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Bringing alcohol on campus to raise money: impact on student drinking and drinking problems

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Abstract

Aims—Universities are striving to raise funds, often attracting spectators by selling alcohol at campus events. This study evaluates the effect of a policy change on student drinking at a large western university that had historically banned alcohol on campus but transitioned to permitting the sale of alcohol in some of its facilities.

Methods—Surveys of student drinking and perceptions of other students' drinking were conducted before, during and after the policy change at the transition university (TU) and compared to similar data from a control university (CU). Surveys of student drinking at on-campus and off-campus venues and observations of alcohol service practices were also conducted.

Results—The policy change at the TU was introduced cautiously, and sales to underage drinkers were relatively well controlled. Despite this, student drinking rose initially, then declined after 1 year. Perceptions of the amount of drinking by other students increased slightly, but there was no overall measurable increase in student drinking during the first 3 years of the new policy.

Conclusions—The conservative TU policy—to sell alcohol only at select events and to control sales to minors—may have limited the impact of on-campus alcohol sales on student consumption. Although the study results did not find a stable increase in student drinking, they do not necessarily support the liberalization of campus alcohol policy, because the transition is still 'in progress' and the final outcome has not been evaluated.

Keywords

Alcohol availability; alcohol sales controls prevention; college drinking; dry campus; underage drinking

Introduction

College drinking problems

Alcohol-related problems are among the most serious public health threats on American college campuses [1]. National surveys suggest that 44% of college students engage in heavy episodic drinking at least occasionally [2], often leading to tragic consequences. Each year, nearly 1400 college students aged 18–24 die and 500 000 are injured due to unintentional alcohol-related causes [3]. The misuse of alcohol by college students is associated with date rape and other

violent behavior, poor academic performance, vandalism, injury and high-risk sexual behavior [4–6]. Three out of four college students report experiencing at least one secondhand effect of college drinking [2], including having their sleep or study interrupted, being insulted or humiliated, having a serious argument or quarrel, or experiencing an unwanted sexual advance [7,8].

Press to sell alcohol on campus

The growing concern over student drinking has led colleges and universities to implement programs and policies designed to reduce alcohol consumption on campus [9,10], and research has focused upon limiting availability to students, moderating student drinking through social marketing campaigns [11] and other means [12]. At many universities, however, there is a countervailing trend to increase the events, if not the venues, where alcohol can be sold to raise revenues for campus programs and athletic teams. Increasing financial pressures provides an incentive for colleges and universities that have traditionally banned alcohol to allow alcohol sales as a part of an overall effort to improve services. Although liberalized sales policies are targeted generally at increasing revenues from alumni and the public, they may also increase availability to students, thus risk increasing student drinking. Consequently, the question arises as to whether initiating sales on campus will increase student alcohol consumption and drinking problems.

One university's rationale for sales

In 2000, one large western university (referred to as the transition university—TU) that had prohibited the possession, sale and consumption of alcohol on campus property since its founding received permission from the state Higher Education Commission to sell alcohol on its campus. The decision to allow alcohol sales at TU was driven by financial problems facing the campus's music and sports center. In 1997, two competing entertainment facilities opened in the same city as the TU, and TU suffered a loss of \$77K in 1998 and 1999.

The TU administration attributed the loss of revenue at the campus facility (i) to the fact that the university could not contract with some of the most popular music groups as the beer companies that sponsored their national tours would not agree to venues where the company's products could not be sold, and (ii) the university had insufficient funds to compete with the downtown facilities for top-level artists without the added revenues from alcohol sales. The TU administration argued that allowing alcohol sales at the campus venue would make it more competitive and allow it to generate revenue for the university more effectively.

In its argument to the state Higher Education Commission, the TU administration stressed that the campus sports and music venue drew customers primarily from the community, rather than from among students, and therefore would not attract students who simply wanted to get drunk. Alcohol sales would be limited only to events that principally attracted community members to limit further exposure of students to alcohol on campus. The administration assured the Commission that if alcohol sales were allowed, all sales personnel working at the campus venue would receive responsible beverage service training, emphasizing checking IDs to prevent sales to underage drinkers, and to discourage heavy student drinking. Thus, it was argued that revenue could be generated without increasing alcohol-related problems among the campus population.

Sales program at the TU

Despite the interest in increasing revenues through alcohol sales, the TU administration adopted a very conservative policy with respect to scheduling events at which alcohol could be sold. During the 5 years from January 2000 to December 2004, only 37 events at which alcohol was sold occurred at the TU pavilion, and alcohol was not sold at home-team athletic

events. Revenues from alcohol sales at the TU pavilion generated \$338 147 in revenue over 5 years (approximately \$67 629 per year), of which 37.7%, or \$127 435, was profit. In the fifth year, despite, or perhaps because, of a decline in campus alcohol revenues, the TU administration decided to permit sales at three new venues. Thus, the transition of TU from a campus where alcohol sales were prohibited to the promotion of sales is still a work in progress.

