The Effect of a Campus-Community Environmental Alcohol Prevention Initiative on Student Drinking and Driving: Results from the “A Matter of Degree” Program Evaluation

TOBEN F. NELSON, ELISSA R. WEITZMAN, and HENRY WECHSLER
Department of Society, Human Development and Health, Harvard School of Public Health, Boston, Massachusetts, USA

Objective. Motor vehicle crashes involving alcohol are a major contributor to morbidity and mortality among college students in the United States. This study evaluates the effect on drinking and driving outcomes of the “A Matter of Degree” program, a campus-community coalition initiative to reduce college binge drinking.

Methods. We used a quasi-experimental longitudinal study design that compared student responses at 10 colleges participating in the program and students attending 32 similar colleges that did not participate in the program. We also divided the program sites into two groups of five according to their level of program implementation and compared each with the non-program colleges. We examined driving after any alcohol consumption and driving after five or more drinks among drinkers who drove one or more times a week per month and riding with a high or drunk driver among all students at these colleges beginning in 1997 through 2001. Outcomes were based on data collected from repeated cross-sectional surveys using the Harvard School of Public Health College Alcohol Study. Analyses were conducted using MLwiN multilevel statistical software.

Results. We found significant reductions in driving after drinking, driving after five or more drinks and riding with a high or drunk driver at the program colleges relative to the comparison colleges. Further analyses indicated that these reductions among the AMOD program colleges occurred at the sites with high program implementation relative to comparison sites, while no statistically significant change was noted at the program sites with low implementation. The program effect on the two drinking and driving outcomes appeared to be mediated by frequent binge drinking, while significant decline in the riding with an intoxicated driver outcome was not mediated by the individual’s drinking.

Conclusions. Campus-community based environmental alcohol prevention is a promising approach for reducing alcohol-impaired motor vehicle crashes among this population.

Keywords Drink Driving; Injury Prevention; Alcohol; Alcohol-Impaired Driving; Alcohol Availability

Alcohol-involved motor vehicle crashes are a leading cause of morbidity and mortality among young adults in the United States (CDC, 2002; Stahre, Brewer, Naimi et al., 2004). The heavy toll of this problem for the young adult age group likely results from the combination of relative inexperience with driving and the high rates of drinking consistently noted among this population (Naimi et al., 2003). The problem of heavy drinking is particularly acute among young adults who attend four-year colleges and universities. College students are more likely to binge drink than their same-aged peers who do not attend college (Bachman, O’Malley, & Johnston, 1984; Dawson et al., 2004; O’Malley & Johnston, 2002; Slutske et al., 2004), leaving this population more exposed to the negative consequences of alcohol. The risk of death or disability resulting from a motor vehicle crash is the most serious of these potential outcomes. One study estimated that the annual number of deaths attributable to alcohol among college students for the year 2001 was 1,700 (Hingson et al., 2005). Of these deaths, approximately 1,300 (more than three in four) occurred in an alcohol-involved motor vehicle crash. These deaths in the college student population represent a disproportionate number of the roughly 17,000 motor vehicle fatalities involving alcohol that occur in the United States each year (NHTSA, 2004).

Extensive effort and resources from both public and private sources have been marshaled to prevent alcohol abuse and reduce the high rates of drinking among college students (Wechsler et al., 2000b, 2004), but the strategies employed to date have had relatively little overall impact. Rates of binge drinking
One argument against large-scale community efforts involving greater enforcement of drinking laws, and a concern raised at several of the AMOD sites during the planning and early implementation of this program, is that efforts to limit alcohol consumption will displace heavy drinking to other locales and increase drinking and driving. Although we did not find evidence to support this argument in a previous analysis of college policies to ban alcohol on campus (Wechsler et al., 2001), this remains an important concern to be addressed.

