

Effects of AlcoholEdu for College on Alcohol-Related Problems Among Freshmen: A Randomized Multicampus Trial*

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ABSTRACT. Objective: AlcoholEdu for College is a 2- to 3-hour online course for incoming college freshmen. This study was the first multicampus trial to examine effects of AlcoholEdu for College on alcohol-related problems among freshmen. **Method:** Thirty universities participated in the study. Fifteen were randomly assigned to receive AlcoholEdu, and the other 15 were assigned to the control condition. AlcoholEdu was implemented by intervention schools during the summer and/or fall semester. Cross-sectional surveys of freshmen were conducted at each university beginning before the intervention in spring 2008/2009; post-intervention surveys were administered in fall 2008/2009 and spring 2009/2010. The surveys included questions about the past-30-day frequency of 28 alcohol-related problems, from which we created indices for the total number of problems and problems in seven domains: physiological, academic, social, driving under the influence/riding with drinking drivers, aggression, sexual risk taking, and victimization. Multilevel Poisson regression analyses were conducted

to examine intent-to-treat and dosage effects of AlcoholEdu for College on these outcomes. **Results:** Multilevel intent-to-treat analyses indicated significant reductions in the risk for past-30-day alcohol problems in general and problems in the physiological, social, and victimization domains during the fall semester immediately after completion of the course. However, these effects did not persist in the spring semester. Additional analyses suggested stronger AlcoholEdu effects on these outcomes at colleges with higher rates of student course completion. No AlcoholEdu effects were observed for alcohol-related problems in the other four domains. **Conclusions:** AlcoholEdu for College appears to have beneficial short-term effects on victimization and the most common types of alcohol-related problems among freshmen. Universities may benefit the most by mandating AlcoholEdu for College for all incoming freshmen and by implementing this online course along with environmental prevention strategies. (*J. Stud. Alcohol Drugs*, 72, 642–650, 2011)

NATIONAL EPIDEMIOLOGICAL STUDIES indicate that substantial numbers of college students experience negative consequences that are associated with alcohol use. Hingson et al. (2009) estimated that the number of alcohol-related unintentional injury deaths among college students increased from 1,440 in 1998 to 1,825 in 2005. They also estimated that, in 2001, 599,000 full-time 4-year students were injured because of drinking; 696,000 were hit or assaulted by another student who had been drinking; and 97,000 were victims of alcohol-related sexual assault or date rape. Additionally, the prevalence of past-year drinking and driving among college students increased from 26.5% in 1999 to 28.9% in 2005. Identifying effective strategies to prevent or reduce negative drinking consequences among college students clearly remains a public health research priority.

Of growing popularity are web-based interventions designed to reduce both hazardous drinking and alcohol-related problems on college campuses (Nelson et al., 2010). Online courses such as AlcoholEdu for College are modeled in part on efficacious multicomponent interventions led by trained

clinicians (e.g., Brief Alcohol Screening and Intervention for College Students [BASICS]; Dimeff et al., 1999). Such interventions typically include personalized feedback to change normative beliefs about alcohol use, education about alcohol's effects on the brain and on behavior, risk awareness, challenges to expectations regarding the effects of alcohol use, and suggestions for alcohol-free activities and strategies to minimize alcohol-related harm (Dimeff et al., 1999; Larimer and Cronce, 2007). Although brief interventions such as BASICS with trained clinicians are now fairly well established, web-based interventions are still being developed and tested. Thus, questions remain about their potential for reducing student alcohol misuse and related consequences.

There have been several investigations on the effects of AlcoholEdu for College. In one randomized controlled trial, Croom and colleagues (2009) tested the effects of the program on incoming freshmen. Students assigned to the intervention group took the course during the summer before matriculation and then completed a survey 1 month after they arrived on campus. In both the entire sample and among students who reported alcohol use at baseline, those assigned to the intervention group reported participation in fewer drinking games at follow-up but were more likely to report unsafe sexual practices. Students in the intervention group who reported 30-day use at baseline also were more likely to experience a hangover than those in the control

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group. We note, however, that this study was based on an earlier version of AlcoholEdu for College, and intervention-versus-control-group comparisons did not adjust for baseline differences in alcohol-related behaviors.

In a second study, Lovecchio and colleagues (2010) also used a randomized controlled trial to examine the short-term effects of AlcoholEdu for College in a sample of all incoming freshmen, irrespective of baseline drinking status. Study results indicated that students exposed to the intervention reported a decrease and those in the control group an increase in a range of drinking-related behavioral but not psychological consequences.

A recent 30-campus randomized controlled trial by Paschall and colleagues (in press) investigated the effects of AlcoholEdu for College on the frequency of past-30-day alcohol use and heavy drinking among freshmen. AlcoholEdu for College extends traditional educational approaches to prevent alcohol misuse by including normative feedback to correct student misperceptions about the acceptability and level of heavy drinking on campus, interactive exercises to challenge alcohol expectancies, and recommendations for strategies to reduce the likelihood of heavy drinking and related consequences (e.g., avoiding drinking games, planning for safe transportation). The multicampus design was used because AlcoholEdu for College is typically mandated for all incoming freshmen and is therefore considered a campus-level prevention strategy (Outside the Classroom, 2010). Findings indicated significant reductions in these behaviors among freshmen at intervention schools relative to control schools during the fall semester immediately following course implementation. Stronger effects on these outcomes were observed at colleges with a higher percentage of students who completed the course. However, course effects on these behaviors did not persist into the subsequent spring semester, regardless of the level of course completion.