Potential risks of sales policy

By limiting the events at which alcohol was sold, and through responsible beverage service training, the TU administration hoped to contain any increase of alcohol availability to students. However, the liberalization of alcohol policy at TU could influence student drinking indirectly. First, allowing 21-year-old and older students to drink on campus may change the perceived norms about student drinking. This is particularly true for a campus where drinking on university grounds had been previously kept underground and out of sight. Research suggests that people's drinking behavior is influenced by their perceptions of drinking norms [13–19]; therefore, public alcohol consumption by students on campus could increase the perception that student drinking is more prevalent than it actually is. Secondly, changing the policy to allow campus alcohol sales could signal a new leniency towards student drinking, suggesting implicitly that violations of the school's alcohol policies would not be punished harshly. In turn, this could undermine the general deterrent effect [20] of the campus alcohol policies.

Thirdly, the sales policy could create a conflict with campus health promotion activities. Like most American universities, the TU was implementing several campus-wide programs designed to reduce student drinking. Thus, the university's decision to allow alcohol sales on campus while promoting drinking-reduction programs sends mixed messages to students and could undermine the efficacy of those programs. Fourthly, even if vigilance regarding responsible beverage service practices is strong at first, it could potentially wane over time and become easier for minors to obtain alcohol on campus. Finally, once the psychological (and state legal) barriers to alcohol sales on campus are breached, further expansion of sales to additional venues and events becomes easier.

Thus, a close examination of changes in student drinking at the TU is important. Liberalizing the university's alcohol policy may appear attractive to many schools and universities that prohibit alcohol on campus, particularly if the TU derives substantial revenues from on-campus sales without increasing student drinking and drinking problems. In the absence of highly salient alcohol-related tragedies on campus (e.g. student deaths from alcohol poisoning or alcohol-related crash involvement), it may appear to those who are monitoring the outcome of the policy change at the TU that drinking has not increased.

This study is the first to report on a naturally occurring transition of a university from the complete prohibition of alcohol sales, possession and consumption to sponsoring alcohol sales at a limited number of campus events. It follows the first 4 years of the transition at the TU, measuring to what extent the university has successfully controlled on-campus sales to minimize their impact on student drinking problems. The study covers two major topics: (i) to what extent the TU controlled service to students, particularly underage students; and (ii) the effect of campus alcohol sales on student drinking, drinking problems and perceptions of the normative drinking of other students.

Methods

The research described in this paper used four distinct methodologies to examine the alcohol service policies at the TU venue. Specifically, the TU venue (venue A) was compared to two competing, private venues (venues B and C) located downtown in the same city as the TU. In addition, student drinking levels at the TU (before and after the alcohol policy change) were

compared to drinking behavior at a comparison university (CU) that prohibited alcohol possession, sales and consumption throughout the 4-year study.

Both the TU and the CU are large (18 000 and 23 000 students, respectively) state universities in the western United States. At the time of the study, the student demographic composition at both was predominately white (non-Hispanic; approximately 84% and 70% during the time of the study, respectively), but with a higher proportion of Asian students at the CU.

Preliminary analysis of spring 2000 baseline data (see the Campus Alcohol Survey) indicated that drinking was heavier at the CU than at the TU. Controlling for gender, age, class, minority status (Caucasian versus non-Caucasian) and Greek membership, students at the CU consumed five or more drinks on a single occasion more times per 2 weeks ($M = 1.27$) than students at TU ($M = 0.97$), $F_{1,722} = 4.28$, $P < 0.05$, and were drunk more times in the past 4 weeks (2.50 versus 1.75), $F_{1,722} = 6.33$, $P < 0.05$. Baseline binge drinking rates (the proportion of students who indicated consuming five or more drinks on a single occasion in the past 2 weeks) were 29.4% for the TU and 35.5% at the CU, and both were lower than the national average in 2000 (as measured by the CORE survey) of 46.5%. Although the differences between campuses are statistically significant, they are small in magnitude and do not suggest qualitatively different drinking environments. Further, our analyses accommodate these differences by testing for relative rather than absolute change.

Observational survey of alcohol service practices

Survey staff attended and systematically observed alcohol service practices at one of the three venues on a total of 75 nights from December 2002 to December 2003: 11 nights at venue A, 31 at venue B and 33 at venue C. Only events where alcohol was served were included, and because of the administration's caution in implementing the new policy, there were relatively few events at the TU's venue A. During each event, one to six staff members (separately) circled the interior of the venue and recorded their observations at each alcohol service booth. Observers were instructed to dress appropriately for the nature of the event, spread throughout the venue (i.e. no two observers collected data from the same booth at the same time), and record inconspicuously their observations into handheld computers. The purpose of this training was to minimize any observer effects caused by alcohol servers becoming aware that they were being watched. While we cannot state conclusively that such effects did not occur, it is important to stress that whatever bias was introduced by awareness of the observers should be equal across venues, and thus does not threaten the interpretation of results.

