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ABSTRACT

This study examined the relationship of volume of alcohol consumed to the occurrence of alcohol-related problems among male and female college students to develop a gender-specific measure of heavy episodic or binge drinking by college students for public health research. A self-administered survey was mailed to a national representative sample of students at 140 4-year colleges in 40 states and the District of Columbia. A total of 17 592 college students completed the survey. Women who typically drink four drinks in a row were found to have roughly the same likelihood of experiencing drinking-related problems as men who typically drink five drinks in a row. Use of the same standard for both sexes underestimates binge drinking and the negative health risks for women. (*Am J Public Health*. 1995;85:982-985)

A Gender-Specific Measure of Binge Drinking among College Students

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Introduction

Binge drinking, or the consumption of large amounts of alcohol on a single occasion, has been linked to an increased risk of negative health outcomes.¹ It has become common practice in research on alcohol to define heavy or binge drinking in terms of episodes involving five or more drinks in a row for both men and women.²⁻⁷ Yet blood alcohol level tables that determine the legal definition of driving while intoxicated⁸ are based on sex as well as on weight. Recent research suggests that the gender differences are owing to women's lower rates of gastric metabolism of alcohol (initially only 80% of men's) and, therefore, to their higher blood alcohol levels for a fixed amount of alcohol, even after accounting for differences in body weight or lean body mass.⁹ Psychiatric epidemiologists have suggested that clinical criteria should therefore be defined differently for men and women in the diagnosis of alcohol dependency and alcoholism.¹⁰

This paper contrasts the use of the currently accepted definition of binge drinking to the use of a gender-specific standard among college students.

Methods and Statistical Analysis

The data for this research were gathered as part of a representative survey of 17 592 students at 140 colleges. A self-administered 20-page questionnaire received by 25 627 students in early 1993 yielded an overall response rate of

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69%. Details of the study design have been published elsewhere.¹

This analysis is based on the 12 243 respondents who reported drinking alcohol in the 30 days prior to the survey and could be classified as current drinkers, nonbinge or binge. To quantify differences by sex and to control for other potential confounders, multiple logistic regression was used to compare the likelihood of an alcohol-related problem among men with that among women for a typical drinking level (i.e., the usual number of drinks per occasion in the past 30 days). The dependent variable was whether a student reported experiencing 1 of 12 outcomes as a result of drinking. Each student was asked: "Since the beginning of the school year, how often has your drinking caused you to [experience each of twelve problems]." The nine alcohol-related problems that were experienced by at least 5% of students of each sex are presented in Table 1. The three problems that fell below this cutoff—vandalism, trouble with the police, and alcohol overdose—were excluded from the rest of the analysis.

The logistic model was as follows:

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_{gender} + \sum_{i=2}^n \beta_i x_i + \beta_{inx_i} x_i x_{gender}$$

where x_{gender} is 1 if male and 0 if female and the x_i are a series of indicator variables specifying the level of a student's typical drinking during the previous month. For example, x_3 takes on the value 1 for students who reported typically drinking three drinks per occasion and x_3 is 0 for all other students. Students typically drinking one drink were considered the reference category. The antilogs of the beta coefficients can be directly interpreted as the odds of a particular outcome between the "exposed" and the referent populations. The β_1 is the estimate for the effect of sex, the β_i 's are the estimates of effect for each individual level of alcohol consumption, and the β_{inx_i} 's are the estimates for the interaction between sex and level of drinking.

To determine if female and male students had similar odds of an alcohol-related outcome for a given level of alcohol consumption, the odds ratio (OR) between the sexes was calculated. For example, the odds ratio for a woman who drinks four drinks versus a man who

TABLE 1—Odds Ratios (95% Confidence Intervals) for Risk of Alcohol-Related Problems with Gender-Neutral and Gender-Specific Definitions among 12 243 US College Students

Alcohol-Related Problem	% Reporting Problem	Gender-Neutral Definition: OR of Women Consuming 5 Drinks vs Men Consuming 5 Drinks	Gender-Specific Definition: OR of Women Consuming 4 Drinks vs Men Consuming 5 Drinks
Hangover	64	1.78*** (1.36–2.34)	1.30* (1.02–1.67)
Miss a class	30	1.47*** (1.19–1.81)	0.99 (0.81–1.21)
Fall behind	23	1.33* (1.06–1.66)	1.04 (0.83–1.29)
Cause regret	36	1.41** (1.15–1.73)	1.17 (0.96–1.43)
Forget	27	1.31* (1.06–1.62)	0.92 (0.74–1.13)
Argument	22	1.08 (0.86–1.35)	0.90 (0.72–1.12)
Unplanned sex	21	0.89 (0.71–1.12)	0.89 (0.72–1.11)
Unsafe sex	11	0.94 (0.70–1.26)	0.87 (0.66–1.16)
Injury	10	1.23 (0.92–1.65)	0.81 (0.60–1.09)

* $P < .05$; ** $P < .01$; *** $P < .001$.