The present study used survey data collected as part of the 30-campus randomized controlled trial to investigate the effects of AlcoholEdu for College on alcohol-related problems among freshmen. In light of the observed effects of AlcoholEdu for College on drinking behaviors, we also expected to see short-term effects on alcohol-related problems, with stronger effects at schools with higher course completion rates.

Method

Study design

AlcoholEdu for College was evaluated as a campus-level prevention strategy with a randomized controlled design. Colleges eligible to participate in the study had never implemented AlcoholEdu or any other type of online alcohol prevention program designed for all incoming freshmen, and officials expressed willingness for their colleges to be

randomly assigned to an intervention or control condition in the first year of the study. Officials at participating schools also agreed, if their schools were assigned to the intervention group, to implement the program as designed. Outside the Classroom provided AlcoholEdu for each college with a 50% discount; these costs were covered by the grant, and the colleges were not involved in financial transactions with Outside the Classroom pertaining to the study. In addition, officials of all participating schools agreed to provide random samples of 200 freshman students each semester to the Survey Sciences Group, an independent survey organization. Before random assignment, colleges were stratified (i.e., matched as pairs or larger groups) based on characteristics such as geographic location (region of the United States, urban/suburban vs. rural area), governance (public vs. private), total undergraduate population, and percentage of students who were White and in fraternities/sororities. Pre-stratification helped to enhance the baseline equivalence of the intervention and control groups with respect to characteristics that could be associated with student drinking. Because of time constraints, it was not possible to use baseline student-survey data for pre-stratification purposes.

Thirty-two colleges were initially enrolled in the study over a 2-year period. Twenty-two schools were enrolled in fall 2007 and the remainder in fall 2008. Colleges were randomly assigned to the intervention (AlcoholEdu) or to the control condition. Of the 16 schools assigned to the intervention condition, one did not fully implement AlcoholEdu as a result of the loss of its campus coordinator position, but it was retained in the study to avoid attenuating the study design. One of the other 15 intervention schools was lost to follow-up because it did not provide usable survey samples for all three waves of data collection. Of the 16 schools assigned to the control condition, one dropped out of the study before baseline data collection. Three waves of survey data were collected from the 30 remaining colleges, with 15 in each study condition.

AlcoholEdu for College

AlcoholEdu is an online alcohol misuse prevention and harm reduction course for college students that typically takes 2–3 hours to complete. Depending on the implementation method selected by any given college, students generally complete Part I of the program in the late summer, before the beginning of the fall semester. Part I consists of a baseline survey and four modules: *Introduction*, *Getting the Facts*, *Deciding for Yourself*, and *Review and Exam*. Thirty to 45 days later (by which time they have matriculated), students are prompted by email to complete Part II of AlcoholEdu, which consists of one module that comprises review materials, some new content, and a follow-up survey.

The course includes attitudinal and behavioral surveys, tests of program-related knowledge, and multimedia com-

ponents, including informational text with graphics, audio discussions of topics, interactive animations, case studies with streaming video clips of college students in different drinking situations, blog simulations, and self-reflection exercises. Some of the content of the course is tailored to respond to students' specific drinking status and gender. For example, students who report high-risk drinking are provided with feedback using national statistics concerning the prevalence of alcohol use among college students to correct any misperceptions about this behavior.

Module 1 begins with an overview of the course, emphasizes why taking the course is important, and through a flash animation provides detailed information about a standard drink size in relation to different types of alcoholic beverages. Students then complete a pop quiz to assess their baseline knowledge about the information covered in the course, as well as a pre-intervention survey designed to measure their alcohol-related attitudes, beliefs, and experiences.

Module 2 challenges students with regard to their perceptions of campus drinking norms and their knowledge of alcohol's effects on the brain and body, and it includes a discussion about blood alcohol concentration and a blood alcohol concentration calculator exercise. Module 2 also provides information about alcohol laws and policies, including consequences of alcohol law violations, and it gives students the opportunity to explore policies that are specific to their state.

Module 3 encourages students to set academic, social, and health-related goals for themselves concerning their next year of college and to develop strategies to help them meet those goals. Students select among a number of harm-reduction approaches (e.g., setting a limit on drinks, planning for safe transportation) to develop a specific plan for themselves, which is then referenced in Part II of the program. Module 3 also teaches students how to deal with alcohol problems that they may encounter with friends, such as alcohol poisoning and drinking and driving. Alcohol-related campus resources are provided at the end of the module.

Module 4 consists of a course review and an examination. Students may view their exam scores and then review the correct answers to the questions that they missed.

Finally, Module 5 (Part II), taken 30–45 days after completion of Part I, includes a follow-up survey and an opportunity for students to review, reflect on, and revise the plan that they developed in Part I. It also covers some new course material, including segments on constructively managing stress and recognizing problems related to alcohol misuse. Part II concludes with a final quiz.

Student surveys

Contact information for random cross-sectional samples of approximately 200 first-year students at least 18 years old was provided by the officials of 30 colleges at the beginning

of each semester. Spring surveys were conducted in March and April, and fall surveys were conducted in October and November. Students first received a survey invitation letter via U.S. mail with a \$10 cashable check enclosed. The letter provided information about the study and how to log into the survey website with a unique personal identification number. Up to three email reminders with similar information were sent to students if they had not yet logged into the survey website within the next 3 weeks. The survey took an average of 15 minutes to complete.