The data were based on two 5-minute observations at each booth, at different times, during the evening. Observational notes included (i) the number of customers in line at the start of the observation; (ii) the number of customers who appeared to be younger than 21; and (iii) the percentage of customers apparently younger than 21 who were carded (recorded in five categories: 100%, 75%, 50%, 25% or 0%). In addition, our staff recorded the number of clerks working the stand, the presence or absence of signs indicating ID checks and the number of general alcohol-related warning signs (e.g. 'We ID everyone under 30', 'Don't Drink and Drive', 'Pregnant Women Should Not Consume Alcohol').

According to the design, the observational data were organized in a nested structure. Two observation ratings (time 1 and time 2) were nested within each booth, with multiple booths nested within each observer. Observers, in turn, were nested within events. In all, there were a total of 1594 booth observations. Analysis of the variations between the three venues used logistic regression analysis for the nested data, using PROC MIXED in SAS.

Compliance checks of alcohol service practices

During the study, 12 young-looking adults worked as confederates and attempted to purchase alcohol from booths at the events. Confederates were chosen based upon ratings of an independent panel of six judges, aged 30 years and older, who were selected from a community sample of professions who did not have regular contact with students (e.g. furniture sales, food service and accounting). The confederates answered three questions for the judges: their names (aliases), their favorite food and their major. Each judge estimated the approximate age of each confederate in person. The interaction between confederates and judges took less than 1 minute (the typical amount of exposure time that a bartender might have with a patron during a drink order). Confederates rated by the judges as appearing to have a mean age of 21 or younger were selected to make purchase attempts. The actual ages of the confederate buyers, however, ranged from 21 to 27, with a median age of 22. Seven of the 12 confederates were women.

Between December 2002 and December 2003, the confederates completed a total of 485 compliance checks at venues A, B and C during events where alcohol was sold. Compliance checks were conducted at 11 events at venue A, six events at venue B and five events at venue C. Confederates attended events where alcohol was served and were required to dress appropriately for the event. The confederates circled the venue and attempted purchases at each booth. They recorded whether the vendor checked their ID and estimated the age and sex of the vendor. The confederates made two complete circuits of the venue per night. After attempting a purchase at a booth, they were instructed to go to an inconspicuous location (such as the bathroom) to enter data into a handheld computer.

The management policy at some events was to 'pre-identify' attendees as being of legal drinking age (i.e. their IDs were checked at the door when they entered and their hand was stamped or they were given a wristband). Because we were interested in the alcohol service practices of the vendors, confederates attending such events removed the pre-identification (cut the wristband or washed the stamp off their hands) before attempting to make a purchase. Had confederates not removed the pre-identification, we would not expect vendors to check their IDs. Logistic regression using buyer age, buyer sex, estimated vendor age and vendor sex as covariates was used to analyze compliance data differences between the TU pavilion (venue A) and the two downtown venues (B and C).

Campus alcohol survey

During eight semesters from spring 2000 to spring 2004 (but excluding fall 2000), a general 'Campus Alcohol Survey' (CAS) on student drinking and perceptions of student drinking was administered to 8085 students at the TU and the CU (approximately 500 participants per semester per campus). The surveys conducted in the spring of 2000, before the policy change at the TU when both campuses banned alcohol sales, provided a baseline measure. The alcohol policy change at the TU did not take effect until fall 2000.

In order to minimize survey costs, the CAS was administered to students on each campus using a non-random method. However, steps were taken to ensure that we captured a representative sample. Each semester, at each campus, a booth was set up at two well-traveled campus locations. Research assistants working at the booths invited student passers-by to take part in the survey for a small incentive (video rental coupon). Interested students were informed that the survey concerned their personal drinking behavior and their perceptions of student drinking on campus, and that the survey was completely anonymous. Individuals who agreed to participate were given a clipboard containing a paper version of the survey. They were asked to complete it and then place it into a slotted box. Participants did not record their names anywhere on the survey; however, they were asked to sign a separate document (also stored separately from the survey) asserting that they had not already taken part in the survey.

The same booth locations were selected each semester, the surveys were conducted at the same time each year, and each wave of data collection took approximately 4 or 5 days. Data on refusals were not collected; however, the demography of our samples approximated that of the student population at each campus (although students under age 21 were over-sampled) and that the demographic composition was stable over time (see Results: Analysis of campus alcohol survey data).