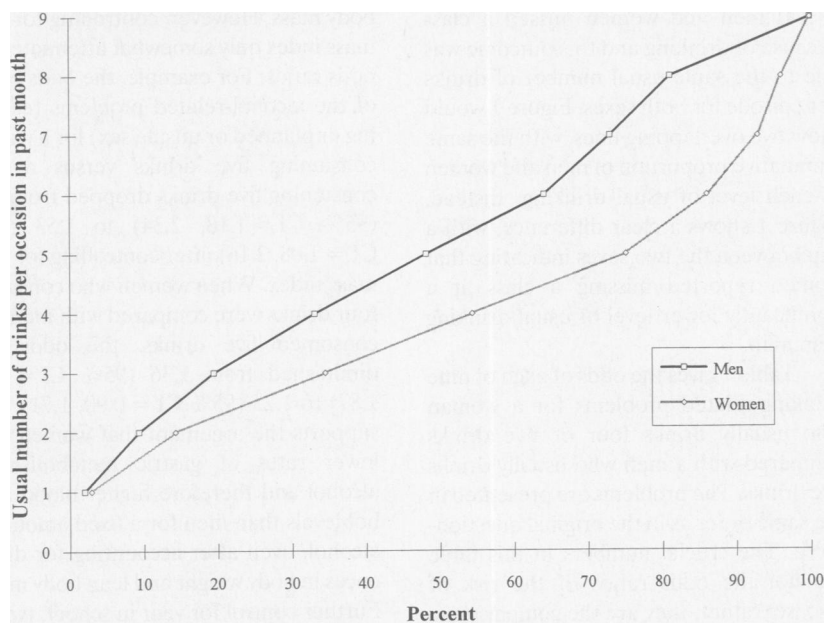


FIGURE 1—Cumulative percentage of 12 243 students who reported missing a class as a result of drinking alcohol, by usual number of drinks per occasion in the past month.

drinks five drinks can be estimated from the ratio of fitted logits:

$$\begin{aligned} \text{OR} &= \frac{\text{Odds of woman who drinks 4}}{\text{Odds of man who drinks 5}} \\ &= \frac{e^{\beta_0 + \beta_4}}{e^{\beta_0 + \beta_{gender} + \beta_5 + \beta_{inx_5}}} \\ &= e^{\beta_4 - \beta_{gender} - \beta_5 - \beta_{inx_5}} \end{aligned}$$

We calculated 95% confidence inter-

vals (CIs) using the variance estimates of each coefficient plus two times the covariance of each possible pair of terms.¹¹ Self-reported items on height and weight were transformed into metric measurements. The body-mass index was created using the conventional definition of weight (in kilograms) divided by the square of height (in meters). In this sample, body mass index averaged 24 for males and 22 for females.

Results

The overall sample is representative of full-time undergraduates currently studying at 4-year American colleges and universities. The proportions of men and women were similar in such variables as age, race, marital status, self-rating of health, having a parent who was a college graduate, and living with a roommate.

Figure 1 illustrates the differences between the sexes for one drinking-related problem. Plotted along the vertical axis are the usual numbers of drinks consumed per occasion during the previous 30 days. The horizontal axis presents the cumulative percentage of students who reported missing a class since the beginning of the school year as the result of drinking. Other figures (not presented for reasons of space) illustrating individual alcohol-related problems show similar results.

If men and women missed a class because of drinking and this outcome was due to the same usual number of drinks per episode for both sexes, Figure 1 would show two overlapping lines, with the same cumulative proportion of men and women at each level of usual drinking. Instead, Figure 1 shows a clear difference, with a gap between the two sexes indicating that women reported missing a class at a significantly lower level of usual drinking than men.

Table 1 gives the odds of each of nine drinking-related problems for a woman who usually drinks four or five drinks compared with a man who usually drinks five drinks. The problems are presented in the same order as in the original questionnaire. The crucial numbers in this table are not the odds ratios of the risk of disease; rather, they are the comparisons. For example, the second row reports on the results from one question, "Since the beginning of the school year, how often has your drinking caused you to miss a class?" Thirty percent of the students who drank during the last year reported missing a class because of drinking. Women who usually consumed five drinks were 1.47 times (95% CI = 1.19, 1.81) more likely to miss a class than were men who consumed five drinks, strong and statistically significant evidence that using the same cutoff for binge drinking for men and women is misleading. By contrast, women who usually consumed four drinks were almost equally likely to miss a class compared with men who usually consumed five drinks (OR = 0.99; 95% CI = 0.81, 1.21). The important compari-

sons are not across the two sets of odds ratios (1.47 and 0.99) but are embedded within the confidence limits of each. The only meaningful comparison across columns may be that one odds ratio is significantly different from 1.00 while the other is not. For most of the problems examined, the evidence (presented in the column labeled "Gender-Neutral Definition") suggests that women who drank five drinks were significantly more likely to experience an adverse outcome than men who drank at a similar level. By contrast, for eight of the nine problems reported (the column labeled "Gender-Specific Definition"), women who typically drank four drinks had a similar likelihood of each alcohol-related problem as men who had five drinks.