The overall survey response rate ranged from 44% to 48% (~90 respondents per school each semester). Because response rates were less than optimal, nonresponse weights were created to reduce the possibility of sample bias that could result from over- or under-representation of several demographic subgroups. Nonresponse weights were computed as ratios based on gender/ethnic breakdowns for the entire freshman classes at the universities, relative to analogous breakdowns from the survey respondent samples. Nonresponse weights were applied in both preliminary descriptive analyses and multilevel regression analyses.

Measures

Alcohol-related problems. Based on the Rutgers Alcohol Problem Index (White and Labouvie, 1989) and additional questions about student alcohol problems included in a recent multicampus trial (Saltz et al., 2010), respondents were asked how often in the past 30 days they had experienced any of 28 problems as a result of their drinking, including physiological problems (e.g., had a hangover, got nauseated or vomited, passed out, forgot where you were or what you did), academic problems (e.g., missed a class, got behind in schoolwork, performed poorly on a test), social problems (e.g., got into trouble with school authorities or local police, were criticized by someone you know), aggressive behavior (e.g., got into physical fights when drinking or became very rude, obnoxious, or insulting after drinking), drove after drinking or rode with a driver who was high or drunk, sexual risk taking (e.g., unplanned sex, sex without protection), and victimization (e.g., victim of a crime, taken advantage of sexually). Six possible responses ranged from 1 (*never*) to 6 (*10 or more times*). The ordinal response values were converted to interval-based values using midrange values where appropriate (i.e., 1 = 0, 2 = 1, 3 = 2, 3–5 times = 4, 6–9 times = 7.5, ≥ 10 times = 10). Students who did not report any alcohol use in the past 30 days were given a value of zero for each alcohol-related problem.

We created summative indices for the six alcohol-problem domains noted above to examine the effects of AlcoholEdu for College on different types of problems, plus an overall index for all problems. Because of the low prevalence of many of the problems (Table 2) and skewed or “zero-inflated” distributions of summative indices, we treated these

measures as event counts in subsequent analyses, recognizing that in some cases these alcohol-related events may not be completely independent.

Student demographic and academic characteristics

Respondents reported their age, gender, race/ethnicity (non-Hispanic White, Black, Asian, Hispanic, other), place of residence (campus residence hall, fraternity or sorority house, off-campus apartment or house, at home with parents), and current or high school grade-point average. Because the majority (81%) of students were living in a campus residence hall or dormitory, we treated place of residence as a dichotomous variable (0 = other, 1 = dormitory).

College characteristics

College characteristics included geographic location (region of the United States, urban/suburban vs. small town), governance (public vs. private), religious vs. nonreligious, total undergraduate population, and percentage of undergraduate students who were White, male, in fraternities/sororities, and living on campus. Fall 2008/2009 semester characteristics were used because the first wave of post-intervention data was collected during this semester and because college characteristics could potentially confound the relationship between AlcoholEdu and student drinking.

Data analysis

Descriptive analyses were first used to compare the characteristics of intervention and control schools as well as the baseline characteristics of the student samples. Multilevel Poisson regression analyses were conducted in HLM Version 6.06 software (Raudenbush et al., 2004) to examine the effects of the intervention condition on outcome slopes. Student-level models were represented by the following general equation:

$$E(Y_{ij}) = \beta_{0j} + \beta_{1j}(\text{Time}) + \beta_{Xj}(\text{Covariates})$$

In this equation, $E(Y_{ij})$ is the probability of an alcohol-related problem (or event) for student i at college j ; β_{0j} is the mean outcome at college j at baseline; $\beta_{1j}(\text{Time})$ is the slope of the relationship between the mean outcome at college j for Time (1 = Spring 2008/2009, 2 = Fall 2008/2009, 3 = Spring 2009/2010); and $\beta_{Xj}(\text{Covariates})$ are slopes of relationships between student-level covariates (e.g., age, gender) and mean outcome at college j . No student-level random effect is included for Poisson regression. College-level models were based on the following equations:

$$\text{Model 1: } \beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Intervention Condition}) + \gamma_{0X}(\text{Covariates}) + \mu_{0j}$$

$$\text{Model 2: } \beta_{1j} = \gamma_{10} + \gamma_{11}(\text{Intervention Condition}) + \mu_{1j}$$

In the first model, γ_{00} is the mean college-level outcome at baseline; $\gamma_{01}(\text{Intervention Condition})$ is the main effect of the AlcoholEdu intervention condition on the outcome; $\gamma_{0X}(\text{Covariates})$ are slopes of relationships between college covariates and the outcome; and μ_{0j} is the unique (random) effect associated with college j . In the second model, γ_{10} is the mean college-level outcome slope across survey years; $\gamma_{11}(\text{Intervention Condition})$ is the effect of implementing AlcoholEdu on the outcome slope across survey years (i.e., Time \times Intervention effect); and μ_{1j} is the unique (random) effect on the outcome slope associated with college j (i.e., Time \times College effect).