Participants were asked to provide information on demographics, drinking behavior and their perceptions of typical drinking among other students at their campus. Regarding drinking behavior, participants indicated the number of times in the past 2 weeks that they consumed five or more drinks in a row, the number of times in the past 4 weeks they 'got drunk', the number of drinks they consumed on a typical Friday and the number of drinks they consumed on a typical Saturday. Participants indicated their perceptions regarding how many alcoholic drinks students consume typically when they go out, their beliefs on the percentage of students that consume five or more drinks in a row and their perceptions on the typical student's attitude towards drinking [on a five-point scale, from (1) 'drinking is never good' to (5) 'frequent drinking is also OK if that is what the individual wants'].

Event survey

In addition to the CAS, we administered an 'event survey' (ES) that measured attendance and drinking behavior at the TU venue A as well as the two off-campus venues (venues B and C). The ES was administered to students at TU using the same method as was used to administer the CAS. The booth locations were the same as the CAS; however, the data collection occurred at least 1 month after the CAS. Over four semesters (from fall 2002 to spring 2004), 1903 participants completed the ES (between 400 and 500 participants took part each semester).

In the ES, the participants indicated whether they had attended a musical or sporting event at the TU venue A or city venues B or C in the past 6 months. Participants were asked to provide demographic information and then provide information regarding the most recent event that they attended at each venue. They were also asked (separately, for each event/venue) whether they had consumed alcohol before the event, during the event and after the event.

Results

Analysis of alcohol service observation data

Alcohol service observation data were analyzed to compare the percentage of underage-appearing individuals who were carded when attempting to purchase alcohol at the TU venue A compared to the two downtown venues, B and C. Our staff recorded 1594 customer attempts to purchase alcohol, of whom 543 appeared to be younger than 21. In addition, the staff recorded the number of clerks working the stand, the presence or absence of signs stating that IDs would be checked and the number of general alcohol-related warning signs (e.g. 'Don't Drink and Drive', 'Pregnant Women Should Not Consume Alcohol').

In this design, the outcome ratings (made by each observer for each booth at two different times) were nested within service booths, and multiple booths were nested within individual observers. Observers, in turn, were nested within events. The nesting variables—events, booths and time—were treated as random variables and were incorporated into the statistical model. The analysis, conducted using PROC MIXED in SAS, regressed the five-point ID check outcome (observed percentage of patrons estimated to be younger than 21 who were carded) onto venue (A, B and C). The number of clerks per booth and signage (presence or absence of warning and ID check signs) were also included in the model.

The analysis yielded a statistically significant main effect of venue, $F_{2,591} = 10.84$, $P < 0.01$. Planned contrasts revealed that the estimated percentage of ID checks on youthful-appearing customers was significantly higher at the TU venue A ($M = 4.30$) than at city venue C ($M = 2.95$), $F_{1,591} = 12.44$, $P < 0.01$. However, there were no statistically significant differences between the TU venue A and city venue B ($M = 4.04$), $P = 0.52$. Overall, at venues A and C approximately 85% of individuals who appeared younger than age 21 were carded, whereas at venue B only approximately 50% were carded.

Analysis of compliance check data

Compliance checks by young-appearing students aged 21 and older were conducted at each of the three venues to confirm the findings of the observational survey. The analysis was designed to predict the likelihood of a confederate having been checked as a function of venue. Although the compliance checks were nested within events (which were then nested within venue), we did not include event as a variable in the analysis. We speculated that alcohol service practices were determined by the venue and should stay relatively constant across events. Further, preliminary analyses failed to find statistically significant differences in the rate of ID checks as a function of the individual confederate buyer; Wald (11) = 12.64, $P = 0.31$ (i.e. on average, none of 12 confederates were more likely to be served than another). Consequently, we did not include 'buyer' as a cluster factor in the analysis. However, buyer age, buyer sex, estimated vendor age and vendor sex were included.

Logistic regression revealed a statistically significant main effect for venue; Wald (2) = 14.09, $P < 0.01$. The likelihood of ID checks was significantly lower at city venue B than at the TU venue A (odds ratio = 0.36, $P < 0.01$). The likelihood computed from our sample was lower at city venue C than at the TU venue A, but not significantly so (odds ratio = 0.66, $P = 0.18$). Overall, the service staff at venue A failed to check the IDs of our young-appearing confederates approximately 25% of the time.

Analysis of campus alcohol survey data

Preliminary analysis—In order to verify that the survey data collected via a non-random sample of students walking across campus was representative of the campus population, we compared the demography of our sample to that of the two campuses' populations (obtained from the university registrar). Separately for the TU and the CU, we present the percentage of the population and sample—aggregated across 4 years—that were male, non-white (Caucasian) and between 18 and 20 years old. We also list the largest (maximum) deviation between population and sample estimate for any 1 year (see Table 1).

We conducted χ^2 goodness-of-fit tests to test for statistical significance and used Cramer's Phi to measure the magnitude of the 'fit' between observed (sample) and expected (population) data. Although Cramer's Phi is used traditionally with tests-of-independence to measure effect size, it also can be used to estimate the magnitude of fit (i.e. expected–observed differences), whereby lower values reflect smaller discrepancies between observed and expected data. Phi values range from 0.00–1.00 and can be interpreted as correlations.

