Binge Drinking Among Youth and Young Adults in the United States: 1979–2006

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Abstract

Objective—To evaluate trends in the past 30-day prevalence of binge drinking by age, gender, and student-status, among youth and young adults in the United States between 1979 and 2006, a period that encompasses the federally mandated transition to a uniform legal drinking age of 21, and other policy changes aimed at curbing underage drinking.

Methods—Data were analyzed from twenty administrations of the National Survey on Drug Use and Health, yielding a pooled sample of over 500,000 subjects. Trends in relative risk for four different age groups, stratified by gender, relative to the 24–34 year old reference group were calculated. We also examined trends in risk for binge drinking associated with student status (among college-age students), and race/ethnicity.

Results—Significant reductions in relative risk for binge drinking over time were observed for 12–20 year old males but no changes were observed for females in this age range, and binge drinking among minority females increased. Risk for binge drinking increased among 21–23 year old women, with college women outpacing non-students in this age range. Trends also indicate that no reduction in binge drinking occurred for college men.

Conclusion—While the overall trend is toward lower rates of binge drinking among youth, likely a result of a higher legal drinking age and other changes in alcohol policy, little improvement has occurred for college students, and increases in binge drinking among women has offset improvements among youth. Understanding these specific demographic trends will help inform prevention efforts.

Keywords

binge drinking; alcohol; epidemiology; trends

Introduction

There is substantial evidence that the uniform minimum legal drinking age (MLDA) of 21 has resulted in reduced traffic fatalities and numerous other favorable public health outcomes.[1–7] Nonetheless, recent discussion in the popular media has focused on whether reconsideration of the uniform MLDA is in order, and at least two state legislatures have studied or considered

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relaxation of their drinking age laws. [8–11] The credibility of such a proposition is bolstered by the "Amethyst Initiative" in which over 100 presidents of United States colleges and universities have signed onto a statement proposing that the "twenty-one (MLDA) is not working" and that a "culture of dangerous, clandestine 'binge-drinking'…has developed" at U.S. colleges and universities. [12]

Epidemiological analysis of secular trends in drinking behaviors can facilitate an informed debate about the likely efficacy of changes in the minimum legal drinking age and other public health policies, such as zero-tolerance laws for underage drinking and driving. The accuracy of the claim that the development of a "binge-drinking culture" among college students occurred subsequently to changes in drinking-age laws warrants scrutiny. If true, particular attention should be paid to how these putative trends in binge drinking differ by age, gender, and student-status. Such descriptive epidemiological analyses can motivate and inform more formal policy analysis, as they can elucidate the magnitude of trends in binge drinking and how they might differ by key demographic variables. Such analyses are also relevant to clinical practice as the leading causes of death among adolescents -- motor vehicle accidents, suicide, and homicide -- are all likely be impacted by alcohol use. [3, 7, 13–15] Given recent developments suggesting that adolescence may be a unique period of vulnerability for the effects of alcohol on neurobiological development, [16] such analyses are timely with regard to both scientific and cultural debates.

The global objective of this report is to evaluate trends in the prevalence of binge drinking among youth and young adults in the United States over the past three decades using data from the National Survey on Drug Use and Health, the longest running survey to provide estimates on binge drinking in nationally representative samples. Binge drinking has been customarily defined by survey researchers as consuming five or more drinks on a given occasion. Use of the five-drink threshold as an indicator of unhealthy drinking patterns has been the topic of debate (summarized in Wechsler, 2006[17]). However, there is consensus among alcohol researchers that this corresponds to a level of drinking that is "clearly dangerous for the drinker and for society." [18] Moreover, it represents a reliable and efficient predictor of alcohol-related harms, including high-risk sexual behaviors, drinking and driving, and alcohol-related injury, and alcohol use disorder. [17, 19–22] While not all individuals who engage in this level of drinking experience such consequences, the use of higher thresholds would miss a large portion of individuals who do experience such harms. [17]

Archival data from the NSDUH (formerly known as the National Household Survey on Drug Abuse, or NHSDA) is available beginning with the 1979 administration, conducted five years before the uniform MLDA act was passed. [4] The transition to the uniform MLDA, which marks the beginning of a period during of increased efforts to reduce harms related to youth drinking, was completed in 1989. Subsequent to this, there have been numerous other policy efforts aimed at reducing youth alcohol consumption, including the widespread adoption of "zero-tolerance" laws that impose penalties on drivers under 21 with even low levels of blood-alcohol though these changes have varied widely by state. Other policy changes have varied widely by state, include stricter penalties for underage drinking or providing alcohol to minors, and laws aimed at preventing the use of false identification, and other measures. [23] Estimates of binge drinking prevalence are available for three surveys before or during the transition to a uniform MLDA (1979, 1985, and 1988), and for each year after the transition was complete (1990–2006). There are a number of additional sources of data on binge drinking patterns in the U.S. over the past twenty to thirty years, but gaps in knowledge remain, particularly with regard to youth under the age of 18.