This study examines the drinking and driving outcomes for the AMOD program. We examined whether drinking and driving either decreased or increased following implementation of the AMOD program. However, consistent with the overall program approach, we hypothesized that the AMOD sites with the highest level of implementation would have greater reductions in drinking and driving outcomes compared with the low implementation AMOD sites and the comparison colleges. We further hypothesized that reductions in drinking and driving outcomes would be mediated by previously observed reductions in heavy alcohol consumption. In addition to a more in-depth examination of the drinking and driving outcomes, we employed multilevel statistical methods that allow for incorporating individual- and college-level control variables and enhance statistical power in the modeling.

METHODS

The study employed a quasi-experimental, longitudinal study design (Cook & Campbell, 1979) with students nested within colleges as the unit of observation and repeated measurement at the college level. The 10 AMOD sites were drawn from the top tercile of colleges by drinking behavior in the initial Harvard School of Public Health (HSPH) College Alcohol Study (CAS) sample (Wechsler et al., 1994) where college binge drinking rates were greater than 50%. Program sites submitted a proposal for funding to the Robert Wood Johnson Foundation (RWJF) beginning in 1996 and were included in the program based on the expressed willingness of the college presidents to give high priority to the intervention program and to form a college-community coalition to undertake environmental prevention strategies to combat heavy student drinking. A one to two year funded planning process began for six sites in 1997 and four additional sites in 1998. Colleges that had been selected to participate in the AMOD program sites were drawn from top tercile from which the AMOD program sites were drawn that did not participate in the AMOD program (n = 32) served as comparison sites in order to track secular change on the study outcome measures.

AMOD is a demonstration of an environmental intervention program, the specific elements of which were developed through local initiative at each of the sites (Weitzman, Nelson, & Wechsler, 2003). Since these program elements were of central scientific interest, we developed a formal protocol and theory-based intervention categorization system rooted in the public health model of agent-host-environment to track program interventions. AMOD program sites were divided into two groups based on their program implementation (high vs. low) and these

nationally were largely unchanged from 1993 to 2001, while rates of driving after drinking increased during this same time period, possibly reflecting similar increases observed for the heaviest forms of drinking (Wechsler et al., 2002).

Several studies have shown that about one-third of college students nationally report driving after drinking alcohol (Presley, Meilman, & Cashin, 1996; Wechsler et al., 2002; Wechsler et al., 2003) and about one in ten college students drove after consuming five or more drinks (Wechsler et al., 2003). These rates are significantly higher than drinking and driving in the overall adult population in the United States (NHTSA, 2003).

Most intervention efforts to reduce drinking and driving in the college population to date have focused on the individual student, through education about the serious consequences of drinking and driving, behavioral self-control strategies, mass media messages, and promotion of designated drivers (Barr & MacKinnon, 1998; DeJong & Winsten, 1999; Gotthoffer, 1999, 2001; Werch, 1990). These individually focused efforts are the most commonly employed interventions by colleges and mirror those frequently used to address overall drinking (Wechsler et al., 2000, 2004), despite the lack of empirical support for these approaches (Larimer & Cronce, 2002). New approaches combine the emphasis on interventions that target the individual with efforts that also address factors in the environment that may contribute to heavy drinking, such as the availability of low-cost, high-volume sources of alcohol, heavy marketing and promotion of alcohol to youth, enforcement of laws regulating alcohol supply, strict minimum drinking age laws, and mandatory responsible beverage service training programs (DeJong & Hingson, 1998; DeJong & Wallack, 1992). Community-based approaches that include these supply-side initiatives have been effective in reducing drinking and drinking-driving outcomes in community settings (Hingson et al., 1996; Holder et al., 2000; Perry et al., 1996; Toomey et al., 2001; Wagenaar, Murray, & Toomey, 2000) and have been recommended for implementation in college community settings (Wechsler & Weitzman, 1996; DeJong & Langford, 2002; Hingson & Howland, 2002; Toomey & Wagenaar, 2002).

