

# Background Information on Alcohol Issues

University-City Issues Committee  
of the  
Boulder City Council

October 5, 2004

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University of Colorado at Boulder

Vice Chancellor for Student Affairs

307 Rogont Administrative Center  
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Boulder, Colorado 80309-0031  
303-492-8476

August 17, 2004

Peter C. Dietze, Esq.  
Dietze and Davis, P.C  
Siena Square Building  
2060 Broadway, Suite 400  
Boulder, CO 80302

Dear Mr. Dietze:

I have been asked by Chancellor Byyny to respond to your letter, received August 4, regarding the application of Daredevil LLC for a liquor license at 1129 13<sup>th</sup> Street.

The University of Colorado at Boulder has been working for many years with campus and community members to address concerns over the high-risk use of alcohol by our students and others, who live, work or visit our community. The university, in fact, has the only on-going and functioning campus-community coalition, called the Standing Committee on Substance Abuse (SCOSA), dedicated to this matter.

SCOSA is chaired by a Coordinator in the Student Affairs Division, Robert Maust. Mr. Maust has also served as a Research Associate and Director of a million dollar national research project called "A Matter of Degree" that investigated ways to reduce high-risk drinking by our students. As a part of his research he was one of the first to apply Geographic Information System (GIS) technology to study the location of alcohol outlets in Boulder and to share this information with the Beverage Licensing Authority and other community groups. He was also one of the first to point out the high number of liquor licenses bordering the campus, as well as the disproportionate growth in liquor licenses in comparison to student enrollment and city population growth.

Furthermore, Mr. Maust is an active and dedicated member of both the campus and local community where he has worked with the neighborhood associations located immediately adjacent to the university and such organizations as the Hill Alliance, the Responsible Hospitality Group and the Hill Roundtable at the Academy. He is also a member of the city's Task Force and Oversight Committee that meets regularly to systematically address student-campus-community issues, including alcohol related issues.

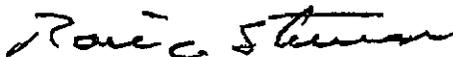
Since 1997, Mr. Maust has represented the university on almost every matter relating to alcohol use and abuse. He has provided University Hill Neighborhood Association (UHNA) member Dr. William Marine, with copies of contemporary research findings on alcohol related matters so that Dr. Marine could be well prepared for his appearance before the Beverage Licensing Board to discuss the impact on communities where there is a high concentration of alcohol outlets. Following are three of the articles Mr. Maust gave to Dr. Marine and other community members which were shared with the Beverage Licensing Board.

- UNIVERSITY OF COLORADO STUDENT AFFAIRS      1073027702000      F.00E 00E
- "The Relationship of Alcohol Outlet Density to Heavy and Frequent Drinking and Drinking-related Problems among College Students at Eight Universities." (Health & Place, 2003)
  - "The Marketing of Alcohol to College Students." (American Journal of Preventative Medicine, 2003)
  - "Secondhand Effects of Student Alcohol Use Reported by Neighbors of Colleges- The Role of Alcohol Outlets." (Social Science & Medicine, 2002)

Given these materials and presentations, we believe the Beverage Licensing Authority has been informed of the impact of alcohol outlet density on student alcohol use and abuse. The campus administration is opposed to such a high proliferation of liquor licenses in close proximity to the campus and the University Hill residential area.

We will continue to provide all concerned parties with the best information available on the issues related to their deliberations and decision making.

Sincerely,



Ronald J. Stump  
Vice Chancellor for Student Affairs

RJS:svb

c: Elizabeth Hoffman  
President

Richard L. Byyny, M.D.  
Chancellor

Frank Bruno, Boulder City Manager

Robert Maust, Student Affairs Coordinator

Milagros Cortez  
Secretary to the Board of Regents

September 13, 2004

Members of the Beverages Licensing Authority  
City of Boulder  
c/o Ms Anne Large, Deputy City Clerk  
P O Box 791  
Boulder, CO 80306

Dear Ms Large

Enclosed for you is a copy of a letter sent to Peter C. Dietze, Esq regarding the application of Daredevil LLC for a liquor license at t1129 13<sup>th</sup> Street He asked that I share it with you

The letter briefly presents some of the University's efforts in addressing alcohol abuse by our students The letter closes with our belief that the Beverage Licensing Authority has been made aware of the impact of alcohol outlet density on student alcohol use and abuse Further, the letter states that the University is opposed to the high proliferation of liquor licenses now in existence so close to the campus and the University Hill residential area