HLM software allowed us to conduct multilevel analyses while adjusting for clustering of student observations that were nested within each campus (intraclass correlations for alcohol-related outcomes ranged from .01 to .05) and sample nonresponse weights. Separate multilevel analyses were conducted to examine the Time \times Condition effect from Spring 2008/2009 to Fall 2008/2009 and from Spring 2008/2009 to Spring 2009/2010. We expected to find that any observed AlcoholEdu effects found in the fall semester, immediately following AlcoholEdu implementation, would attenuate by the spring semester.

As noted above, AlcoholEdu is intended to be a campus-level intervention and is evaluated as such. Even so, some may want to distinguish those campuses in which a majority of students participated in the course versus those where only a small minority did so. Thus, we also conducted analyses to examine possible dosage effects based on the level of students' participation in the AlcoholEdu course at the institution level. The percentage of freshmen who completed both Parts I and II was used as the dosage measure. We examined Time \times Dosage effects on targeted outcomes, controlling for college- and student-level covariates.

Results

College and student sample characteristics

As shown in Table 1, colleges in the intervention and control conditions were evenly distributed across the four U.S. regions, and the majority of schools were located in midwestern and southern states. A somewhat larger number of control than intervention schools were located in urban or suburban settings. Equal numbers of colleges in intervention and control conditions were public and religious institutions, and colleges in each condition were similar with respect to total undergraduate population size as well as the percentage of undergraduates who were White, male, in fraternities/sororities, and living on campus in Fall 2008/2009. The average Fall 2008/2009 survey response rate was somewhat

TABLE 1. College characteristics, by study condition

Variable	Control group (<i>n</i> = 15)	AlcoholEdu (<i>n</i> = 15)	<i>p</i>
College region, <i>n</i>			
Northeast	4	2	.65 ^a
South	4	4	1.00 ^a
Midwest	5	7	.71 ^a
West	2	2	1.00 ^a
Urban/suburban	11	7	.26 ^a
Public university	8	8	1.00 ^a
Religious institution	4	4	1.00 ^a
Total undergraduate population, <i>M</i> (<i>SD</i>)	8,491.47 (7,685.8)	8,489.9 (7,269.1)	1.00 ^a
% White, <i>M</i> (<i>SD</i>)	71.6 (20.1)	76.8 (12.9)	.40 ^b
% Male, <i>M</i> (<i>SD</i>)	46.4 (5.8)	43.7 (5.8)	.22 ^b
% Fraternity/sorority students, <i>M</i> (<i>SD</i>)	12.3 (11.2)	11.2 (7.9)	.77 ^b
% Living on campus, <i>M</i> (<i>SD</i>)	46.1 (26.5)	46.3 (24.8)	.99 ^b
Survey response rate, <i>M</i> (<i>SD</i>)	51.4 (9.9)	45.2 (9.8)	.10 ^b

^aFisher's exact test; ^bStudent's *t* test.

higher at control than at intervention schools, but this difference was not statistically significant.

Baseline (Spring 2008/2009) survey sample characteristics are shown in Table 2. Students' mean age was 18.7, and most were female (55%), White (71.3%), and living in a campus dormitory (80.3%). Intervention and control schools were similar with respect to student demographic and behavioral characteristics.

AlcoholEdu implementation

There was considerable variability across the 15 colleges assigned to the intervention condition, both in the manner in which AlcoholEdu was implemented and in the level of their students' participation. As noted above, one college

was not able to fully implement AlcoholEdu because it lost its campus coordinator position; only one email message was sent to first-year students to encourage them to take the course. Ten of the other 14 intervention schools used an implied mandate by instructing students to complete the AlcoholEdu course without imposing any consequences on those who failed to do so. The other four schools required students to take the course and penalized those not doing so (e.g., by not allowing them to register for classes). Almost all of the colleges (*n* = 13) administered Part I of the course during the late summer, before their freshmen matriculated, and Part II early in the fall semester. AlcoholEdu course completion rates (number of freshmen who completed the course / total number of freshmen) ranged from 4% to 100% (*M* = 56%, *SD* = 30%). We used intent-to-treat analyses to

TABLE 2. Baseline student sample characteristics, by study condition

Variable	30 colleges (<i>N</i> = 2,400)	15 control schools (<i>n</i> = 1,298)	15 AlcoholEdu schools (<i>n</i> = 1,102)
Demographics			
Age, years, <i>M</i> (<i>SD</i>)	18.7 (0.8)	18.6 (0.7)	18.8 (0.9)
Male, %	45.0	46.2	43.7
White, %	71.3	67.5	75.8
Hispanic, %	11.2	12.2	10.1
Asian, %	7.1	9.5	4.4
Black, %	5.3	4.7	6.0
Other race/ethnicity, %	4.1	4.7	3.3
Living in dormitory, %	80.3	80.5	80.0
Grade-point average, <i>M</i> (<i>SD</i>)	3.2 (0.6)	3.2 (0.6)	3.2 (0.5)
Alcohol-related problems, past 30 days			
Total, %	49.0	47.3	50.9
Physiological, %	40.1	39.9	40.4
Academic, %	19.1	18.7	19.6
Social, %	32.7	31.4	34.2
Aggression, %	3.9	3.9	3.9
DUI/RWDD, %	14.5	13.4	15.7
Sexual, %	11.0	10.7	11.5
Victimization, %	4.0	3.7	4.2

Notes: DUI/RWDD = driving under the influence/riding with drinking drivers.