One such initiative is the “A Matter of Degree” (AMOD) program. AMOD was developed as an alternative to the traditional, individually focused prevention programming prevalent on many college campuses. It is a coalition-based approach that generates participation of key stakeholders from both campus and the local community with a mission of changing the environment that encourages heavy alcohol consumption. In a previously published evaluation of the drinking outcomes from this demonstration effort we found significantly lower rates of alcohol consumption over time in six of seven measures at AMOD sites that had high levels of program implementation, compared with similar colleges who did not participate in the AMOD program (Weitzman et al., 2004). We found similar differences over time in alcohol-related harms among drinkers and secondhand effects among all students in the high implementation AMOD sites. These initial findings suggest the promise of this overall approach to prevention.

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groups of sites served as the primary exposure of interest in the study.

A detailed description of the methodology and the criteria used to differentiate between high and low implementation sites is published elsewhere (Weitzman et al., 2004). Sites in the high implementation grouping had substantially more interventions focusing on the alcohol environment (in contrast to those focusing on individual students), consistent with the overall program model. Within this set of environmental interventions we also observed greater implementation in each of six separate intervention sub-types. No single environmental intervention or type of environmental intervention appeared to distinguish the high and low implementation sites. Previous analyses of these data found significant increases over the program period in student reports of increased difficulty of obtaining alcohol at the AMOD sites with high program implementation, but no changes at low implementation AMOD sites or comparison sites.

Study Measures

The Survey. The AMOD program evaluation used the CAS survey, a 20-page mailed questionnaire that included questions about students’ alcohol use and associated problems, and background characteristics.

Procedure. An administrator at each school provided a list of randomly selected full-time undergraduate students enrolled during each survey year. Comparison schools sampled 225 students and AMOD program schools sampled 750 students during the years enrolled in the program. Program participant schools were surveyed annually between February and April, while comparison schools were surveyed in 1997, 1999, and 2001 only. A subcontractor conducted the questionnaire mailings and delivered final datasets for analysis. Further details on the CAS survey procedures and sampling plan are provided elsewhere (Wechsler et al., 1994, 1998, 2000b, 2002).

Outcome Measurement. All outcomes were derived from student self-report on a self-administered questionnaire. 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 5 or more drinks,” and 3) “riding with a driver who was high or drunk” (Wechsler et al., 2003). 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. From these questions we created dichotomized variables (not at all vs. once or more) for use in all analyses. The two drinking and driving variables were limited to only those respondents who reported driving a motor vehicle one or more times per week in the past 30 days, since one precondition of drinking and driving is having access to a vehicle (n = 17,952 for the driving after drinking any alcohol measure and n = 17,923 for the driving after five or more drinks measure). The riding with an intoxicated driver variable included all respondents to the questionnaire with complete data on the variables of interest (n = 26,098).

Data Analysis

Measuring Change Over Time. We employed a quasi-experimental design and two sets of comparisons. Outcome measures were assessed for change over time for all ten AMOD colleges compared to 32 referent colleges (n = 10,653 students). AMOD sites were then disaggregated into two groups; those with high program implementation (N = 5 colleges; n = 7,177) and those with a low program implementation (N = 5 colleges, n = 8,268 students), and analyzed over time simultaneously in comparison to the referent colleges.

We used a multilevel regression model and the logit-link function to examine change in the individual probability of each outcome over time and to compare change over time between intervention and referent colleges. Analyses were conducted using MLwiN version 1.1 (Rasbash et al., 1999). A survey year variable was assigned a value corresponding to the survey year (e.g., 1997 = 7; 1998 = 8). An interaction term for the program participation by year was the parameter of interest, adjusting for the group at baseline. We fit a random-intercepts random-slopes model to the observed data.