With data aggregated across time (semesters) but between schools, the magnitude of the sample-population discrepancy for underage (18–20) students was statistically significant ($\chi^2_{(2)} = 400.9$, $P < 0.01$) and moderate in size (Cramer's Phi = 0.313). However, for gender and for minority racial status, the difference was not statistically significant (P -values > 0.35).

When examining stability of our sample data over time, the observed counts of male students each semester did not deviate from the expected counts ($P = 0.76$). Although counts of underage (18–20) students and racial minorities did vary significantly over time (both P -values < 0.05),

the magnitude of the deviations were quite small (Cramer's Phi of 0.060 and 0.054, respectively).

The results of these preliminary analyses suggest that our sample approximated campus population values regarding gender and race/ethnicity and did so with reasonable stability over time; however, our method clearly over-sampled younger students (18–20) and did so by a moderate margin. It should be noted that we are interested particularly in this age range (given the focus on underage drinking) and that gaining higher counts of the target group is desirable. Furthermore, Table 1 reveals that the bias towards oversampling younger students is consistent across campuses, and thus the presence of this bias does not necessarily limit our ability to compare the two samples.

Data reduction—The first set of analyses focused upon the four self-report drinking items: (i) frequency of heavy episodic drinking during the first 2 weeks; (ii) number of times drunk in the past 4 weeks; and the typical number of drinks consumed on (iii) Friday and (iv) Saturday nights. Preliminary analysis revealed that all four drinking measures were highly correlated (all r -values > 0.65). Accordingly, to reduce the number of significance tests to conduct, principal components analysis (PCA) was used to create an overall drinking factor. PCA revealed that a single factor accounted for 79.2% of the variance (eigenvalue = 3.17), thus justifying the use of a single composite factor in place of four separate items.

Analytical approach—The drinking factor then was used as the dependent measure in analysis. The primary predictor variables included in our statistical model were school (TU versus CU), time (eight semesters, treated as a continuous variable) and the school $\times$ time interaction. In addition, we modeled time as a power function (time²) as well as the school $\times$ time² interaction to capture any curvilinear effects, as we hypothesized that there might be an initial spike in drinking at TU following the fall 2000 policy change.

Our model also included gender (male versus female), age category (age 20– versus age 21+), and fraternity/sorority status (yes versus no) as control variables. Furthermore, because the demographic composition of our samples from the two campuses might be different, we modeled school $\times$ gender, school $\times$ age category and school $\times$ fraternity/sorority status interactions as well. Although not theoretically meaningful, the presence of these interactions in the analyses appropriately controlled for the effects of demography separately for each school.

Our analytical approach involved first testing the full statistical model, and then engaging in a process of model reduction by removing non-significant effects to obtain a parsimonious model. Non-significant higher-order effects were removed first, followed by non-significant main effects [21], and the resulting model was retested after each wave of reductions. However, non-significant main effects were allowed to remain in the model if they were involved in a higher-order effect, and non-significant main effects for time were included if time-squared effects were statistically significant.

For brevity, we do not describe the significance results regarding any of the control variables, as the findings replicate patterns encountered typically in examination of college student drinking (e.g. men consume more than women, fraternity members consume more than non-fraternity members). Other than a statistically significant school $\times$ age category interaction, $F_{1,6898} = 22.0$, $P < 0.01$, the relationship between demographic control variables and drinking behavior did not vary as a function of school. At both the TU and the CU, students aged 20 and younger drink more heavily than those aged 21 and older; however, the difference was more exaggerated at the TU.

Main analyses—The primary analysis focused upon the interactions between time and school and time² and school. The analysis, which controlled for campus demography, revealed a statistically significant interaction between school and time², $F_{1,6898} = 6.79$, $P < 0.01$. The data showed an increase in drinking at the TU following the alcohol policy change, and then a decline. In contrast, no such initial increase was evident at CU (see Fig. 1). *Post-hoc* analyses conducted separately for each school confirmed the curvilinear shape of the drinking factor over time at TU, $F_{1,3348} = 8.7$, $P < 0.01$, but not at the CU, $F_{1,3548} = 0.5$, $P = 0.47$.

For the purpose of describing the results using ‘real’ numbers (as opposed to factor scores), Table 2 reveals the point estimates (and 95% confidence intervals) for two drinking questions by campus (TU versus CU) and by semester: the actual percentage of the sample that reported consuming five or more drinks on a single occasion in the past 2 weeks, and the mean number of times that participants reported being drunk in the past 4 weeks. These point estimates control for participant gender, age and fraternity membership. Note that the confidence intervals are based upon standard errors computed for each cell, not upon the overall error term for the model.