Although the NSDUH/NHSDA is the longest-running data source for estimates of binge drinking in a national sample, occasional design changes within the survey series prevent direct

comparison of prevalence estimates across all years.[24, 25] Hence, we focus on trends in the relative risk for binge drinking among youth, compared to young adults above the legal drinking age. Many of the design changes within the NSDUH series were introduced to decrease social desirability bias, thereby increasing honest reporting, and to increase response rates. Therefore, they are likely to influence prevalence estimates, with the general expectation that substance use estimates would be higher for more recent surveys. We proceed with the assumption that such design effects do not vary significantly with age, so that relative risk measures are less sensitive to design changes than are prevalence estimates. Our objective is accomplished by analyzing trends the relative odds for binge drinking by age and gender, with 24–34 year-old adults chosen as a reference group that is past the legal age for alcohol purchase and consumption. These groups are further stratified by student-status (for college aged subjects) and race/ethnicity.

Methods

Survey Overview

The National Survey on Drug Use and Health (NSDUH), is an ongoing survey of the civilian non-institutionalized population of the United States, ages 12 and over. Between 1979 and 1988, the survey was conducted every three years. Since 1990, the survey has been conducted annually. Fieldwork has been carried out by RTI, International since 1988. For the 1985 survey, fieldwork was conducted by the Temple University Institute for Survey Research, and the 1979 and 1982 surveys were conducted by Response Analysis Corporation, Princeton, NJ. The 1982 survey did not inquire about binge drinking or any proxies, and so is not included in these analyses.[24, 26]

Multistage probability sampling was utilized for all surveys. Sample sizes, oversampling targets, and other methodological parameters have changed periodically throughout the series. Among the major changes are the following: Prior to 1991, the sampling universe did not include Alaska and Hawaii, or group-quarters such as college dormitories or shelters. Numerous changes in the questionnaire and editing methods were undertaken during the 1994 survey. In 1999, the administration mode for substance use items changed from self-administered answer sheets to audio-computer assisted self-interview (ACASI); sample design changes were also introduced.[25] In 2002, a $30 incentive was introduced, further sample design and protocol changes were made, and the survey name was changed from the "National Household Survey on Drug Abuse" to the "National Survey on Drug Use and Health".

Variables

Since 1985, binge drinking has been queried as the number of days in the past 30 days in which an individual has consumed five or more drinks on any one occasion. In the 1979 survey, individuals were asked about the largest number of drinks they had in any one day in the past 30 days. These questions were used to determine the prevalence of individuals who had drank five drinks in a day, at least once in the past 30 days.

We defined five age categories: 12 to 14 years old, 15 to 17 years old, 18 to 20 years old, 21 to 23 years old, and a reference category comprising 24 to 34 years old of both sexes. The last group was chosen to represent young adults who are several years past the legal drinking age, both before and after the transition to a uniform MLDA of 21. The upper limit for the 24–34 year age range was defined based on age category definitions in recent NSDUH survey public use data files, which do not specify exact year of birth. Race/ethnicity was coded as White, Black, Hispanic, or Other. Individuals indicating Hispanic ethnicity were considered to be "Hispanic" regardless of race. Individuals indicating more than one race, as well as non-Caucasian and non-African-American races were coded as "Other".

School and college attendance has been queried several different ways throughout the series. In order to keep a consistent definition, we define a "college-age student" as any high-school graduate, ages 18 to 23, who is currently enrolled in school (or on vacation). This encompasses all college students in this age range, as well as part-time students, commuters, and individuals enrolled in technical or vocational schools.

Statistical Methods

All analyses were carried out in SAS version 9.0, using the "surveylogistic" and "surveyfreq" procedures, in conjunction with survey design variables, including weights, to account for the complex sample design of the NSDUH in variance estimation. Time-trend analyses of prevalence within methodologically contiguous NHSDA/NSDUH segments were conducted, in which binge drinking prevalence was modeled as a function of survey year, relative to the first year in the segment, assuming a log-linear trend (i.e., a single odds ratio describing change per-year). For the 1994 survey, which utilized a split-sample design, we analyzed only the larger "B" survey, which was methodologically identical to the 1995–1998 surveys. Time-trend analyses of odds ratios across the entire NSDUH series were conducted by combining all survey years into a single logistic regression analysis, predicting binge drinking from age category, survey year, and their interaction. The interaction effect is the odds ratio describing the change in the main effect odds ratio over time, relative to the first time point (1979), and corresponds to the slope of a plot of log(OR) *versus* survey year, where a constant trend is assumed by modeling a single, per-year interaction term. From this slope, and the intercept, trend line estimates for the first and last survey years (1979 and 2006) were calculated.

Results

Sample Description

Descriptions of the unweighted sample size, demographics, and demographic oversampling ratios for the 12–34 year old NSDUH series subsamples are listed in Table 1. For periods where no design changes occurred, yearly sample sizes and demographic fproportions are averaged. Altogether, the present analyses involve data from over 500,000 subjects, across twenty administrations of the NSDUH.