We conducted two sets of statistical tests to examine change over time. First we tested the trend over time comparing the slope for intervention colleges with the referent colleges using all data available for 1997–2001. We also analyzed the change from 1997 to 2001 as a dichotomous variable (baseline = 0, follow-up = 1). The change results for the baseline and endpoint years are expressed in the text as odds ratios with corresponding confidence intervals. Because these sites were not randomized to the intervention conditions by design and in order to control for potential bias that may result, all analyses were adjusted by individual compositional characteristics of gender (male/female), age (under 21 years, 21–23 year, 24 year and older), race/ethnicity (White, Hispanic, African-American/Black, Asian, Native American/Pacific Islander, other race), and college residence (on-campus, off-campus). We also adjusted the model for college-level characteristics of region (North Central, Northeast, South, West), funding (public, private), and school location (rural, small town, suburban, urban). Because school response rate varied by school and year, it was included as a covariate in all models to adjust for potential response bias. Prototypical plots based on fitted regression models are presented for the three groups of colleges.

To examine whether changes in drinking and driving outcomes were mediated by changes in drinking outcomes we tested whether adding terms for binge drinking and frequent binge drinking at baseline and the changes in each of those measures over time would influence the parameter estimates for the interaction term of program type over time. Binge drinking was defined as the consumption of five or more drinks in a row on a single occasion for males and four or more drinks for females at least one time in the previous two weeks and frequent binge drinking was defined as binge drinking on three or more occasions during the same time frame, consistent with previous studies using the HSPH CAS dataset (Wechsler & Austin, 1998; Wechsler et al., 2002; Wechsler & Nelson, 2001). If changes over
time in drinking and driving outcomes were mediated through drinking measures we would expect to see the parameter estimates for these variables move toward zero and become statistically non-significant.

**Weighting and Standardization**
All analyses were performed using a direct standardization procedure. This step helps to protect against falsely attributing change on outcome measures to the program implementation rather than changes in demographic characteristics. Data were weighted by gender, age and race/ethnicity using each school’s underlying demographic characteristic at baseline as a reference as described in detail elsewhere (Wechsler et al., 2002; Weitzman et al., 2004).

**RESULTS**

**Driving After Any Drinking**
Among students who drank alcohol in the past year and drove a motor vehicle one or more times per week we found weighted prevalence rates of driving after any drinking of 44.9 percent in 1997 and 41.6 percent in 2001 at the AMOD sites and 41.4 percent in 1997 and 42.5 percent in 2001 at the comparison colleges. We disaggregated the AMOD sites into high and low program implementation and found that high implementation AMOD colleges declined from 46.6 percent in 1997 to 43.6 percent in 2001, while the low implementation sites went from 42.7 percent in 1997 to 39.3 percent in 2001.

In statistical models of these data adjusting for both individual and college characteristics we observed a significant difference over time between the AMOD program sites and the comparison colleges for driving after consuming any alcohol, after accounting for baseline prevalence rates of drinking and driving. The 10 AMOD sites had a decline over time (slope = −0.048; standard error [s.e.] = 0.022; test for difference from comparison Adjusted Odds Ratio [AOR] 0.95; 95% Confidence Interval [95% CI] 0.91–0.995; χ² (1) = 4.64; p = 0.0313) relative to the change in the comparison sites (slope = 0.007; s.e. = 0.016; test for difference from no change over time AOR 1.01; 95% CI 0.98–1.04; χ² (1) = 0.16; p = 0.6892). In a model analyzing change from baseline to follow-up only, we found significant change for the overall program (AOR 0.83; 95% CI 0.69–0.996; χ² (1) = 4.01; p = 0.0452) relative to no change in the comparison sites (AOR 1.04; 95% CI 0.91–1.18; χ² (1) = 0.27; p = 0.6060).

We disaggregated the data by level of program implementation and found that the program participants that had a greater number of environmental interventions showed significant changes over time (slope = −0.059; s.e. = 0.029; test for difference from comparison AOR 0.94; 95% CI 0.89–0.998; χ² (1) = 4.09; p = 0.0432) relative to the comparison colleges. The change over time in the low implementation program sites was not significantly different from the comparison colleges (slope = −0.038; s.e. = 0.029; test for difference from comparison AOR 0.96; 95% CI 0.91–1.02; χ² (1) = 1.71; p = 0.1905). However, in a direct test we found no statistical differences between the high and low implementation AMOD program groupings (slope = −0.021; s.e. = 0.034; test for difference high vs. low implementation AOR 0.98; 95% CI 0.92–1.05; χ² (1) = 0.39; p = 0.5276).