Class standing analysis—In a subsequent analysis, we separated students according to class standing (freshman, sophomore, junior and senior) and predicted drinking behavior over time for each class. These analyses included only data from the TU students; we controlled for gender and fraternity/sorority membership and modeled time (semesters) as well as the time power function (time²). The purpose was to determine which student classes experienced a spike in drinking at the TU following the policy change.

There was no main effect for the curvilinear time-function (time²) for freshman, sophomores or juniors ($P = 0.33, 0.55, 0.16$, respectively); however, the effect was statistically significant for seniors, $F_{1,1949} = 4.2$, $P < 0.05$. The results revealed a sharp spike in drinking among the TU seniors in fall 2001, and then a decrease. After removing the curved-time function from the model, analyses found no significant main effects of (linear) time for freshmen ($P = 0.87$) or juniors ($P = 0.83$), but a significant, linear decrease in drinking over time for sophomores, $F_{1,1680} = 5.2$, $P < 0.05$. Although it is not clear why the TU sophomores specifically demonstrated a reduction in drinking given the alcohol-control efforts exerted by the TU, it is not surprising that only drinking by TU seniors spiked following the policy change.

Did campus sales predict student's perceptions of peer drinking?

The second set of analyses of the CAS focused upon the three items dealing with perceptions of the drinking of other students: perceptions of how many alcoholic drinks students consume typically when they go out, beliefs about the percentage of students that consume five or more drinks in a row and perceptions about the typical student's attitude towards drinking [on a five-point scale, from (1) ‘drinking is never good’ to (5) ‘frequent drinking is also OK if that is what the individual wants’]. Preliminary analyses revealed that correlations among these perception items were weak; all r -values were less than 0.34, and two of the three were less than 0.20. Therefore, we could not justify using PCA to create a drinking perception factor; instead, we analyzed each of the perception items separately. Otherwise, analysis of the drinking perception data was similar to that of the drinking factor data and used the same statistical model.

The analysis of the students' perceptions of ‘how many drinks students have when they go out’ revealed a statistically significant school $\times$ time² interaction, $F_{1,7024} = 7.0$, $P < 0.01$. The pattern of these results showed a small increase in perceived drinking by other students at the TU during 2001, and then a gradual decrease; an inversion of that pattern was evident at the CU. However, separate analyses at each campus revealed that the curves at both the TU and the CU only approached statistical significance, $F_{1,3364} = 3.7$, $P = 0.06$ and $F_{1,3656} = 3.3$, $P = 0.07$, respectively.

Regarding participants' perceptions of the percentage of fellow students who consume five or more drinks in a single sitting, the analyses revealed a statistically significant school $\times$ time interaction, $F_{1,7045} = 4.1$, $P < 0.05$. There was also a statistically significant main effect of time², $F_{1,7045} = 7.6$, $P < 0.05$, but no school $\times$ time² interaction ($P = 0.14$). Initially, students at the TU perceived that a larger percentage of their classmates engaged in heavy episodic drinking than at CU; however, the schools converged to identical levels by spring 2004.

More women than men perceived that a higher percentage of students engaged in five or more drinking (46.6% versus 44.6%), $F_{1,7045} = 12.2$, $P < 0.01$; these perceptions were higher at the TU ($M = 47.7\%$) than at the CU ($M = 43.6\%$), $F_{1,7045} = 24.7$, $P < 0.01$. Furthermore, participants aged 20 and younger, compared to those aged 21 and older, perceived that a higher percentage of students engaged in heavy episodic drinking (47.0% versus 44.3%), $F_{1,7045} = 20.9$, $P < 0.01$, and there was a statistically significant school-age category interaction, $F_{1,7045} = 12.4$, $P < 0.01$. At the TU, underage drinkers perceived that 50.0% of students binge drink, whereas students aged 21 and older estimated that only 45.3% of students were binge drinkers; the differences at the CU were considerably smaller (43.9% versus 43.3%).

Analyses of participants' perception of the typical student's attitude towards drinking revealed no school $\times$ time or school $\times$ time² interactions. However, both the main effects for time, $F_{1,7092} = 10.5$, $P < 0.01$, and for time², $F_{1,7092} = 5.2$, $P < 0.05$, were statistically significant. There was a statistically significant difference between the two campuses, $F_{1,7092} = 44.2$, $P < 0.01$. Students at the TU perceived that their peers have a more permissive attitude regarding students' drinking ($M = 3.28$) than did students at the CU ($M = 3.13$).

Table 3 displays point estimates (along with 95% confidence intervals) of responses to two perceived drinking norm questions (the perceived number of drinks that students consumed when they go out, and the perceived percentage of students who consumed five or more drinks when they go out). These estimates are computed controlled for sample gender, age and fraternity membership, and are meant to aid in the interpretation of the analytical results described above.

Analysis of event survey data

This analysis examined the proportion of students (in particular, those younger than 21) who reported drinking at the TU venue A relative to city venues B and C to determine the quality of responsible beverage service at venue A. In addition, we examined self-reports of drinking before and after events at each of the three venues.