TABLE 3. Effects of AlcoholEdu on alcohol problems during post-intervention fall semester, event rate ratio [95% confidence interval]

Variable	Total	Physiological	Academic	Social
Time × Condition	0.67 [0.51, 0.87]**	0.73 [0.57, 0.93]*	0.75 [0.47, 1.21]	0.55 [0.37, 0.83]**
Time, 1 = baseline, 2 = post-intervention	1.11 [0.94, 1.31]	1.01 [0.87, 1.17]	1.75 [0.76, 4.02]	1.30 [0.99, 1.70]
Intervention condition, 0 = control, 1 = AlcoholEdu	1.56 [1.03, 2.36]*	1.43 [0.99, 2.06]	1.45 [0.60, 3.51]	1.86 [0.94, 3.66]
Student covariates				
Age	1.04 [0.97, 1.11]	1.07 [1.00, 1.14]	1.08 [0.95, 1.22]	0.99 [0.91, 1.08]
Class	0.97 [0.64, 1.47]	0.90 [0.64, 1.27]	1.08 [0.69, 1.69]	0.86 [0.45, 1.64]
Male	1.37 [1.18, 1.60]**	1.26 [1.07, 1.49]**	1.10 [0.90, 1.34]	1.35 [1.10, 1.66]**
White	0.86 [0.60, 1.22]	1.08 [0.74, 1.57]	1.22 [0.80, 1.85]	0.81 [0.52, 1.26]
Black	0.60 [0.32, 1.12]	0.52 [0.27, 1.02]	1.05 [0.57, 1.92]	0.59 [0.31, 1.11]
Asian	0.54 [0.37, 0.78]**	0.47 [0.32, 0.71]**	0.77 [0.43, 1.41]	0.49 [0.31, 0.77]**
Hispanic	1.00 [0.67, 1.50]	1.16 [0.78, 1.73]	1.42 [0.78, 2.59]	1.07 [0.69, 1.66]
Living in dormitory	1.11 [0.87, 1.41]	1.31 [1.04, 1.65]*	0.89 [0.60, 1.33]	1.25 [0.92, 1.70]
Fraternity/sorority	1.05 [0.78, 1.43]	1.52 [0.99, 2.33]	0.99 [0.30, 3.29]	0.98 [0.67, 1.44]
Grade-point average	0.75 [0.67, 0.83]**	0.81 [0.73, 0.90]**	0.67 [0.55, 0.81]**	0.74 [0.64, 0.87]**
College covariates				
Midwest region	0.96 [0.79, 1.18]	0.91 [0.75, 1.10]	0.94 [0.67, 1.33]	0.98 [0.80, 1.22]
Urban/suburban	1.04 [0.74, 1.45]	0.96 [0.75, 1.22]	1.53 [0.95, 2.47]	1.13 [0.87, 1.46]
Public institution	0.92 [0.45, 1.90]	0.80 [0.41, 1.56]	1.88 [0.69, 5.16]	1.02 [0.56, 1.89]
Religious institution	1.02 [0.61, 1.74]	1.10 [0.69, 1.74]	0.84 [0.36, 1.98]	1.10 [0.70, 1.73]
Student population	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]
% White	1.01 [1.00, 1.02]*	1.01 [1.00, 1.02]*	1.01 [1.00, 1.02]	1.01 [1.00, 1.02]**
% Male	1.00 [0.97, 1.02]	0.99 [0.97, 1.02]	0.98 [0.95, 1.01]	0.99 [0.97, 1.02]
% Living on campus	1.00 [0.98, 1.01]	1.00 [0.98, 1.01]	1.02 [0.99, 1.04]	1.01 [0.99, 1.03]
% In fraternity/sorority	0.99 [0.97, 1.01]	1.00 [0.98, 1.02]	0.98 [0.95, 1.02]	0.99 [0.96, 1.01]
Survey response rate	0.99 [0.98, 1.00]	1.00 [0.98, 1.01]	0.94 [0.67, 1.33]	0.97 [0.94, 1.00]

Note: N = 5,206 students. **Bold** indicates statistical significance.
*p < .05; **p < .01.

TABLE 4. Effects of AlcoholEdu on alcohol problems during post-intervention fall semester, event rate ratio [95% CI]