Figure 1 shows the predicted probability plots for each of the three groups of sites (high and low implementation AMOD program and comparison colleges). In a model examining only the baseline and follow-up time points we did not observe statistically significant differences between either the high implementation (AOR 0.80; 95% CI 0.63–1.03; χ² (1) = 3.03; p = 0.0818) or low implementation (AOR 0.82; 95% CI 0.64–1.05; χ² (1) = 2.57; p = 0.1092) AMOD group relative to the comparison colleges.

**Driving After Consuming Five or More Drinks**
We found weighted prevalence rates of driving after consuming five or more alcoholic drinks of 17.9 percent in 1997 to 15.2 percent in 2001 at the AMOD sites and 15.6 percent in 1997 and 18.6 percent in 2001 at the comparison colleges among students who drank alcohol in the past year and drove a motor vehicle one or more times per week. Prevalence rates of driving after five or more drinks at high implementation AMOD colleges declined from 20.0 percent in 1997 to 17.7 percent in 2001, while the low implementation sites went from 15.1 percent in 1997 to 12.3 percent in 2001.

Significant differences over time for driving after five or more drinks emerged between the AMOD program sites and the comparison colleges. The 10 AMOD sites in aggregate had a decline over time in driving after consuming five or more drinks (slope = −0.069; s.e. = 0.032; test for difference from comparison AOR 0.93; 95% CI 0.88–0.994; χ² (1) = 4.77; p = 0.0290). This finding was relative to a significant change over time in the comparison group (slope = 0.049; s.e. = 0.021; test for difference from no change over time AOR 1.05; 95% CI 1.01–1.09; χ² (1) = 5.34; p = 0.0209). For the overall AMOD program from baseline to follow-up only, we found significant change (AOR 0.67; 95% CI 0.51–0.87; χ² (1) = 8.59; p = 0.0034) relative to an increase at the comparison sites (AOR 1.23; 95% CI 1.03–1.48; χ² (1) = 5.40; p = 0.0202).

When we examined the data for the AMOD colleges disaggregated by level of program implementation, we found that the
program participants that had a greater number of environmental interventions showed significant changes over time (slope = −0.092; s.e. = 0.037; test for difference from comparison AOR 0.91; 95% CI 0.85–0.98; \( \chi^2_{(1)} = 6.25; p = 0.0124 \)) relative to significant increase in the comparison colleges. We did not observe a similar significant difference in the change over time in the low implementation program sites relative to the comparison colleges (slope = −0.051; s.e. = 0.045; test for difference from comparison AOR 0.95; 95% CI 0.87–1.04; \( \chi^2_{(1)} = 1.25; p = 0.2634 \)). However, in a direct test we found no statistical differences between the two AMOD program sites (slope = −0.039; s.e. = 0.048; test for difference high vs. low implementation AOR 0.96; 95% CI 0.88–1.06; \( \chi^2_{(1)} = 0.66; p = 0.4166 \)). The predicted probability plots of driving after five or more drinks for each of the three groups of sites are shown in Figure 2. When we examined change for the baseline and follow-up time points only, we observed statistically significant differences for both the high implementation (AOR 0.55; 95% CI 0.34–0.88; \( \chi^2_{(1)} = 9.05; p = 0.0026 \)) and low implementation (AOR 0.59; 95% CI 0.42–0.83; \( \chi^2_{(1)} = 6.24; p = 0.0125 \)) AMOD groups relative to the comparison colleges.