If further information or clarification on this matter would be helpful, please let me know

Sincerely,

Ron Stump  
Vice Chancellor for Student Affairs

RJS svb

c Richard L Byyny, M D , Chancellor  
Charles Sweet, Jr , University Counsel  
Milagros Cortez, Secretary to the Board of Regents  
Frank Bruno, Boulder City Manager  
Robert Maust, Student Affairs Coordinator  
Peter C Dietze, Esq

**THE UNIVERSITY HILL NEIGHBORHOOD ASSOCIATION**  
*Neighbors Working Together for a Safe, Clean, Peaceful and Diverse Neighborhood*

September 14, 2004

Frank Bruno, City Manager  
City of Boulder, Colorado  
P O Box 791  
Boulder, CO 80306

Re Recommendations to Improve Liquor Licensing in the City of Boulder

Dear Mr. Bruno:

Our Association, as you know, is deeply committed to the health, safety, and well-being of the University Hill neighborhood. The business area of the Hill has been of particular interest and concern to us, as it constitutes a high concentration of commercial uses that often burden the nearby residential areas with problems associated with parking, noise, trash, and of course alcohol consumption. There are sixteen liquor and beer outlets within the three-block business area of the Hill, which is adjacent to the main campus of the University of Colorado. In addition, a proposed 10,000 square foot bar in the same three-block area awaits city consideration. The University of Colorado at Boulder has furnished you and us with published research by respected scientists, which shows a direct relationship of alcohol outlet density to heavy and frequent drinking-related problems among college students. The well-documented consequences and costs to individuals and the community from high-risk college drinking include injury, death, assault, sexual abuse, and property damage. We feel the community of Boulder, including the city government and the University administration, can no longer ignore the problems associated with the high density of alcohol outlets and must now apply the insights of this research in order to rationalize our liquor licensing process.

For that reason, with the guidance of counsel, we reviewed the Colorado Liquor Code, the City Ordinances, the State liquor licensing regulations, and the regulations promulgated by the Beverages Licensing Authority of the City of Boulder and wish to put forth a series of recommendations for changes to the administration of the liquor licensing process. We submit these recommendations for your consideration and hope to be able to meet with you in the near future to discuss your reactions and thoughts.

I. As a general principle, the City must recognize its primary and authoritative role in liquor licensing and drop its laissez faire attitude. The City is empowered by state law to be more than a mere processor of the paperwork associated with liquor license applications. The City Administration has adopted a limited view of its role in the process of approving new



licenses and proposed changes of location of existing licenses. You wrote in a letter of August 4, 2004 to John Price that *except for processing the paperwork and offering legal opinions, city staff and city council have very little influence*. Although the State of Colorado regulates the licensing of liquor outlets, it has delegated to the local licensing authorities substantial authority and wide discretion that would support a quite different view of the role of the local licensing authorities.

For example, section 301(2)(a) of the Colorado Liquor Code delegates to all licensing authorities the power, in addition to considering the reasonable requirements of the neighborhood, the desires of the adult inhabitants, etc., to impose all other reasonable restrictions that are or may be placed upon the neighborhood by the local licensing authority. (Emphasis supplied.) The point is repeated in slightly different context in section 313, which directs that no application for the issuance of any license shall be received or acted upon for a location in an area where the sale of alcohol beverages as contemplated is not permitted under the applicable zoning laws of the municipality or county. (Emphasis supplied.)

According to section 304(3), the state licensing authority may not grant a license until the local licensing authority has approved the application.

The local licensing authorities have also been given substantial authority in the supervision of licensed outlets, and have the power, subject to conditions stated in the Liquor Code, to suspend or revoke or refuse to renew licenses.

In light of the research cited by Vice Chancellor Stump (see his letter of August 17, 2004), a different, more pro-active approach to the City's role in the licensing process is not only timely, it is consistent with the Colorado Liquor Code. So in addition to responding to high-risk college drinking tragedies with sadness and empathy, let's also respond with positive policy-making for those matters, like liquor licensing, that are in our hands.

II Concrete Steps for a Revised Approach. A number of steps can be taken by the City of Boulder to improve liquor licensing. We ask that you evaluate the following specific proposals and make appropriate recommendations to the City Council.