Variable	DUI/RWDD	Victimization	Sexual	Aggression
Time × Condition	0.65 [0.40, 1.05]	0.38 [0.16, 0.88]*	0.81 [0.48, 1.38]	0.52 [0.17, 1.57]
Time, 1 = baseline, 2 = post-intervention	1.12 [0.85, 1.49]	2.08 [1.31, 3.32]**	1.00 [0.72, 1.41]	0.05 [0.00, 3.77]
Intervention condition, 0 = control, 1 = AlcEdu	1.44 [0.73, 2.86]	2.39 [0.45, 12.58]	1.04 [0.38, 2.84]	1.30 [0.27, 6.21]
Student covariates				
Age	1.05 [0.97, 1.14]	0.90 [0.73, 1.10]	1.04 [0.90, 1.21]	1.01 [0.84, 1.22]
Class	1.20 [0.77, 1.89]	0.82 [0.16, 4.21]	0.88 [0.46, 1.69]	0.82 [0.23, 2.95]
Male	1.67 [1.31, 2.13]**	1.93 [1.11, 3.33]*	1.73 [1.28, 2.35]**	1.75 [0.90, 3.40]
White	0.74 [0.50, 1.11]	0.34 [0.12, 0.93]*	0.47 [0.25, 0.88]*	0.92 [0.40, 2.13]
Black	0.54 [0.27, 1.09]	0.46 [0.09, 2.30]	0.35 [0.13, 0.97]*	2.24 [0.53, 9.46]
Asian	0.94 [0.51, 1.74]	0.08 [0.02, 0.34]**	0.36 [0.10, 1.33]	0.86 [0.33, 2.25]
Hispanic	0.77 [0.42, 1.41]	0.74 [0.23, 2.39]	0.73 [0.34, 1.56]	2.29 [0.70, 7.47]
Living in dormitory	0.75 [0.55, 1.02]	1.08 [0.50, 2.34]	0.87 [0.55, 1.40]	0.64 [0.30, 1.35]
Fraternity/sorority	1.21 [0.46, 3.21]	3.79 [0.60, 23.99]	1.81 [1.01, 3.25]*	3.57 [0.74, 17.31]
Grade point average	0.75 [0.63, 0.89]**	0.86 [0.55, 1.33]	0.83 [0.67, 1.04]	0.69 [0.45, 1.06]
College covariates				
Midwest region	1.37 [0.91, 2.06]	0.87 [0.45, 1.674]	1.24 [0.76, 2.02]	0.86 [0.60, 1.25]
Urban/suburban	1.35 [0.61, 2.98]	1.20 [0.52, 2.76]	1.00 [0.55, 1.82]	1.14 [0.74, 1.77]
Public institution	0.50 [0.11, 2.28]	0.72 [0.12, 4.45]	0.54 [0.16, 1.79]	0.48 [0.15, 1.51]
Religious institution	0.32 [0.11, 0.97]*	0.51 [0.15, 1.67]	0.59 [0.24, 1.47]	0.50 [0.19, 1.29]
Student population	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]
% White	1.02 [1.00, 1.04]	1.04 [1.02, 1.06]**	1.03 [1.01, 1.05]**	1.00 [1.02, 1.06]**
% Male	0.99 [0.95, 1.03]	0.98 [0.93, 1.03]	0.98 [0.94, 1.03]	0.98 [0.95, 1.01]
% Living on campus	0.99 [0.96, 1.02]	1.01 [0.97, 1.05]	0.99 [0.97, 1.02]	1.01 [0.98, 1.04]
% In fraternity/sorority	0.96 [0.92, 1.01]	0.97 [0.91, 1.03]	0.98 [0.94, 1.02]	0.96 [0.91, 1.02]
Survey response rate	0.98 [0.96, 1.01]	0.95 [0.91, 1.00]*	0.99 [0.97, 1.00]	0.98 [0.94, 1.01]

Notes: N = 5,206 students. **Bold** indicates statistical significance. CI = confidence interval.
*p < .05; **p < .01.