Of the 1903 participants who completed the ES, 769 indicated that during the past 6 months they attended an event at venue A, B or C where alcohol was sold. A total of 1208 drinking descriptives were provided. Some participants attended events at more than one venue; however, relatively few participants attended events at all three venues. Due to the small sample size, it was not feasible to treat venue as a repeated factor in the analysis. Including those participants who attended multiple venues in a between-groups analysis, however, would violate the assumption of independent observations. Therefore, our analyses of event survey data included only responses from participants who attended an event at one venue (63.5% of the sample). Our usable data set for this analysis consisted of 488 participants.

Analyses involved three logistic regressions: one with drinking before the event as an outcome, one with drinking during the event as the outcome and one with drinking after the event as the outcome. Each outcome was dichotomous (either a 'yes' or 'no' response to having consumed alcohol). In each model, venue was the primary categorical predictor (TU venue A, city venue B or city venue C). Participant sex, age category (age 20–, age 21+) and driver status to the event (driver, non-driver) were also included in the statistical model.

In all three regressions (drinking before, during and after), the main effect for driver was significant indicating that non-drivers consumed more (before: Wald (1) = 21.01, $P < 0.01$, odds ratio = 3.77; during: Wald (1) = 7.48, $P < 0.01$, odds ratio = 2.02; and after: Wald (1) = 5.96, $P = 0.44$, odds ratio = 2.10). For the before-and-after periods, no other main effect was significant. However, for drinking during the event, the main effect of venue also was significant (Wald (2) = 7.15, $P < 0.05$). Contrast tests revealed that the likelihood of drinking during an event at venue B was significantly higher than at the TU venue A (odds ratio = 2.61, $P < 0.01$), and higher at venue C than at the TU venue A (odds ratio = 2.08, $P < 0.05$).

It is possible that individuals who attend events at multiple venues drink differently, in general, than those who visit only a single venue, and if this was the case our results may not reflect drinking accurately before, during and after events at the three venues. Analyzing data from the entire set of 1208 drinking descriptions (i.e. including multiple descriptions from individuals attending more than one venue) would violate the statistical assumption of independent observations. Nevertheless, we were interested in exploring whether attending multiple venues predicted heavier drinking histories. Using all 1208 drinking descriptions and controlling for sex, age category and driver status, we predicted two drinking out-comes (maximum number of drinks on one occasion in the past month, and number of times consuming five or more drinks on one occasion in the past 2 weeks) from the number of venue attended. Even with a large sample size ($n = 1208$) and a violation of the assumption of independence (which tends to inflate the risk of a Type I error), our analyses revealed that the number of venues attended did not predict drinking history significantly. Thus, we do not suspect that our previous findings (regarding drinking during events at the three venues) are threatened by the exclusion of individuals who attended multiple venues.

Discussion

The data presented suggest that the TU administration was generally more successful than the competing downtown entertainment centers in controlling illegal service to underage customers. Moreover, there is evidence from the ES that students drink less at the TU pavilion than at the downtown venues. This attention to responsible service practices undoubtedly limited the extent to which alcohol sales affected student drinking. However, the influence of these safety practices was probably modest compared to the limitations placed on the number of events at which the sale of alcohol was permitted. The administration's conservative approach to approving events at which alcohol could be sold considered both the number and type of event. One limitation of this study is that we do not have a good measure of the types of events occurring at the off-campus venues or the characteristics of the attendees.

The apparent increase in student drinking at the TU following the policy change was apparently transient. There appears to have been a small increase in consumption, as well as a small increase in the students' perception of normative drinking on the TU campus, during the first year of the new sales policy. However, these changes dissipated in the last 2 years of the study. Therefore, overall, there was no measurable change by the end of the 4-year introductory period.

This project involved multiple methods drawing a coherent picture of the drinking behavior at the TU and the CU over the course of the study. Our method for administering the campus alcohol survey and event survey was limited by its reliance on a convenience sample rather than a random sample; however, our data suggest that the procedure generated a sample that was comparable to the student population. Perhaps the greatest limitation of our non-random survey was its use to compare the two campuses. However, the kiosk data from TU alone—even without contrasting it to CU—tells the story of a very modest increase in drinking shortly after the policy transition, followed by stability and gradual decline.

A challenge for this study is how to interpret the results in relation to the central issue: can universities bring alcohol on to the campus to raise money from alumni and community members without increasing student drinking and drinking problems? While our study did not find an association between the policy liberalization at TU and an increase in student drinking, there are additional factors to consider. The process of bringing alcohol onto campus required both the legislature and state education board to grant the administration the right to regulate alcohol sales on campus. With this obstacle removed, it now becomes easier to expand alcohol sales. Indeed, in the 5th year following initiation of the alcohol sales policy, the TU administration announced three new venues for alcohol sales on campus.