Trends in Relative Distribution of Binge Drinking by Age and Gender

Odds ratios describing the relative risk for each age-by-gender group (12–14, 15–17, 18–20 and 21–23), relative to the combined gender 24–34 year age group, were computed separately for all 20 administrations of the NHSDA/NSDUH that assessed binge drinking. These results are plotted by year, in Figure 1 for males, and Figure 2 for females. Results of trend analyses for these data are shown in Table 2, and corresponding trend-lines are included in the Figures. Table 2 lists interaction odds ratios (Trend OR) that describe the average per-year change in age-category odds ratios over time. For example, a per-year odds-ratio of 0.98 corresponds to an average 2% reduction in odds per-year, or an overall reduction in odds of 43% over the 27 years covered by the surveys ($1 - 0.98^{27}$). To facilitate the interpretation of the overall change in odds, trend line estimates of relative odds for each age-by-gender groups for the first and last survey years analyzed (1979 and 2006) are also listed in Table 2.

For males, 21 to 23 year old subjects had the highest rates of binge drinking, with point estimates of odds ratios ranging from 2.1 to 3.7 across the series, and underwent a modest decline in relative risk for binge drinking over the 1979–2006 timeframe. Odds ratios for the 18–20 year old age group were consistently greater than 1.0, but exhibited a significant decline over the survey period (trend OR=0.979 per year, p=<0.001). Males 15 to 17 years old had binge drinking rates comparable to the reference group in earlier survey years, but underwent the largest decline in binge drinking of all age groups (trend OR=0.963 per year, p<0.001) with

odds ratios declining to about 0.4 in recent survey years. Finally, 12–14 year olds had the lowest rates of binge drinking in all survey years, and also underwent a marked decline in risk (trend OR=0.969, p=0.01), with ORs as low as 0.05 in survey recent years. Hence, for males, relative to the 24–34 year old combined-gender, there were significant declines in binge drinking across all age categories in the 1979–2006 period, but with the largest declines seen in the 12–14 and 15–17 year age groups.

For females, odds ratios for 21–23 and 18–20 age groups were consistently just below, or near 1.0 for most survey years, with significant increases in ORs across time for the 21–23 year old age group (trend OR=1.023, p<0.001). Odds ratios in the 15–17 year age group ranged from 0.2 to 0.4, and the 12–14 year group ranged from 0.01 to 0.14. Unlike the trends for males, there were no significant changes in the relative risk for binge drinking in any of the younger female groups (ages 12–14, 15–17 or 18–20).

Trends in Relative Distribution of Binge Drinking by Student Status

The trend analyses were repeated with the 18–20 and 21–23 year age groups each divided into student and non-student groups; these results are shown at the bottom of Table 2. Because our interest was in students in a college environment, or similar setting, 18 year-old high-school students were classified as "non-students". For men, the reduction in relative risk for binge drinking among 18–20 year olds was significantly larger among non-students than for students (trend OR=0.970 per year, 95% CI: 0.961,0.980, p<0.001 *vs*. OR=0.990 per year, 95% CI: 0.981, 0.999, p=0.09, respectively). Trends for 21–23 year old males did not differ by student status. For women, trends were similar for students and non-students in the 18–20 year age group, but diverged in the 21–23 year age group; with increases in relative risk for binge drinking being higher among students compared with non-students (trend OR=1.035 per year, 95% CI 1.018, 1.052, p<0.001 vs. trend OR=1.013, 95% CI: 1.002, 1.025, p=0.02).

Trends in Binge Drinking by Age, Gender, and Race/Ethnicity

Table 3 describes results of additional trend analyses with the age-by-gender groups further divided into racial/ethnic categories. For these analyses, the 12–14 and 15–17 year age categories were combined. This was because of low rates of binge drinking among some groups in this age range, (particularly minority women), and because trends in Table 3 were similar for these two age categories. Among men, there was only one trend that exhibited significant differences by race/ethnicity: Among 21–23 year olds, the relative risk for binge drinking among Black men has increased since 1979 (OR=1.025 per year; 95% CI: 1.006, 1.045, p=0.01), while other groups were unchanged. Among women, however, there were several trends that differed by race/ethnicity. Significant increases in odds ratios were observed for 12–17 year old Black and Hispanic females, and for 18–20 year old Black females, but not for White females in either age category. In addition, increases in risk among minority women ages 21–23 exhibited larger trends than those for Whites (see Table 3). Minority females exhibited substantially lower rates of binge drinking than Whites in earlier survey years, but these trends suggest that this gap has narrowed somewhat over the past three decades.

Absolute Prevalence Estimates of Binge Drinking, 1979–2006

Our core analyses (above) describe changes in relative risks for various demographic categories, all compared to adults aged 24 to 34. In order to anchor these relative risks to absolute prevalences of binge drinking, prevalence estimates by age and gender for 1979 and 2006, the first and last survey years analyzed here, are presented in Table 4. While methodological differences prevent direct comparisons between these two surveys, it is notable that estimates for all age groups in 2006 are higher than those from 1979 among females. In males, however, increases were smaller for the older age categories (18–20, 12–23 and 24–34)

and prevalence estimates were lower for the 12–14 and 15–17 year age groups in 2006 compared to 1979.