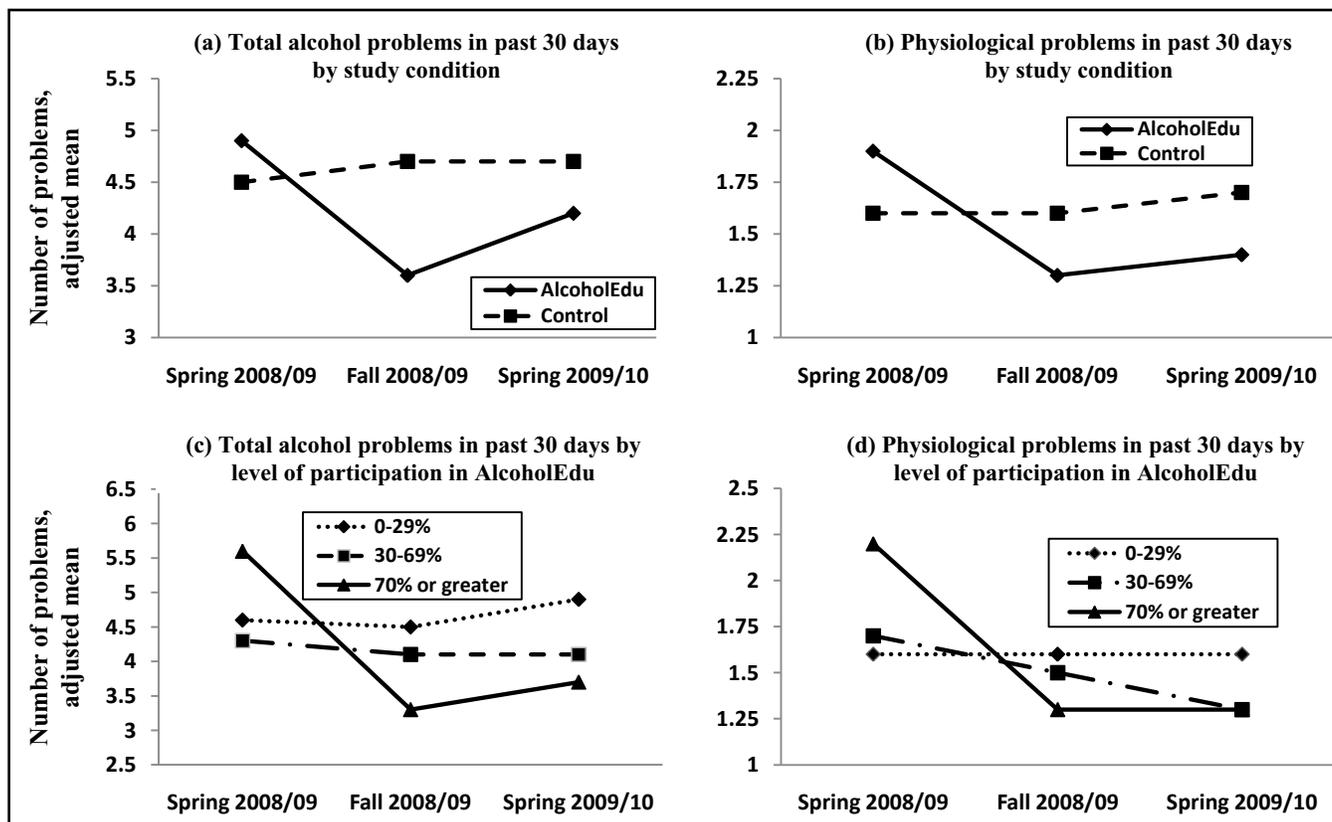


FIGURE 1. Trends in the total number of alcohol-related problems and physiological problems in the past 30 days (adjusted mean) by study condition (a, b) and by level of student participation in AlcoholEdu (c, d)

test our primary hypothesis concerning the effectiveness of AlcoholEdu on alcohol-related problems at the campus level while recognizing that those results might underestimate the actual effectiveness of the course at the student level. Further analyses were conducted to test whether AlcoholEdu’s effects varied by level of student participation.

Results of multilevel Poisson regression analyses

As shown in Tables 3 and 4, during the fall semester immediately following AlcoholEdu implementation, the risk of alcohol problems in general was significantly lower among freshmen at intervention schools than among freshmen at

control schools. A similar pattern was observed for physiological, social, and victimization problems. Intent-to-treat effects for the total number of alcohol problems and physiological problems during the post-intervention fall semester are illustrated in Figure 1 (a,b), along with discontinuation of those effects in the following spring semester. No significant AlcoholEdu effects were observed for academic problems, driving under the influence/riding with drinking drivers (DUI/RWDD), aggression, and sexual risk taking during the fall semester.

Further analyses (Tables 5 and 6) revealed stronger AlcoholEdu effects during the fall semester on alcohol problems in general and on physiological, social, and vic-

TABLE 5. Summary of AlcoholEdu participation level effects on alcohol problems during post-intervention fall semester, event rate ratio^a [95% CI]

Variable	Total	Physiological	Academic	Social
Time × High Participation ^b	0.66 [0.48, 0.92]*	0.67 [0.49, 0.92]*	0.64 [0.40, 1.04]	0.65 [0.46, 0.91]**
Time × Medium Participation ^b	0.94 [0.71, 1.25]	0.86 [0.62, 1.19]	1.13 [0.74, 1.72]	1.05 [0.70, 1.57]
Time	1.01 [0.86, 1.18]	0.98 [0.86, 1.12]	0.98 [0.76, 1.27]	1.07 [0.82, 1.39]
High participation level ^b	1.72 [1.02, 2.90]*	1.74 [1.05, 2.91]*	2.18 [0.89, 5.33]	1.70 [0.87, 3.32]
Medium participation level ^b	1.06 [0.70, 1.60]	1.14 [0.69, 1.88]	0.98 [0.46, 2.06]	0.70 [0.35, 1.38]

Notes: **Bold** indicates statistical significance. CI = confidence interval. ^aAll student and college covariates indicated in Table 3 were included in the regression models; ^bcolleges with low levels of AlcoholEdu participation (0%–29% course completion rate) are the referent group; high participation level = ≥70%; medium participation level = 30%–69%. **p* < .05; ***p* < .01.

TABLE 6. Summary of AlcoholEdu participation level effects on alcohol problems during post-intervention fall semester, event rate ratio^a [95% CI]

Variable	DUI/RWDD	Victimization	Sexual risk taking	Aggression
Time × High participation ^b	0.71 [0.31, 1.66]	0.44 [0.23, 0.85]*	0.73 [0.37, 1.42]	0.75 [0.22, 2.56]
Time × Medium participation ^b	0.67 [0.44, 1.01]	0.29 [0.08, 1.11]	1.13 [0.70, 1.82]	1.44 [0.53, 3.88]
Time	1.06 [0.82, 1.36]	1.89 [1.22, 2.94]**	0.93 [0.73, 1.19]	1.30 [0.61, 2.75]
High participation level ^b	1.25 [0.39, 4.05]	1.58 [0.53, 4.71]	1.23 [0.34, 4.48]	0.91 [0.14, 5.78]
Medium participation level ^b	2.13 [0.96, 4.69]	8.11 [0.57, 116.03]	1.35 [0.59, 3.06]	0.34 [0.06, 1.88]

Notes: **Bold** indicates statistical significance. CI = confidence interval; DUI/RWDD = driving under the influence/riding with drinking drivers. ^aAll student and college covariates indicated in Table 3 were included in the regression models; ^bcolleges with low levels of AlcoholEdu participation (0%–29% course completion rate) are the referent group; high participation level = ≥70%; medium participation level = 30%–69%.

* $p < .05$; ** $p < .01$.

timization problems among freshmen at schools with the highest (≥70%) course completion rates relative to those with lowest completion rates (<30%). These dosage effects are illustrated in Figure 1 (c,d). Such high dosage effects were not observed for academic problems, DUI/RWDD, aggression, and sexual risk taking. No AlcoholEdu effects on any of the alcohol problems were observed for schools with medium (30%–69%) course completion rates relative to schools with the lowest completion rates (<30%) during the fall semester.