The growing approval of on-campus alcohol sales would be expected to weaken the TU administration's efforts to promote student alcohol and drug problem prevention programs. Our research did not examine the extant alcohol reduction programs on the campus, and thus we cannot comment on to what extent liberalization of alcohol sales may have mitigated the efficacy of those programs. The decreases in drinking at TU after the first year of the policy change, however, is consistent with the hypothesis that ongoing health interventions are having some effect. Nevertheless, it is clear that the two objectives of the campus administration—promoting responsible drinking behavior while increasing access to alcohol on campus—clearly conflict, and it is not difficult to imagine how promoting the latter would affect the former.

Increasing alcohol sales on campus brings TU into competition with local student bars. Our data indicate that students attending concert events drank just as much before and after the event whether it was on campus or downtown. If the sale of alcohol at campus events increases student attendance, then they would expect to do more of their before-and-after drinking on campus or in the campus area. This may benefit nearby bars, but it will be at the expense of the downtown establishments. It is reasonable to expect that the downtown locations will respond with special sales promotions designed to regain their market share. The drop in alcohol revenues during the 5th year of the current study may be related to the downtown centers out-competing the TU pavilion for talent. Regardless, the problem with relying on revenue from alcohol sales to support student activities is that it inevitably places the campus in competition with other alcohol providers.

The issues discussed above involve considerable speculation. None the less, with the number of venues at which alcohol can be served increasing, it is still too early to determine whether alcohol can be brought onto a campus to raise revenue from community members without increasing student drinking problems. Readers should be wary of interpreting our failure to find an increase in student drinking as an indication that liberalizing alcohol policy has no negative consequences. Our study revealed no dramatic changes in drinking up to a certain point in the transition process at the TU. However, that process continues.

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Figure 1.
Change in drinking over time at transition university (TU) and control university (CU)

Table 1

Characteristics of transition university/control university (TU/CU) sample compared to population values.

	Population	Sample	Maximum deviation
TU, % male	45.0%	43.9%	4.1%
CU, % male	44.9%	47.1%	4.4%
TU, % non-white (Caucasian)	16.8%	16.2%	4.9%
CU, % non-white (Caucasian)	30.8%	32.5%	3.5%
TU, % age 18–20	32.4%	43.1%	16.8%
CU, % age 18–20	25.8%	40.1%	20.7%

Table 2

Point estimates for drinking measures, by campus and semester.

	Spring 2000	Spring 2001	Fall 2001	Spring 2002	Fall 2002	Spring 2003	Fall 2003	Spring 2004
% 5+ drinks past 2 weeks								
TU	37.0% ± 5.3	35.3% ± 4.9	45.0% ± 5.1	39.1% ± 4.9	38.5% ± 4.9	35.2% ± 4.9	36.4% ± 4.9	32.3% ± 5.1
CU	44.5% ± 4.9	37.0% ± 4.7	41.1% ± 4.9	44.9% ± 4.7	42.1% ± 4.7	42.7% ± 4.7	41.6% ± 4.9	43.5% ± 4.9
Times drunk past 4 weeks								
TU	2.07 ± 0.50	2.50 ± 0.47	3.21 ± 0.48	2.54 ± 0.46	2.54 ± 0.47	2.40 ± 0.46	2.34 ± 0.47	1.92 ± 0.48
CU	2.74 ± 0.48	2.56 ± 0.45	3.26 ± 0.46	2.94 ± 0.45	3.26 ± 0.46	2.48 ± 0.46	3.17 ± 0.46	3.63 ± 0.47

CU: control university; TU: transition university.

Point estimates for perceived norms measures, by campus and semester (adjusted for sample gender, age and fraternity membership).

Table 3

	Spring 2000	Spring 2001	Fall 2001	Spring 2002	Fall 2002	Spring 2003	Fall 2003	Spring 2004
Perceived norm: no. drinks								
TU	6.43 ± 0.35	6.84 ± 0.34	6.92 ± 0.34	6.50 ± 0.32	6.79 ± 0.33	6.42 ± 0.33	6.51 ± 0.33	6.20 ± 0.34
CU	5.97 ± 0.34	5.62 ± 0.32	5.73 ± 0.33	5.52 ± 0.32	5.74 ± 0.32	5.61 ± 0.32	5.73 ± 0.33	5.83 ± 0.34
Perceived norm: % drink 5+								
TU	46.08 ± 2.6	46.76 ± 2.5	47.86 ± 2.6	48.91 ± 2.5	52.11 ± 2.5	46.01 ± 2.5	46.69 ± 2.5	46.60 ± 2.6
CU	42.68 ± 2.6	41.82 ± 2.4	43.30 ± 2.5	44.81 ± 2.4	45.59 ± 2.4	43.61 ± 2.5	43.57 ± 2.5	46.08 ± 2.5

CU: control university; TU: transition university.