A. Do away with Rule 17(9) of the Rules of Procedure of the Boulder Beverages Licensing Authority. It provides that at the closing of the evidence in hearings for a new license or for a change of location of an existing license, there be automatically and without

need for a motion by a member of the Authority, a motion to approve before the Boulder Beverages Licensing Authority. The underlying policy supporting this rule suggests a laissez faire attitude toward the issuance of new licenses, which we believe is inappropriate. This rule is inconsistent with an objective review and weighing of the evidence by the Authority. The rule appears to be in conflict with the statutory mandate that the local authority five days prior to the hearing must publish a preliminary report of its investigation as to the facts bearing upon the qualifications of the applicant and the reasonable requirements of the neighborhood, as well as the desires of the adult inhabitants for a new license.

**B.** Make the investigation by the staff and issuance of the preliminary report, which is required by Section 312 of the Colorado Liquor Code, meaningful. This is the most serious and far-reaching change we recommend. The Authority is to make a decision based on facts and evidence adduced as the result of its investigation, as well as other facts that the applicant and interested parties might present. The investigation by the Boulder Beverages Licensing Authority's staff, to be meaningful, should cover the elements named in Section 312, which are (a) whether the reasonable requirements of the neighborhood support the issuance of an additional license for the type of license for which the application has been made, (b) the number, (c) type, (d) and availability of alcohol beverage outlets located in or near the neighborhood under consideration, and any other pertinent matters affecting the qualifications of the applicant for the type of business proposed. Items (a) through (d) are the critical issues concerning which the Authority must make findings and make its decision, but the preliminary investigation the staff generates prior to the hearing does not include detailed facts with regard to these factors. It should. Examples of what the report should include are: capacity of existing outlets to meet the needs of the neighborhood, the occupancy load in each existing outlet, the hours of operation, types of food served, etc. The City has collected data concerning these matters, as each new applicant has to submit such information.

We are informed that some members of the Authority believe, based on advice by the City Attorney's staff, that information regarding the number and type of existing outlets is irrelevant in deciding whether a new license should be issued or a change of location approved. If such advice was given, we respectfully disagree and, based on the advice of our attorney, assert that the Colorado Liquor Code does not support such advice. Indeed, the wording of Section 312 is to the contrary.

Although we agree that State law would frown on a bright line being drawn based on the assessment that there are enough outlets in a given neighborhood, and thus justifying the denial of a new application, the statute expressly directs the licensing authorities to consider whether the existing outlets of the same type and the availability of alcohol beverage outlets in or

near the neighborhood under consideration satisfy the reasonable requirements of the neighborhood, and if the answer is affirmative, the denial of a new application or a change of location would fall squarely within the statutory criteria. See Sections 305 and 312 of the Colorado Liquor Code.

The applicant has no incentive to offer such information, and as a result, the task of submitting evidence relevant to the decision criteria is left to residents in the neighborhood if they choose to get involved. That is, however, not their task. In the past, too often this burden has been shifted to residents in the affected neighborhood. They, our group included, do not have the resources or the obligation to do so. The Colorado Liquor Code is clear that the Authority, or its staff, is obligated to develop these facts and to present them to the Authority for deliberation.

C. Define the neighborhoods as they are commonly known. The City Clerk tentatively outlines the neighborhood for each application soon after it is filed. As a rule, a one-mile radius of the proposed outlet is circumscribed, streets near the perimeter of the circle established by the one-mile radius are named, and they establish the boundaries of the applicable neighborhood. In the case of the application for the proposed license of the Tulagi building at 1129 13<sup>th</sup> Street on the Hill, the north line of the neighborhood is Mapleton Avenue, the south boundary is King Street, the east is Folsom, and the west is 4<sup>th</sup> Street. This example demonstrates that the method of describing the neighborhood currently employed does little to adhere to the distinct neighborhoods in Boulder. The Hill neighborhood does not include Mapleton Hill, and vice versa. Why not consult with the staff of the Planning Department or Neighborhood Services in this regard?

D. Affirmatively determine neighborhood compatibility. A distinction should be made between the neighborhood and the area from which the applicant intends to draw patrons to its business. It goes without saying that the latter area is usually very different from the neighborhood of the proposed outlet.

We recommend that a rule be adopted stating that the applicant shall show whether the size and nature of the neighborhood under consideration can absorb the influx of persons expected to come from the draw area. To illustrate, Pearl Street Mall absorbs people from a large regional area, and thanks to the cooperation among business owners and the city, few problems with noise or public peace and safety have occurred. This has not been the experience of the Hill.