At least some of the association between usual drinking and the occurrence of alcohol-related problems might be owing not to sex but to differences in body mass. However, controlling for body mass index only somewhat attenuated the odds ratios. For example, the odds of any of the alcohol-related problems (excluding unplanned or unsafe sex) for a woman consuming five drinks versus a man consuming five drinks dropped from 1.66 (95% CI = 1.18, 2.34) to 1.53 (95% CI = 1.08, 2.16) after controlling for body mass index. When women who consumed four drinks were compared with men who consumed five drinks, the odds also diminished from 1.36 (95% CI = 1.00, 1.87) to 1.25 (95% CI = 0.90, 1.71). This supports the argument that women have lower rates of gastric metabolism of alcohol and therefore higher blood alcohol levels than men for a fixed amount of alcohol, even after accounting for differences in body weight and lean body mass.⁹ Further control for year in school, type of school, or living arrangements did not appreciably alter these results.

Discussion

The methodological implications of this research are clear: a lower standard defining heavy or binge drinking needs to be used for women than for men. For eight of the alcohol-related problems examined in this study of college students, women who typically drank four drinks had a similar likelihood of experiencing that problem as men who usually drank five drinks. The findings did not apply, however, to the most frequently experienced problem, hangover.

The study relies on self-reports, which introduce the possibility of error

due to under- or overreporting or untruthfulness. However, investigators have studied the validity of self-reported questionnaires and have used this method with success.^{1,12-17} There is also no evidence of differences between men and women in self-report inconsistencies or inaccuracies.

What are the practical consequences of using this cutoff to understanding college binge drinking? Using the old definition of binge drinking (five or more drinks) would identify 33% of the women as binge drinkers; using the new definition increases that figure to 39%. This increase of 6% (a relative increase of 18%) in the number of women binge drinkers is in line with the growing emphasis on alcohol problems in women.¹⁸⁻²⁰ Clinicians and administrators might draw additional implications from the findings. Women should be advised that they cannot drink at the same level as men without risking greater health and behavioral consequences. College alcohol educators should consider programs to alert women to the heightened risk they run in matching male drinking patterns. While "blaming the victim" is poor social policy, it is entirely appropriate to educate women to protect their own health in an environment in which gender-neutral drinking norms actually put them at higher risk than men. Clinicians should suspect the presence of drinking problems in their female patients at lower levels of alcohol use than is seen in male patients.

Although many women drink as heavily as men, their recognition of alcohol problems lags. Among drinkers who binged three or more times in the past 2 weeks, 22% of the men described themselves as heavy or problem drinkers compared with only 8% of the women. It is important to correct the underestimation of the extent and seriousness of drinking problems in women,²⁰ contributed to in part by the use of a single standard for heavy alcohol consumption. A gender-specific definition of binge drinking should be used in future research and clinical practice. □

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ABSTRACT

Structured interviews measuring tuberculosis knowledge were administered to 494 New York City injection drug users, 31% of whom reported a history of having a reactive tuberculin skin test. Medical records review of a subsample confirmed the validity of self-reported data. Most respondents understood the mechanisms of tuberculosis transmission. Three fourths of the subjects did not fully understand the distinction between a reactive skin test and active tuberculosis, but those who reported a history of skin test reactivity were twice as likely to understand this distinction. Forty percent of subjects did not understand the importance of medication adherence. Misunderstandings, based on a recent lack of tuberculosis education, may contribute to the fear and confusion that interfere with efforts to control tuberculosis. (*Am J Public Health*. 1995;85:985-988)

Tuberculosis Knowledge among New York City Injection Drug Users

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Introduction

In the past decade, New York City has witnessed a dramatic increase in pulmonary tuberculosis. Increases in human immunodeficiency virus (HIV) infection, homelessness, and poverty are responsible for much of this resurgence; all of these are prevalent among New York City injection drug users, who are among those at highest risk for tuberculosis.¹⁻⁶ The present study sought to assess tuberculosis-related knowledge in this population.

Virtually no public health education regarding tuberculosis has been done in the past 3 decades. A recent survey of injection drug users in Brooklyn, NY, suggests the presence of a high level of misinformation and fear about tuberculosis.⁷ The Centers for Disease Control and Prevention (CDC) recently called for public awareness campaigns to alert the

minority communities most affected by tuberculosis about its increasing incidence, and to provide knowledge and other resources needed to influence tuberculosis programs directed toward those communities.⁸ In 1994, the CDC added questions on tuberculosis transmission to

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