**Riding with a High or Drunk Driver**

Among all students, we found prevalence rates of riding with an intoxicated driver declined at the AMOD program colleges from 29.8 percent in 1997 to 27.1 percent in 2001, while we observed increases from 25.7 percent in 1997 to 28.8 percent in 2001 at the comparison colleges. At the high implementation AMOD program sites the prevalence rates decreased from 32.9 percent in 1997 to 29.6 percent in 2001. We observed prevalence rates of 26.3 percent in 1997 and 24.5 percent in 2001 at the low implementation AMOD sites.

We observed significant differences over time between the AMOD program sites and the comparison colleges for riding with a driver who was high or drunk. The AMOD sites declined over time (slope = −0.073; s.e. = 0.022; test for difference from comparison AOR 0.93; 95% CI 0.89–0.97; \( \chi^2_{(1)} = 10.44; p = 0.0012 \)) relative to a significant change over time in the comparison group (slope = 0.044; s.e. = 0.015; test for difference from no change over time AOR 1.04; 95% CI 1.01–1.08; \( \chi^2_{(1)} = 8.41; p = 0.0037 \)). We found significant change from baseline to follow-up for the overall AMOD program, (AOR 0.66; 95% CI 0.53–0.83; \( \chi^2_{(1)} = 13.18; p = 0.0003 \)) relative to an increase at the comparison sites (AOR 1.15; 95% CI 1.02–1.30; \( \chi^2_{(1)} = 5.33; p = 0.0209 \)).

When we disaggregated the AMOD colleges by level of program implementation, we found that high implementation sites experienced significant changes over time (slope = −0.078; s.e. = 0.025; test for difference from comparison AOR 0.92; 95% CI 0.88–0.97; \( \chi^2_{(1)} = 9.50; p = 0.0021 \)) relative to the increase at comparison colleges. We observed no similar change over time in the low implementation program sites relative to the comparison colleges (slope = −0.025; s.e. = 0.031; test for difference from comparison AOR 0.98; 95% CI 0.92–1.04; \( \chi^2_{(1)} = 0.65; p = 0.4219 \)). We found no statistical differences in a direct test between the two AMOD program sites (slope = −0.049; s.e. = 0.034; test for difference high vs. low implementation AOR 0.95; 95% CI 0.89–1.02; \( \chi^2_{(1)} = 2.02; p = 0.1552 \)). The predicted probability plots for riding with an intoxicated driver are shown in Figure 3. For the baseline and follow-up time points only, we observed statistically significant differences for both the high implementation (AOR 0.64; 95% CI 0.51–0.81; \( \chi^2_{(1)} = 13.67; p = 0.0002 \)) and low implementation (AOR 0.71; 95% CI 0.51–0.99; \( \chi^2_{(1)} = 4.15; p = 0.0418 \)) AMOD groups relative to the comparison colleges.

**Mediation of Outcomes by Consumption**

In addition to testing the effects of the AMOD program implementation, we tested whether these effects were mediated by alcohol consumption. For driving after drinking any alcohol we noted a small shift in the parameter estimate for the high implementation program sites (from −0.059 to −0.056) and an increase in the standard error estimate, such that the significant program effect was no longer statistically significant (\( \chi^2_{(1)} = 2.49; p = 0.1148 \)). In a separate model to test the mediating effect of frequent binge drinking the parameter estimate dropped (from −0.059 to −0.38) and the program effect was not statistically significant (\( \chi^2_{(1)} = 1.29; p = 0.2570 \)). When we tested the mediating effect of binge drinking on driving after consuming five or more drinks we did not find a meaningful change in the parameter estimate from the original model (−0.092 to −0.093) and the high implementation program effect remained statistically significant (\( \chi^2_{(1)} = 5.49; p = 0.0167 \)).

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**Figure 2** Fitted prototypical plots for driving after consuming five or more alcoholic drinks over time by AMOD program (high and low implementation) and comparison sites.

**Figure 3** Fitted prototypical plots for riding with an intoxicated driver over time by AMOD program (high and low implementation) and comparison sites.
p = 0.0191). However, there appeared to be a mediating effect of frequent binge drinking. When inserted into the model, the parameter estimate for the high implementation program effect over time declined from −0.092 to −0.078 and the program effect was no longer statistically significant (χ²(1) = 3.39; p = 0.0655).