E. Affirmatively determine whether legal prerequisites are met prior to considering applications. Section 313 of the Colorado Liquor Code expressly states that no application for the issuance of any license shall be received or acted upon (emphasis supplied) unless the requirements articulated in this section are met. They are: (1) if within one year preceding the authority denied a license for the proposed location due to the needs and desires of the neighborhood, (2) the applicant is entitled to possession, (3) the location complies with the zoning laws of the city, and (4) if the location of the proposed outlet is within 500 feet of a school or the principal campus of a university or college. In two recent instances, the staff forwarded to the Authority for consideration an application for a location within 500 feet of the CU Boulder campus (The Players Club at 1143 13<sup>th</sup> Street) and an application for a location not meeting the zoning requirements of the city (Daredevil LLC proposing to open an expanded bar and music venue at Tulagi's coupled with a restaurant operation). In each instance, the Boulder Beverages Licensing Authority declined to proceed. In the case of the Tulagi application, the City Attorney's staff advised the Boulder Beverages Licensing Authority that zoning being ministerial, compliance with the Use Review laws of the City could be assumed and the Authority was free to proceed in spite of the clear, unambiguous language of the statute. The Authority postponed consideration of the application until October 20, 2004 with the understanding that the Use Review will be completed by that time.

F. Integrate the Use Review process applicable to restaurants and taverns with the licensing process. Beginning in 1996, the City Council adopted a series of detailed land use regulations with which applicants wishing to open a restaurant or tavern must comply. See Section 9-3-1-1(b) (13) and Section 9-3-4-20, B.R.C. The purpose of these regulations is to minimize or avoid negative impacts on the neighborhood and in particular, residential areas that may be affected by the proposed restaurant or tavern.

We recommend that a Rule be adopted directing the staff of the Boulder Beverages Licensing Authority, in consultation with the planning and land use staff, to set forth the results of its investigation in the Preliminary Report (see Section 312) specifically with respect to compliance with the City's land use laws as they apply to restaurants and taverns, but not limited to said requirements of Section 312, and in this manner inform the Boulder Beverages Licensing Authority, the applicant, and interested parties of the reason(s) the application is not forwarded to the Boulder Beverages Licensing Authority for receipt and action due to noncompliance with Section 313.

G. Revise the recommended form of petition. Rule 20 of the Boulder Beverages Licensing Authority states that it is highly recommended to the applicant that the

City's form of petition be utilized for purposes of establishing the needs of the neighborhood and the desires of the adult inhabitants. There is no requirement that the form of petition favored by the City inform the public of the number of existing outlets of the same type, the availability of alcohol beverage outlets in or near the neighborhood under consideration, the capacity of the existing outlets to meet the reasonable requirements of the neighborhood, and other facts available to the City which would bear on the question sought to be ascertained by the petitioning process, to-wit: whether the reasonable requirements of the neighborhood support the application for another license of the same type. It would seem only appropriate that the petition provide such information in order to allow the persons contemplating whether to sign sufficient information to make his or her decision a fairly informed one.

We recommend the adoption of a rule to such effect.

**H.** Restore the five hundred foot limit. State law prohibits the issuance of liquor licenses if they are to be located within five hundred feet of schools or college campuses. State law also allows cities and counties to adhere to or modify the state-prescribed prohibition of liquor outlets within five hundred feet of a school or principal campus of a university or college. For whatever reasons, Boulder decided to allow hotel-restaurant licenses to be located next to the Boulder campus. The so-called restaurants stop serving food and effectively become bars from 9 pm to 2 am. Over the years, this has resulted in the high density of liquor outlets that are now located on the Hill, many of which could not have been licensed had the five hundred foot limit remained in effect for hotel-restaurant licenses.

We recommend that the City Council adopt an ordinance amending section 4-2-4, B R C , accordingly.

**I.** Audit hotel-restaurant licenses with respect to food service requirements (kitchens, etc.) and state law prescribed revenue ratios (food revenues must be at least 25 percent of total gross revenues). Because many of the hotel-restaurant licensed outlets on the Hill become de facto taverns or bars after the dinner hour - bearing in mind that taverns may not be licensed at locations within 500 feet of a school or campus - strict enforcement of the food service requirements and revenue ratios is called for.

We recommend that the staff be directed to consistently and systematically audit and enforce these requirements.

III Summary. For the sake of convenience and conciseness, we wish to summarize the recommendations contained in this letter.