Parallel multilevel analyses for the spring semester revealed no significant intent-to-treat or dosage effects of AlcoholEdu on any of the alcohol problem outcomes. Results of these analyses are available on request from the first author.

Discussion

The results of this randomized controlled trial suggest that AlcoholEdu for College demonstrates promise as a means to prevent or reduce alcohol-related problems among freshmen during the fall semester that immediately follows course implementation. Particularly strong effects were related to victimization (e.g., sexual assault) and the most common types of physiological and social problems associated with alcohol use. In their first few months following matriculation, freshmen who are newly released from the social constraints of their family and community are at high risk for a range of behaviors that are potentially destructive to themselves and others (Gruenewald et al., 2003). The effects noted in this study suggest that, as a relatively brief, low-cost web-based prevention program that requires no class time to administer, AlcoholEdu for College should be considered for adoption. These findings are all the more noteworthy given the considerable variation in course completion across colleges assigned to the intervention group; these rates were as low as 4% in one college and averaged only 56%.

We found evidence for a dose-response relationship because the effects of AlcoholEdu on alcohol-related problems appeared to be stronger at schools with a relatively high course completion rate (≥70%). We also noted that those

schools had higher levels of alcohol problems at baseline than schools with lower course completion rates. This finding may mean that AlcoholEdu for College is more effective for universities with a relatively high rate of alcohol-related problems.

We found no support for AlcoholEdu's hypothesized effects on academic problems, driving after drinking or riding with a driver who has been drinking, aggression, and sexual risk taking, all of which have been noted as alcohol-related problems in college populations. Nor did we find that AlcoholEdu manifested sustained effects on any alcohol problems in the following spring semester, regardless of the course completion rate. Collectively, these results suggest that college administrators should not expect AlcoholEdu to constitute a panacea for their students' alcohol-related problems. Successful prevention typically requires a comprehensive and prolonged set of strategies that combine individual behavior change approaches with policies that target alcohol consumption and its consequences both on and off campus (National Institute on Alcohol Abuse and Alcoholism, 2002; Saltz et al., 2010). To be effective, these policies must, of course, be accompanied by meaningful sanctions that are consistently enforced. In so doing, college administrators and local communities will collectively send a clear message that alcohol misuse and related infractions will not be tolerated.

Our study has several limitations. We cannot claim with certainty that the sample of freshmen selected for the initial assessment in the Spring of 2008 was equivalent to the sample selected for the Fall 2008 post-assessment, particularly because students in the latter group were making their initial transition from home to college, a period during which alcohol misuse is believed to be most severe. The study could have been biased by our suboptimal survey completion rates, which may have yielded self-selection biases that we could only partially mitigate by the use of nonresponse weights. We also lost one college from each of our groups following random assignment, which adversely affected the integrity of the design of our randomized controlled trial. However, tests of intergroup equivalency suggest that the baseline characteristics of both the college and student samples were quite similar.

Of somewhat greater concern was the variability in course completion rates at intervention schools, which may have led to an underestimation of actual AlcoholEdu effects on alcohol-related problems. More than three quarters (78%) of the students at colleges in the intervention group who responded to our fall surveys did, however, indicate that they had completed the course. As noted earlier, our examination of the relationship between program dosage and effects revealed that colleges with the highest course completion rates were characterized by the highest level of problem rates at baseline and that these colleges also constituted the primary drivers for the positive outcomes we reported. It is thus possible that the lower rates of problems found in the fall following the intervention may be in part a function of regression to the mean effects. Our use of repeated cross-sections also attenuates our ability to state with confidence that the outcomes noted can be attributed to the program tested.

Finally, students' answers to survey questions may have been biased by social desirability, particularly if students exposed to AlcoholEdu felt more constrained about responding honestly to our questions concerning alcohol-related problems.

We note that 10 of the 14 schools in the intervention group used what we termed an "implied" mandate, insofar as they instructed their students to complete AlcoholEdu but did not penalize or otherwise sanction those who failed to do so. Half the colleges with a hard mandate, as opposed to only 36% of those with an implied mandate, secured a course completion rate of at least 70%. We suggest that colleges that choose to adopt AlcoholEdu for College increase its likelihood of success by making it mandatory, perhaps linking completion in the late summer with access to class registration in the fall, to ensure that all incoming freshmen are exposed to it.

In conclusion, this study constitutes the first multicampus randomized controlled trial of the effects of AlcoholEdu for College on problems related to drinking among incoming freshmen, a population at high risk for hazardous drinking. The program demonstrated limited short-term effects on alcohol-related problems in general and on physiological and social problems and victimization in particular but not on key concerns related to hazardous driving, aggression, or sexual risk taking. Furthermore, the program did not have sustained effects after the fall semester.

On the other hand, expectations that AlcoholEdu or indeed any web-based program of that nature can be sustained over time may be unrealistic, given students' continued exposure to alcohol and a culture of peer drinking behavior. Colleges that adopt the program should thus ensure that they have a broad range of strategies in place that address student drinking and related consequences. These strategies should include policies that address alcohol possession and consumption both on the campus and within the surrounding

community, as well as both universal prevention programs such as AlcoholEdu and indicated interventions for students who are manifesting problems related to alcohol use.

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