To understand potential changes over time within the 24–34 reference group, trends in the prevalence of past 30 day binge drinking within each segment of two or more data points (1988–90, 1991–93, 1994–97, 1998–2001, 2002–2006) were analyzed separately by gender. Among men, the only significant trend was a decline in prevalence across the 1994–97 surveys (OR=0.949 per year, 95% CI: 0.916 0.984, p=0.004). There were no significant trends within any individual segments among women. Within the reference group, a convergence of binge drinking prevalence between men and women is apparent (Table 2). This was quantified in trend analyses of the male vs. female odds ratios, which show that, on average, the odds ratio for binge drinking among 24–34 year old men, relative to 24–34 year old women, has been declining about 2.3% per year, since 1979 (Trend OR=0.977; CI: 0.970, 0.985; p<0.001; trend line estimates of ORs for 1979 and 2006 were 5.85 and 2.57, respectively).

Validity of assumptions

The findings from our analyses are contingent on the validity of the assumption that design changes in the NHSDA/NSDUH do not influence prevalences differentially by age or other demographic characteristics. That is, while we expect methodological variation to effect prevalence estimates, we assume that those effects do not differ markedly across demographic groups. This assumption was tested by comparing effect sizes in each redesigned survey to those from the preceding year. Significant differences would be manifest as interactions between demographic variable and survey-year. In theory, significant differences in these tests could correspond to true secular trends, but in practice, true trends would be difficult to observe over a single year. Hence, we tested for interactions between survey year and age, sex, or race/ethnicity for the following pairs of surveys, which correspond to major methodological changes: 1994 vs. 1993, 1999 vs, 1998, and 2002 vs. 2001. In only one case was a significant interaction detected: In the 1994 survey, compared with the 1993 survey, the odds for binge drinking among 12–14 year olds increased significantly whereas those for other age categories did not (Interaction Wald-χ^2=17.0, p=0.002). The implications of such an effect are discussed below.

Prior to 1991, the NHSDA did not sample from group quarters, such as college dormitories. College students were sampled in these earlier surveys (see Table 1), and dorm-dwellers had a chance of being sampled through their permanent addresses, but coverage of this population improved after 1990. We undertook trend analyses separately in the pre-1991 and 1991–2006 survey segments; no significant differences in trends among college students between these two survey periods were observed.

Discussion

Overview

We sought to examine trends in relative risk for binge drinking among youth and young adults in the United States over the past three decades, focusing on differences by age, gender, student status (for college-aged individuals), and race/ethnicity. The overall picture seems to reflect three simultaneous demographic trends that jointly contribute to net trends in binge drinking. First, individuals under 20 have experienced marked reductions in risk for binge drinking, suggesting that changes in the MLDA, as well as other policy changes and public health campaigns have been successful. Second, and countering the former trend, risk for binge drinking among girls and young women has been rising, with risk increasing faster for minorities than for Whites. And third, the reduction in risk for binge drinking among youth has not reached college students. Hence, reductions in binge drinking have been observed for

12–20 year old males, but not among 12–20 year old females because the trend toward less binge drinking among youth has been offset by an across-the-board increase in female binge drinking. And, 18–20 year old college men have experienced no reduction in binge-drinking, whereas non-students in this age range have underwent reductions. Furthermore, 21–23 year old college women have experienced larger increases in binge drinking rates than their non-student counterparts. While some of these trends have been separately documented in other studies e.g. [27–29], the present report demonstrates their joint effects, expands the age-range over which youth trends have been studied during this time period, and extends previous findings to a nationally representative, residence-based sample of youth and young adults.

The reduction in binge drinking among youth in general is likely to be at least partly attributable to the adoption of the uniform drinking age of 21.[4] Statistically significant effects of MLDA on alcohol participation and binge-drinking among high-school seniors has been documented; [30] zero-tolerance DUI laws have a smaller, but still significant effect for high-school seniors. [30, 31] Other policy changes may also have had effects, but have not been as thoroughly studied as the MLDA and zero-tolerance policies. The offsetting trend toward increased binge drinking among women is consistent with other reports of trends towards a "closing gender gap" in terms of alcohol and drug misuse.[27, 28, 32, 33] No reduction in binge drinking has been realized for 18–20 year old college men, and women in college have increased in binge drinking prevalence faster than their non-student counterparts (for the 21–23 year age group). These findings are consistent with observations from Monitoring the Future follow-up surveys, indicating that college students have been less likely to experience declines in binge drinking or heavy drinking than their similarly aged peers.[29]