We did not find similar mediating effects of consumption on riding with an intoxicated driver. Neither binge drinking (parameter estimate from −0.078 to −0.102; χ²(1) = 14.54; p = 0.0001), nor frequent binge drinking (parameter estimate from −0.078 to −0.095; χ²(1) = 12.17; p = 0.0005), appeared to mediate the effect of the program.

**DISCUSSION**

The “A Matter of Degree” program was designed to encourage key campus and community stakeholders to take action to change the prevalent alcohol-promoting environment in their communities. Program leaders expected these efforts to reduce heavy alcohol consumption by college students, and the negative health and social consequences associated with heavy drinking. Perhaps the most serious health threat to college students is driving a motor vehicle under the influence of alcohol (Hingson et al., 2002). Although program leaders hoped to reduce this important health outcome, concern existed about whether program efforts would inadvertently result in higher rates of drinking and driving as students sought opportunities to drink elsewhere. In an evaluation of the effects of the AMOD program, an environmental prevention initiative on college campuses, on drinking and driving outcomes we found significant declines over time in drinking and driving, driving after consuming five or more drinks, and riding with a high or drunk driver over time. When we disaggregated the program sites by level of program implementation we found that significant declines relative to similar comparison sites occurred at the sites with the highest level of implementation. An important finding of this study is that the reductions over time in driving after drinking associated with high levels of program implementation appear to be mediated by frequent binge drinking behavior. A previous analysis found that declines over time in both binge and frequent binge drinking were associated with high program implementation (Weitzman et al., 2004). We found that declines in riding with an intoxicated driver did not appear to be mediated by one’s own heavy drinking behavior. Instead the observed reduction in this outcome may reflect overall decreased opportunities to ride with an intoxicated driver, since there were fewer drinking drivers at the high intervention program sites over time.

These findings indicating parallel declines in both alcohol consumption and drinking and driving provide initial evidence of promise for programs that attempt to limit alcohol consumption by implementing interventions to change the alcohol environment on and off campus. These intervention elements included programs and policies such as mandatory responsible beverage service training, greater monitoring and service standards for alcohol retailers, keg registration, parental notification policies for alcohol-related offenses, greater supervision and more stringent accreditation requirements for Greek organizations and Greek-sponsored social events, cracking down on unlicensed alcohol sales at Greek events and off-campus parties, increasing substance-free residence hall offerings, and expanding alcohol-free social activities.

Several caveats are important to consider when interpreting the results of this study. The self-report measures used are subject to response bias. Students may underreport behaviors that are undesirable or illegal. However, other studies have found self-report surveys on alcohol use to be generally valid and reliable (Cooper et al., 1981; Frier, Bell, & Ellickson, 1991; Midanik, 1988). The study employed a quasi-experimental design, which has inherent limitations with respect to valid causal inference (Cook & Campbell, 1979). AMOD sites were selected on the basis of high binge drinking prevalence rates, an interest in dealing with this problem, and commitment to an intervention model, but were not randomly assigned to intervention conditions. We employed a set of comparison colleges with similar binge drinking rates in the CAS national data (Wechsler et al., 1994; Weitzman et al., 2004), and by doing so we address potential threats to validity of history and maturation (Cook & Campbell, 1979). We found that high environment sites had higher initial rates of drinking and driving and it is possible that the results reflect a regression to the mean. However, we used longitudinal data analysis such that the multiple observations and the analysis of relative change over time adjusting for these baseline differences help to improve reliability and protect against this alternative explanation. The sites were not selected into the high and low environment groups on the basis of their pre-test score, but were assigned using an independent, prospectively measured, theory-based categorization (Weitzman, Nelson, & Wechsler, 2003; Weitzman et al., 2004). While it is also possible that the sites with the highest drinking rates at the outset of the program were more highly motivated to promulgate change in their environment, sites were only provided data about their own drinking rates and were unlikely to be aware of their status within the program or relative to comparison colleges.