(A) Do away with Rule 17 (9) of the Rules of Procedure of the Boulder Beverages Licensing Authority

(B) Cover the elements named in Section 312 in the staff investigation and include the capacity of existing outlets to meet the needs of the neighborhood, the occupancy load in each existing outlet, the hours of operation, types of food served, etc in the preliminary report

(C) Adopt a rule directing the staff of the Boulder Beverages Licensing Authority to consult with planning staff in defining the neighborhood under consideration

(D) Require applicants to demonstrate that the neighborhood under consideration can absorb the influx of persons they hope and expect to draw from the area outside the neighborhood

(E) Insist on compliance with land use and zoning laws before applications are received and acted upon by the Boulder Beverages Licensing Authority

(F) Adopt a rule directing the staff of the Boulder Beverages Licensing Authority to consult with planning and land use staff in investigating the compliance of proposed restaurants and taverns with the City's land use laws and include the results of the investigation in the preliminary report so the applicant and interested parties will be informed of the reason(s) the application cannot be received or acted upon

(G) Change the form of petition intended for circulation among the adult inhabitants to include information about the number of existing outlets and the availability of alcohol beverage outlets in or near the neighborhood, the capacity of the existing outlets, and whether an additional outlet would serve the reasonable requirements of the neighborhood

(H) Adopt an ordinance restoring the five hundred foot limit with respect to all liquor licenses

(I) Audit the restaurants regularly and systematically for compliance with state law as to food service and sales ratios applicable to sale of food and alcohol beverages

Thank you in advance for considering these recommendations. We would be delighted to meet with you in the near future to discuss these recommendations and look forward to your response.

Sincerely Yours,

The University Hill Neighborhood Association Executive Committee

Eleanor DePuy

Jane Stoyva

Andy Kayner

Steven Walsh

David Miller

Dave Zessin

Jan Otto

cc Vice-Chancellor Stump



PERGAMON

Health &amp; Place 9 (2003) 1–6

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& PLACE

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## The relationship of alcohol outlet density to heavy and frequent drinking and drinking-related problems among college students at eight universities

Elissa R. Weitzman\*, Alison Folkman, Kerry Lemieux Folkman,  
Henry Wechsler

*Department of Health & Social Behavior, Harvard School of Public Health, Landmark Center, 401 Park Drive, P.O. Box 15678, Boston, MA 02215, USA*

### Abstract

To determine whether alcohol outlet density was correlated with heavy and frequent drinking and drinking-related problems, we compared ecological measures of outlet density with survey measures of drinking using a geographic information system and the Harvard School of Public Health College Alcohol Study ( $n = 3,421$ , site  $n = 8$ ). We identified 966 outlets within 8 2-mile study areas. Densities/site ranged from 32 to 185. Density was correlated with heavy drinking ( $r = 0.82$ ,  $p = 0.01$ ), frequent drinking ( $r = 0.73$ ,  $p = 0.04$ ) and drinking-related problems ( $r = 0.79$ ,  $p = 0.02$ ). Women, underage students and students who picked up binge drinking in college were affected. Implications for prevention and research are discussed. © 2002 Elsevier Science Ltd. All rights reserved.

*Keywords:* Alcohol use, Drinking problems, Alcohol outlet density, Prevention, Environment, College

### Introduction

Features of local alcohol economies, in addition to characteristics of drinkers, may influence drinking behavior among college students. Discount pricing of alcoholic drinks and promotion of alcoholic beverages have been linked to consumption among college students (Chaloupka et al., 1998; Wechsler et al., 2000a). Lower rates of binge drinking exist among students at schools whose administrators report an absence of alcohol outlets within a mile of campus (Wechsler et al., 1994). Outlet density may impact drinking by making low cost, or volume discounted alcohol available to persons predisposed to drink heavily (Gruenewald et al., 1996), for example young adults. High outlet density may reflect heavy drinking norms and preferences (Scribner et al., 2000), or underlying

community features, such as social disorganization or social capital linked to frequent heavy drinking in college (Weitzman and Kawachi, 2000).

The purpose of this study was to (a) pilot the collection of secondary data about local alcohol licenses and assess their availability and quality, and, (b) determine whether levels of heavy and frequent drinking and drinking-related problems varied systematically with alcohol outlet density among students at colleges participating in the "A Matter of Degree" (AMOD) program to reduce binge drinking and related harms.

### Methods

#### *Data collection for geographic information systems (GIS)*

Outlet information was collected for venues within a 2-mile radius of a central location point (CLP) on or near eight of ten AMOD campuses. CLPs were

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identified by local evaluators and corresponded to a student union, administrative location or major intersection. The 2-mile distance was chosen because it encompassed major businesses and student residences (on- and off-campus). One site was excluded because the response rate on the student behavioral survey was too low (<50%), another because data describing outlet density were unreliable.