Trends in Binge Drinking among Adults

The above interpretation assumes that prevalences of binge drinking in the reference group (ages 24–34) have been relatively constant between 1979 and 2006, an assumption that is justified on several grounds. Comparing data from states participating in the Behavioral Risk Factor Surveillance System (BRFSS) between 1985 and 1999, among adults ages 21 to 34, Serdula and colleagues documented very small (~3%) reductions in binge drinking.[34] BRFSS estimates of binge drinking among adults in the U.S. population were little changed between 1999 (14.9%) and 2006 (15.4%).[35] Similar results were seen among young adults in Monitoring the Future (MTF) follow-up surveys.[15] Hence, available indicators suggest small fluctuations (i.e., changes less than 10%), but no major systematic trends in the prevalence of adult binge drinking between 1984 and 2006. We are unaware of data on adult binge drinking prior to 1984, though available evidence suggests relative stability in other measures of adult drinking between 1979 and 1984.[36]

Binge Drinking Among Post-Secondary Students

These analyses were motivated, in part, by the growing interest in binge drinking on college campuses, and arguments from some quarters that binge drinking among college students is linked to changes in the minimum legal drinking age. Our trend analyses documented no changes among 18–20 year old college students, but strong increases among 21–23 year old college women. Also of note, these trends suggest a growing contrast in binge drinking behavior between college students and other young adults. For example, binge drinking among high-school seniors is currently at a historic low, more than 1/3 lower than its peak in 1979– 1983.[37, 38] Yet binge drinking among college men has seen little or no improvement since 1979, and has probably risen for college women. Moreover, binge-drinking increases among college-women have outpaced their non-student peers in the 21–23 year age range. Hence, binge drinking among college men is as prevalent as ever, and binge drinking among college women has increased in recent years.

Additional Considerations

Our analyses assumed that design changes in the NHSDA/NSDUH do not influence prevalences differentially by age or other demographic characteristics. In testing for differences in effect sizes across consecutive survey years differing in design, we found only one case in which this assumption may have been violated. Specifically, there was a significant difference across the 1993 and 1994 surveys in the odds for binge drinking among 12–14 year olds, suggesting that design changes may have led to increased prevalence estimates for this group to a larger degree than for other age groups. This difference was in the opposite direction of the overall trend, which was for reduced rates of binge drinking among 12–14 year olds over time. Therefore, the potential artifact may lead to an underestimation of the decline in binge drinking among 12–14 year olds, but the decline cannot be attributed to confounding due to methodological changes.

Additional limitations involve the coding of demographic variables. We considered individuals of Hispanic descent to be a separate "racial/ethnic" category, an approach that is consistent with recoding used in recent NSDUH surveys. However, it is possible that some individuals in this group may self-identify as Caucasian or Black rather than Hispanic. In addition, the "Other" category is heterogeneous, and combines various groups that may vary widely in their drinking behavior. Collapsing these categories was necessary due to statistical power considerations. Finally, because of our interest in the college environment, we classified individuals in high-school as "non-(college) students", when in fact college-bound secondary students may differ considerably from non-college-bound individuals in their drinking behavior.[29, 37] It is also important to note that, while it is reasonable to attribute reductions in binge drinking among youth to changes in drinking age laws and related policy initiatives, analyses presented here are intended to document secular trends, but not to assess the direct effects of policy or other variables.

In summary, we find significant declines in the relative risk for binge drinking among 12–20 year old males, but among females, the trend toward lower rates of binge drinking among youth is countered by rising prevalence for women. Additionally, college men have experienced no reductions in binge drinking, while binge drinking among college women has been on the rise. These results suggest that binge-drinking problems among college students would best be addressed by interventions specific to the campus environment, and by interventions targeted toward women, and not by presuming the MLDA or other laws have been ineffective. Relaxation of the uniform MLDA would risk undoing the progress that has been made in reducing binge-drinking behavior among youth over the past three decades.

