferred. Although 1 interpretation of the findings suggests that the presence of lower-drinking demographic groups may moderate drinking in higher-drinking groups, self-selection also may be operating. Colleges that have larger numbers of minority and older students and women may attract White, underage, and male students with dif-

**TABLE 2—Multiple Regression Analysis of Binge Drinking Rates Among Total Students and High-Risk Subgroups, by College Size (n = 456)**

	Binge Drinking Rate			
	Small/Medium ≤ 10 000		Large > 10 000	
	Coefficient (SE)	P	Coefficient (SE)	P
<b>Total students</b>				
Survey year				
2001	Reference	...	Reference	...
1999	0.104 (0.037)	.780	-0.011 (0.030)	.704
1997	-0.015 (0.033)	.652	-0.060 (0.032)	.064
1993	-0.026 (0.043)	.537	-0.015 (0.033)	.648
Percentage minority	-0.339 (0.098)	<.001	-0.485 (0.076)	<.001
Percentage female	-0.197 (0.075)	.009	-0.029 (0.114)	.797
Percentage ≥ 22 y	-0.331 (0.112)	.003	-0.365 (0.086)	<.001
R <sup>2</sup>	0.39		0.63	
<b>White students</b>				
Survey year				
2001	Reference	...	Reference	...
1999	0.023 (0.048)	.630	-0.035 (0.039)	.367
1997	-0.042 (0.036)	.235	-0.075 (0.038)	.047
1993	-0.016 (0.047)	.730	-0.047 (0.041)	.255
Percentage minority	-0.128 (0.105)	.223	-0.303 (0.083)	<.001
Percentage female	-0.205 (0.077)	.008	-0.011 (0.142)	.939
Percentage ≥ 22 y	-0.363 (0.111)	.001	-0.482 (0.089)	<.001
R <sup>2</sup>	0.30		0.50	
<b>Male students</b>				
Survey year				
2001	Reference	...	Reference	...
1999	0.080 (0.057)	.162	0.027 (0.043)	.541
1997	0.085 (0.055)	.124	-0.053 (0.049)	.273
1993	0.076 (0.051)	.136	0.008 (0.040)	.851
Percentage minority	-0.337 (0.066)	<.001	-0.418 (0.070)	<.001
Percentage female	0.156 (0.082)	.057	-0.077 (0.103)	.452
Percentage ≥ 22 y	-0.401 (0.106)	<.001	-0.260 (0.091)	.004
R <sup>2</sup>	0.32		0.47	
<b>Underage students (&lt;21 years)</b>				
Survey year				
2001	Reference	...	Reference	...
1999	-0.002 (0.042)	.966	0.103 (0.046)	.026
1997	-0.023 (0.049)	.646	0.102 (0.051)	.045
1993	-0.002 (0.052)	.966	0.136 (0.047)	.004
Percentage minority	-0.302 (0.087)	<.001	-0.477 (0.067)	<.001
Percentage female	-0.200 (0.069)	.003	-0.069 (0.121)	.567
Percentage ≥ 22 y	-0.286 (0.097)	.003	-0.292 (0.078)	<.001
R <sup>2</sup>	0.35		0.52	

**TABLE 3—Logistic Regression Predicting Binge Drinking, by Drinking Status in High School**

	Odds Ratio (95% Confidence Interval)	
	Nonbinge Drinkers (n = 34 572) in High School	Binge Drinkers in High School (n = 15 590)
Percentage minority	0.61 (0.43, 0.87)	0.66 (0.44, 0.98)
Percentage female	0.66 (0.37, 1.18)	0.80 (0.24, 2.70)
Percentage ≥ 22 y	0.19 (0.12, 0.29)	0.13 (0.07, 0.24)
Survey year		
2001	1.00 (Reference)	1.00 (Reference)
1999	0.99 (0.92, 1.08)	1.02 (0.89, 1.16)
1997	0.95 (0.89, 1.03)	0.86 (0.76, 0.98)
1993	0.98 (0.90, 1.07)	0.84 (0.74, 0.96)
Male	1.25 (1.18, 1.32)	1.76 (1.62, 1.91)
Underage	0.76 (0.72, 0.81)	1.59 (1.44, 1.74)
White	1.86 (1.71, 2.02)	1.42 (1.27, 1.59)

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**Contributors**

H. Wechsler conceptualized the study and interpreted the findings. M. Kuo helped to conceptualize ideas, conducted the analyses, and interpreted the findings. Both authors cowrote the article.

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**Human Participant Protection**

No protocol approval was needed for this study

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ferent attitudes about drinking. However, we found that the presence of more women students, older students, and minority students had an effect on the rates of binge drinking among higher-risk-group students who did

not binge drink in high school as well as among those who did. This finding makes self-selection on the basis of drinking attitudes a less plausible alternative explanation of the findings. ■

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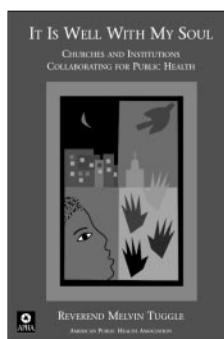
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