Response rates to the survey were slightly lower among the AMOD sites, but we modeled this covariate in the analysis and used standardized sample weights in all analysis in order to represent the underlying demographic distribution of each college. Students attending intervention colleges may have underestimated risky or illicit behaviors. In these cases we would expect bias to operate equally at all intervention sites. Instead we found that site with high program implementation experienced declines in drinking and driving while the low implementation sites did not. Among the comparison sites we had smaller sample sizes and fewer time points for observation comparison schools, which may decrease the measurement precision and make it more difficult to detect true change over time. However, we had more than 10,000 individual observations from 32 colleges in three survey samples and these samples were randomly drawn, anonymous and confidential. While we had limited ability to
report on prevention efforts at comparison sites, our previous research on two national samples of colleges found that environmental approaches that address the supply of alcohol available to college students at U.S. colleges are rare (Wechsler et al., 2000a, 2004). In this case, we would expect the comparison group and the program group to be more alike. Finally, we used cross-sectional survey reports over a five-year period. Including all of the data helps to improve the reliability of the estimates. When we included all survey years the variability in the prevalence estimates were less stable in the low implementation sites, while the finding of a decline in the high implementation sites was evident.

The findings from the evaluation of the AMOD program have important implications for prevention programming directed at reducing drinking and driving and its negative consequences for health. It is possible for colleges and communities to work together to enact changes that will impact the heavy drinking and negative consequences that result. These approaches will require involvement of key stakeholders on-campus and in the community through town-gown coalitions. Most colleges rely solely on individually based approaches (Wechsler et al., 2000a, 2004). In addition, we found that, contrary to the concerns of some that restricting the alcohol environment would lead to increased drinking and driving as students sought out other sources of alcohol, drinking and driving decreased. While the drinking and driving outcomes appeared to be mediated by frequent binge drinking, declines in this style of drinking at the AMOD sites did not completely account for all of the decline in drinking and driving. Further, riding with an intoxicated driver did not appear to be mediated by one’s own drinking behavior.

Further research should investigate other mechanisms that may contribute to reduced drinking and driving or the decision to ride with an impaired driver. Our results demonstrate that reducing alcohol-impaired driving can be achieved by a general approach to reducing binge drinking and heavy alcohol consumption, rather than a program that focuses solely on driving. In fact, the AMOD program participants focused their efforts on drinking rather than driving despite major threat that alcohol-impaired driving can be achieved by a general approach to reducing binge drinking and heavy alcohol consumption. These approaches will require involvement of key stakeholders on-campus and in the community through town-gown coalitions. Most colleges rely solely on individually based approaches (Wechsler et al., 2000a, 2004). In addition, we found that, contrary to the concerns of some that restricting the alcohol environment would lead to increased drinking and driving as students sought out other sources of alcohol, drinking and driving decreased. While the drinking and driving outcomes appeared to be mediated by frequent binge drinking, declines in this style of drinking at the AMOD sites did not completely account for all of the decline in drinking and driving. Further, riding with an intoxicated driver did not appear to be mediated by one’s own drinking behavior.

Further research should investigate other mechanisms that may contribute to reduced drinking and driving or the decision to ride with an impaired driver. Our results demonstrate that reducing alcohol-impaired driving can be achieved by a general approach to reducing binge drinking and heavy alcohol consumption, rather than a program that focuses solely on driving. In fact, the AMOD program participants focused their efforts on drinking rather than driving despite major threat that alcohol-impaired driving represents to this population. Colleges should consider supplementing existing educational efforts aimed exclusively at individual students with comprehensive prevention programs that address structural and environmental factors that promote heavy drinking by college students. The observation in this study that drinking and driving outcomes are sensitive to changes in drinking rates should help colleges focus efforts on drinking and the conditions that promote it in addition to programs tailored to driving outcomes, in order to reduce alcohol-impaired driving.

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