Enumeration of licensed outlets within study areas was accomplished by matching lists of local licenses to study areas addresses using ArcView 3.1 GIS software (Environmental Systems Research Institute, Inc., © 2000), as follows. We compiled a master list of licensed venues by site from government licensing boards, secondary data sources and physical observation for the 1999–2000 academic year. Lists included (1) name, (2) address, (3) license type(s), (4) venue category (i.e., restaurant, bar, nightclub, package store/liquor store/beer distributor, other), and, (5) license category (i.e., whether license supports alcohol consumption on- and/or off-premise). Outlets were excluded that did not typically serve college students, venues with a combined on-site and catering license were coded as “on-site” based on how they functioned for college students. Exclusions and re-categorizations were made case by case.

Next, site CLP addresses were entered into ArcView, and a 2-mile radial boundary was drawn. After identifying the 2-mile study areas we geocoded address and zip code fields of each outlet using ArcView’s automated geocoding function, whereby the software attempted to match each address element with its spatial street database. Addresses for which a 100% match was found were mapped without further inspection. Addresses for which either no match or a partial match was found were verified using multiple resources. Sources of error included (1) misspelled street names, (2) incorrect street types, (3) incorrect or missing street directions, (4) incorrect street numbers, and (5) incorrect zip codes. Incorrect elements were repaired, and a modified subset of addresses was submitted for a second round of geocoding.

The first two rounds of geocoding produced spatial coordinates for 93–100% of the licensed outlets by site. Remaining addresses were likely created subsequent to the ArcView street database. In such cases, a proxy geocode was generated using local data. Six venues were located manually using information from paper maps sent by site evaluators. Once plotted, we visually inspected maps and identified outlets within the study areas. These were counted and included in the analyses.

#### *Student survey data*

We used behavioral survey data from the 1999 Harvard School of Public Health College Alcohol Study

(CAS) survey (institutional  $n = 8$  for this study, student  $n = 3421$ ). Information about the CAS methods and measures is published elsewhere (Wechsler et al., 1994, Wechsler et al., 1998, Wechsler et al., 2000b).

Student drinking behaviors at the AMOD sites included *Heavy drinking* (percentage of drinkers who reported consuming five or more drinks at an off-campus party in the past 30 days), *Frequent drinking* (percentage of drinkers who reported drinking on at least 10 occasions in the past 30 days), and, *Drinking-related problems* (percentage of drinkers reporting five or more problems associated with one’s own alcohol consumption since the beginning of the school year). Measures are consistent with other large national surveys of youth drinking (Presley et al., 1996, Douglas et al., 1997, Johnston et al., 1999).

Initial analyses tested rank order correlations between outlet density and drinking among all student drinkers. Next, we tested rank order correlations between outlet density and drinking measures among subgroups of student drinkers. Because the elasticity of demand for alcohol differs for college women and men as do their access patterns (Chaloupka and Wechsler, 1996), we examined gender differences in effect among all student drinkers. On all analyses, ties were taken into account by Statistical Analysis Software (SAS) (SAS Institute, Inc., ©1999–2000). Findings are reported for probability thresholds of  $p < 0.05$  with a two-tailed test of significance. We note all significant correlations and annotate those with multiple ties.

## **Results**

### *School setting and student characteristics*

Study sites were located in different geographic regions of the United States and set in different types of communities (i.e., small town, urban, suburban) (Table 1). All of the universities were public and all but one had full-time undergraduate student enrollments > 10,000.

There were 3421 survey respondents among the eight AMOD sites (average response rate was 62%, ranging from 51% to 73%). From one-half to two-thirds of the student respondents at the sites were female. A majority of students reported they were White and between 48% reported they were younger than 21–64 years of age, the legal age for purchasing and consuming alcohol. From 10% to 21% of the respondents reported they were members of fraternities and sororities.