Acknowledgments

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Figure 1.
Odds ratios for past-30 day binge drinking for four age categories of males, relative to 24–34 year-old men, by survey year: 12–14 years old (◆), 15–17 years old (■), 18–20 years old (▲) and 21–23 years old (●). Representative error bars are included, and correspond to 95% confidence intervals. Trend lines reflect logistic-regression trend analyses described in the text.
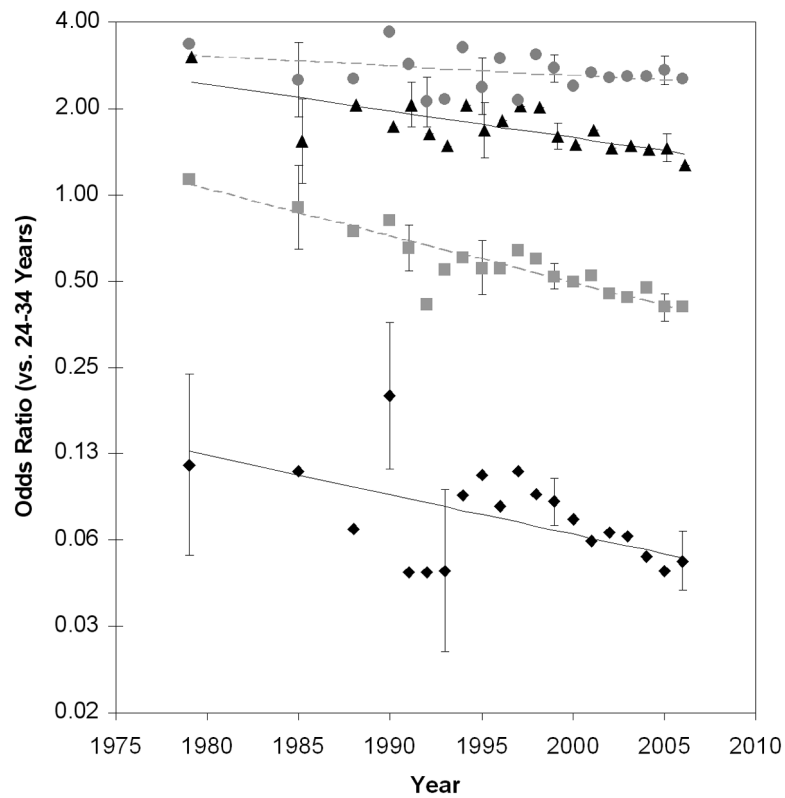
Figure 2.
Odds ratios for past-30 day binge drinking for four age categories of females, relative to 24–34 year-old women, by survey year: 12–14 years old (◆), 15–17 years old (■), 18–20 years old (▲) and 21–23 years old (●). Representative error bars are included, and correspond to 95% confidence intervals. Trend lines reflect logistic-regression trend analyses described in the text.
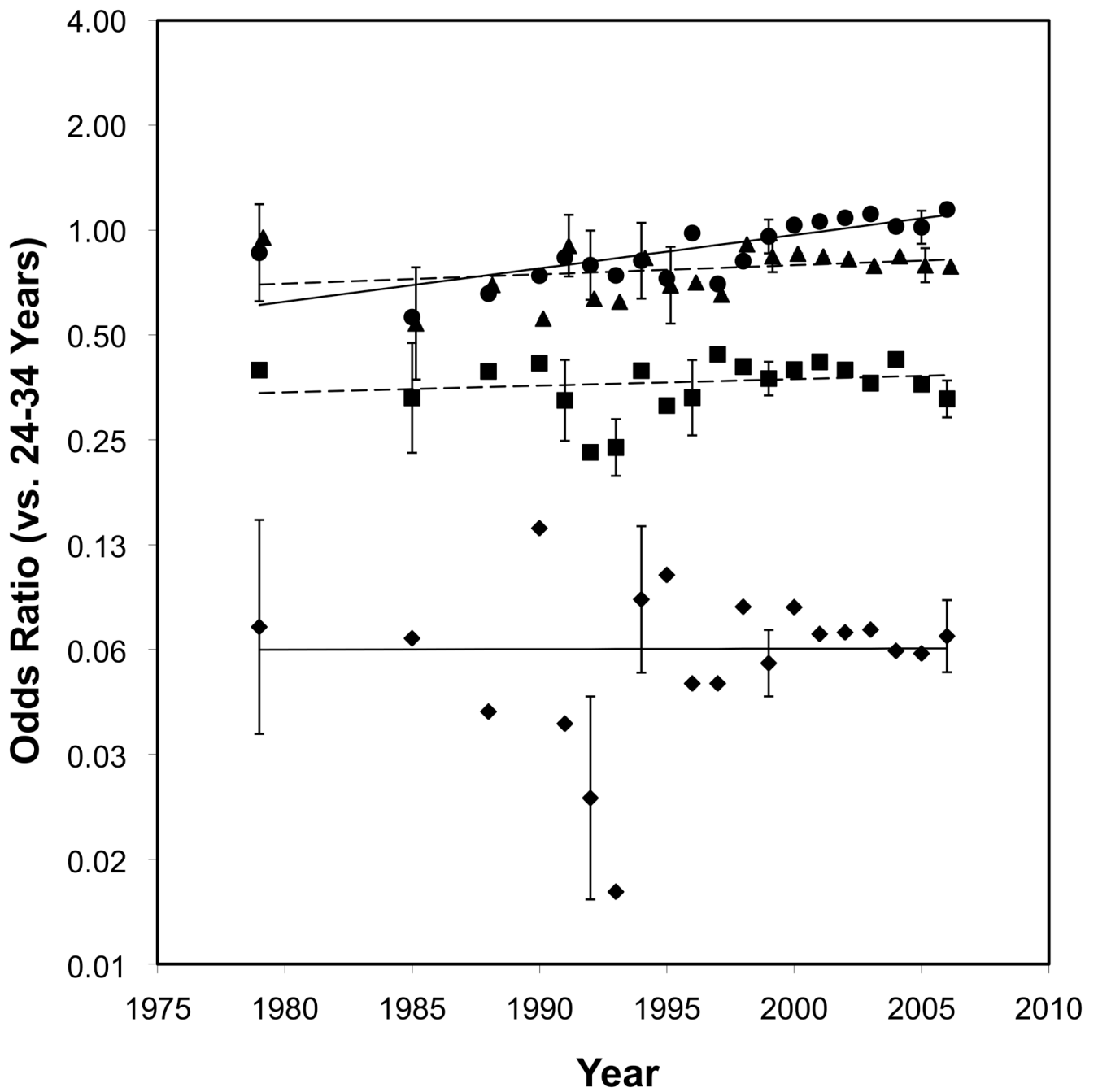
Table 1