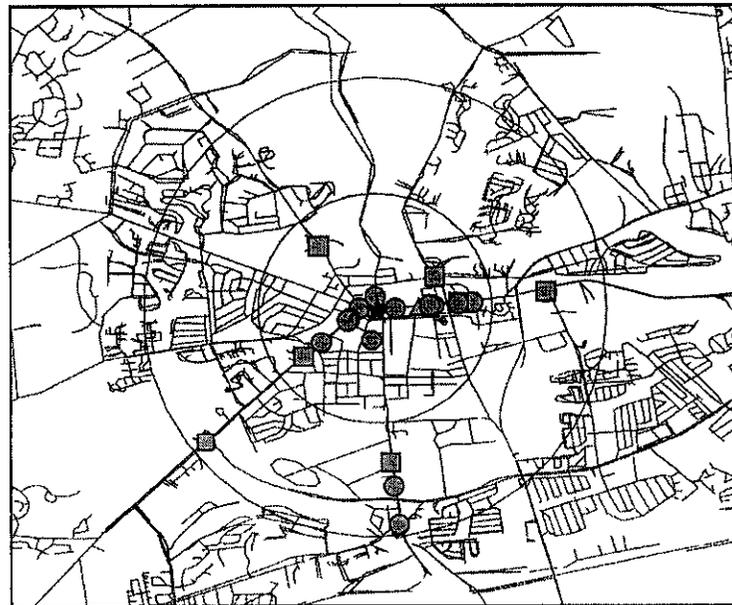
### *Outlet characteristics*

We identified 2304 alcohol outlets using master lists at the eight AMOD sites, of which we were able to geocode

Table 1  
Site characteristics and survey respondent sociodemographics<sup>a</sup>

	Site							
	A	B	C	D	E	F	G	H
<i>Setting</i>								
Region	Northeast	South	South	North Central	North Central	North Central	West	South
Location	Small town	Small town	Sub-urban	Urban	Small town	Urban	Sub-urban	Urban
<i>Student characteristics</i>								
Total N	391	728	348	388	412	462	382	310
Response rate (%)	(63)	(57)	(62)	(62)	(66)	(73)	(63)	(51)
% Female	58	67	56	55	60	56	51	62
% White	94	88	73	90	89	89	83	83
% Underage	63	64	54	48	55	54	58	63
% Greek-affiliated	10	17	20	21	17	12	17	16
<i>Outlet characteristics # (%)</i>								
Total density, 2 miles	156	32	185	117	85	156	152	83
On-site venues, 0-1 miles	41 (26)	17 (53)	0 (0)	26 (22)	0 (0)	0 (0)	60 (39)	12 (14)
Off-site venues, 0-1 miles	13 (8)	4 (13)	18 (10)	6 (5)	14 (16)	12 (8)	15 (10)	13 (16)
On- & off-site venues, 0-1 miles	1 (1)	1 (3)	63 (34)	46 (39)	50 (59)	54 (35)	4 (3)	0 (0)
On-site venues, 1-2 miles	52 (33)	7 (22)	0 (0)	7 (6)	0 (0)	0 (0)	49 (32)	34 (41)
Off-site venues, 1-2 miles	47 (30)	3 (9)	42 (23)	20 (17)	7 (8)	15 (10)	21 (14)	24 (29)
On- & off-site venues, 1-2 miles	2 (1)	0 (0)	62 (34)	12 (10)	14 (16)	75 (48)	3 (2)	0 (0)

<sup>a</sup>Percentages may not add to 100 due to rounding error



Legend  
 ★ CLP  
 ▲ both on & off site  
 ◻ off site  
 ● on site

Fig 1 Study community with the lowest alcohol outlet density

and map 2217 (96%), ranging from 93% to 100% across sites. Site H had the largest proportion of unmapped outlets but, because it drew on source data describing a much larger geographic unit than the others, was not considered to have a disproportionate amount of missing data. Almost half ( $n = 966$ , 44%) of the mapped outlets were located within two miles of the CLPs. Of these 470 fell within the first mile (i.e., a 1-mile radius from the CLP), and 496 fell between one and two miles.

Total outlet densities within the 2-mile radii of the study sites ranged from 32 (Site B) to 185 venues (Site C) with an average of 121 (Table 1). Figs 1 and 2 depict the lowest- and highest-density communities, respectively.

There were fewer off-site venues than there were on-site or both on-/off-site venues in the study areas. The proportion of off-site venues increased at greater distances from the CLPs. Closer in, 10% ( $n = 95$ ) of the 966 outlets were licensed for off-site consumption compared to about one-fifth ( $n = 179$ , 19%) in the one-to-two mile radial ring.

#### *Student drinking behaviors*

All sites had student populations that exhibited high levels of heavy and frequent drinking and drinking-

related problems (Table 2). From 27% to 41% of students reported heavy drinking, consuming five or more drinks at an off-campus party in the past 30 days. From approximately one-fifth to one-third of students at the sites reported frequent drinking (consuming alcohol on ten or more occasions during the past 30 days), and large percentages of students (18-32%) reported experiencing five or more problems resulting from their drinking.