Sample Description: NSDUH/NHSDA[a] Ages 18–34 Subsamples by Survey Year

	1979 N=5,273		1985 N=6,208		1988, 1990 N=6,586		1991–1993 N=21,101		1994[c]–1998 N=16,260		1999–2001 N=43,395		2002–2006 N=41,999	
	Un-weighted %	Sampling Ratio[b]	Un-weighted %	Sampling Ratio[b]	Un-weighted %	Sampling Ratio[b]	Un-weighted %	Sampling Ratio[b]	Un-weighted %	Sampling Ratio[b]	Un-weighted %	Sampling Ratio[b]	Un-weighted %	Sampling Ratio[b]
Ages 12–14	19.2	1.5	17.9	1.5	19.0	1.8	16.7	1.4	17.9	1.4	21.8	1.6	21.6	1.6
Ages 15–17	21.9	1.6	18.0	1.5	21.1	1.7	16.3	1.4	17.8	1.4	20.9	1.5	21.4	1.6
Ages 18–20	14.4	1.0	9.9	0.8	10.4	0.8	11.8	1.0	12.4	1.0	16.1	1.1	16.7	1.2
Ages 21–23	14.3	1.0	11.2	0.8	9.1	0.8	11.3	0.9	11.2	1.0	14.7	1.2	15.7	1.2
Ages 24–34	30.2	0.7	42.9	0.9	40.5	0.8	43.8	0.8	40.6	0.8	26.6	0.6	24.7	0.5
Men	47.8	0.9	44.9	0.9	46.0	0.9	45.8	0.9	45.1	0.9	48.5	1.0	48.8	1.0
Women	52.2	1.1	55.1	1.1	54.0	1.1	54.2	1.1	54.9	1.1	51.5	1.0	51.2	1.0
White	80.2	1.0	46.3	0.6	52.7	0.7	46.7	0.7	46.2	0.7	67.0	1.0	61.5	1.0
Black	11.4	0.9	25.0	1.9	20.9	1.6	23.8	1.8	22.2	1.7	12.7	1.0	13.4	1.0
Hispanic	5.5	0.8	27.3	3.1	23.7	2.4	25.8	2.3	27.4	2.1	14.0	0.9	16.8	0.9
Other	2.9	1.4	1.4	0.6	2.7	1.0	3.7	1.0	4.2	0.9	6.3	1.0	8.3	1.2
Non-Student[d]	66.4	0.9	75.8	1.0	71.7	1.0	64.0	0.9	66.8	1.0	61.8	1.1	71.7	0.9
Student[d]	33.6	1.2	24.2	1.1	28.3	1.0	36.0	1.1	33.2	1.0	38.2	0.8	28.3	1.2

Notes: Yearly averages are reported for surveys within segments where methodology was unchanged.

[a] National Survey on Drug Use and Health, formerly known as the National Household Survey on Drug Abuse.

[b] Degree to which the given demographic is over- or under-sampled.

[c] The 1994 survey utilized a split-sample design. Our analyses included only the larger "B" survey.

[d] 18 to 23 year age range only, "student" refers to post-secondary students.

Table 2

Trends in Odds for Binge Drinking Within Age Categories.

Age	Slope (per Year Change in OR)		Trend Line Estimates (Estimated OR for listed year)	
	Trend OR (95% CI)	p	1979	2006
Male				
12–14	**0.969 (0.950, 0.987)**	**<0.001**	**0.13**	**0.06**
15–17	**0.963 (0.955, 0.971)**	**<0.001**	**1.10**	**0.39**
18–20	**0.979 (0.971, 0.987)**	**<0.001**	**2.49**	**1.40**
21–23	**0.992 (0.984, 1.000)**	**0.049**	**3.11**	**2.51**
	Omnibus[*]*: Wald-χ^2=34.8/p<0.001*			
Female				
12–14	1.004 (0.983, 1.025)	0.74	0.06	0.07
15–17	1.004 (0.995, 1.014)	0.38	0.34	0.38
18–20	1.006 (0.996, 1.016)	0.21	0.69	0.82
21–23	**1.023 (1.013, 1.032)**	**<0.001**	**0.61**	**1.11**
	Omnibus: Wald-χ^2=9.8/p=0.02			
Male				
18–20 Non-Students	**0.970 (0.961, 0.980)**	**<0.001**	**2.66**	**1.18**
18–20 Students	0.990 (0.978, 1.002)	0.09	2.30	1.75
21–23 Non-Students	**0.990 (0.981, 0.999)**	**0.03**	**3.22**	**2.44**
21–23 Students	0.997 (0.984, 1.010)	0.06	2.90	2.66
	Omnibus: Wald-χ^2=15.2/p=0.002			
Female				
18–20 Non-Students	0.999 (0.986, 1.012)	0.91	0.64	0.63
18–20 Students	1.007 (0.993, 1.021)	0.34	0.85	1.02
21–23 Non-Students	**1.013 (1.002, 1.025)**	**<0.001**	**0.63**	**0.91**
21–23 Students	**1.035 (1.018, 1.052)**	**0.02**	**0.59**	**1.49**
	Omnibus: Wald-χ^2=11.9/p=0.008			

Note: Odds ratios describe the estimated relative change in main effect odds ratios (plotted in Figures 2 and 3), per-year, relative to 1979, the first year analyzed.

[*] Omnibus analysis describes test for heterogeneity of slopes; i.e., whether significant differences among trend effect sizes for age or age-by-student status groups are apparent.

Table 3

Trends in Odds for Binge Drinking by Race/Ethnicity

| Age | Slope (per Year Change in OR) | | Trend Line Estimates (Estimated OR for listed year) | |
	Trend OR (95% CI)	p	1979	2006
MEN				
Ages 12–17				
White	**0.964 (0.956, 0.972)**	**<0.001**	**0.67**	**0.25**
Black	**0.961 (0.935, 0.988)**	**0.005**	**0.25**	**0.09**
Hispanic	**0.974 (0.959, 0.990)**	**0.002**	**0.43**	**0.21**
Other	0.983 (0.948, 1.020)	0.37	0.22	0.14
Omnibus[*]: Wald-χ^2=2.4/p=0.49				
Ages 18–20				
White	**0.979 (0.970, 0.988)**	**<0.001**	**3.19**	**1.80**
Black	0.993 (0.975, 1.012)	0.48	0.74	0.62
Hispanic	0.992 (0.971, 1.014)	0.47	1.49	1.20
Other	1.018 (0.973, 1.064)	0.45	0.61	0.98
Omnibus: Wald-χ^2=5.0/p=0.17				
Ages 21–23				
White	0.994 (0.985, 1.003)	0.09	3.80	3.22
Black	**1.025 (1.006, 1.045)**	**0.01**	**0.75**	**1.47**
Hispanic	1.000 (0.983, 1.017)	0.99	2.03	2.02
Other	1.004 (0.965, 1.044)	0.85	1.44	1.60
Omnibus: Wald-χ^2=8.9/p=0.03				
WOMEN				
Ages 12–17				
White	0.999 (0.989, 1.009)	0.89	0.25	0.25
Black	**1.032 (1.006, 1.059)**	**0.015**	**0.04**	**0.11**
Hispanic	**1.034 (1.015, 1.054)**	**<0.001**	**0.09**	**0.23**
Other	1.022 (0.979, 1.068)	0.32	0.08	0.15
Omnibus: Wald-χ^2=45.3/p<0.0001				
Ages 18–20				
White	1.008 (0.997, 1.019)	0.16	0.88	1.08
Black	**1.036 (1.002, 1.071)**	**0.04**	**0.14**	**0.36**
Hispanic	1.022 (0.992, 1.052)	0.15	0.33	0.60
Other	1.029 (0.982, 1.077)	0.23	0.24	0.52
Omnibus: Wald-χ^2=33.6/p<0.0001				
Ages 21–23				
White	**1.024 (1.013, 1.035)**	**<0.001**	**0.76**	**1.44**
Black	**1.057 (1.029, 1.087)**	**<0.001**	**0.13**	**0.58**
Hispanic	**1.039 (1.016, 1.063)**	**<0.001**	**0.28**	**0.80**
Other	**1.079 (1.032, 1.128)**	**<0.001**	**0.12**	**0.92**
Omnibus: Wald-χ^2=47.0/p<0.0001				

Note: Trend Odds ratios describe the estimated relative change in main effect odds ratios, per-year, relative to 1979, the first year analyzed.

*
Omnibus analysis describes test for heterogeneity of slopes; i.e., whether significant differences among trend effect sizes for race/ethnicity groups are apparent.

Table 4

Prevalence of Binge Drinking by Age and Gender: 1979 and 2006

Age	1979			2006		
	N	%	(SE)	N	%	(SE)
Male						
12–14	515	3.2	(1.0)	4,470	2.7	(0.3)
15–17	598	25.1	(2.4)	4,587	18.1	(0.7)
18–20	353	47.6	(3.6)	3,400	41.0	(1.2)
21–23	360	50.3	(3.3)	3,065	58.5	(1.1)
24–34	681	35.7	(2.3)	4,506	47.2	(1.0)
Female						
12–14	485	2.1	(0.7)	4,237	3.5	(0.4)
15–17	545	10.4	(1.6)	4,467	15.1	(0.8)
18–20	403	22.1	(2.4)	3,358	30.1	(1.1)
21–23	393	20.3	(2.7)	3,443	38.6	(1.3)
24–34	907	10.8	(1.3)	5,128	24.0	(0.7)