Between 20% and 46% of the respondents reported frequent drunkenness (i.e., they drank enough to get drunk three or more times during the past 30 days). A minority of respondents reported that they drank but did not do so frequently and heavily. With few exceptions, the majority of students reported that they usually binge when they drink. When asked why they drink alcohol, 44-65% of the students across sites indicated "to get drunk" as an important reason.

#### *Associations between outlet density and heavy drinking, frequent drinking and drinking-related problems*

**Outlet density and heavy drinking** Overall there was a significant correlation between outlet density and heavy drinking (i.e., consumed 5+ drinks at an off-campus

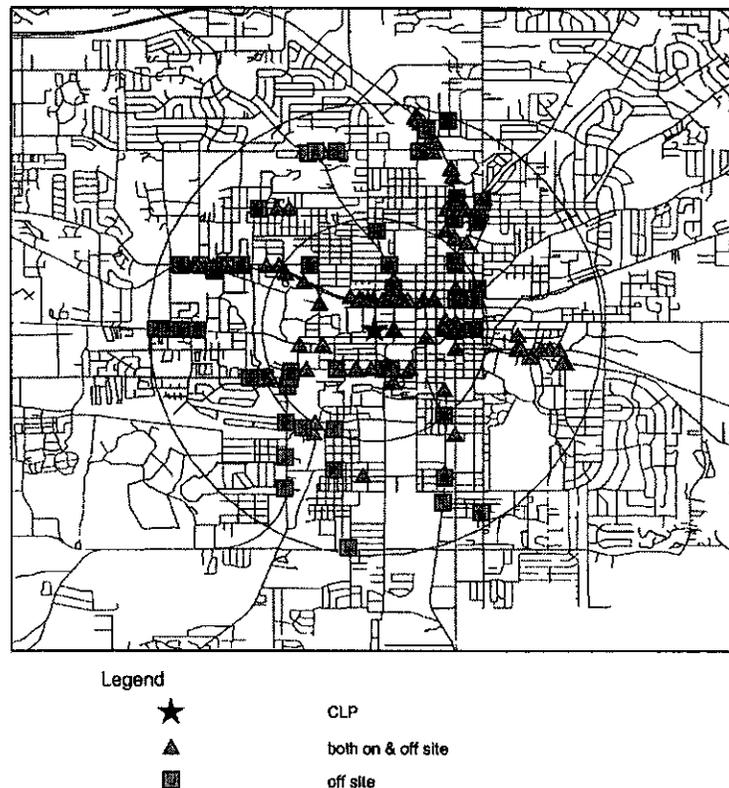


Fig 2 Study community with the highest alcohol outlet density

Table 2  
Drinking characteristics by site, *n* (%)<sup>a</sup>

	Site							
	A	B	C	D	E	F	G	H
<i>Drinking behavior</i>								
Heavy drinking	138 (41)	200 (36)	99 (39)	103 (36)	124 (37)	147 (37)	117 (37)	53 (27)
Frequent drinking	106 (31)	147 (26)	74 (29)	63 (21)	82 (24)	129 (32)	91 (29)	40 (19)
Drinking-related problems	116 (32)	136 (22)	87 (31)	88 (26)	102 (27)	127 (30)	109 (32)	44 (18)
Frequent drunkenness	142 (43)	226 (41)	93 (37)	73 (26)	131 (39)	180 (46)	116 (37)	40 (20)
Non "binge" drinking	90 (24)	198 (27)	111 (33)	120 (32)	116 (28)	113 (25)	109 (29)	125 (42)
Usually binges when drinks	184 (54)	323 (57)	138 (54)	158 (54)	187 (55)	217 (54)	145 (45)	78 (38)
Drinks to get drunk	240 (65)	390 (61)	167 (58)	163 (48)	221 (58)	262 (62)	225 (64)	112 (44)
Abstains	20 (5)	90 (12)	55 (16)	46 (12)	28 (7)	36 (8)	29 (8)	52 (17)

<sup>a</sup>Percentages may not add to 100 due to rounding error

party) for all drinkers ( $r = 0.82$ ,  $p = 0.01$ ), with several sites tied in rank. This finding was found to hold for multiple subgroups of students, specifically for men ( $r = 0.73$ ,  $p = 0.04$ ) and students who picked up binge drinking in college ( $r = 0.75$ ,  $p = 0.03$ ).

*Outlet density and frequent drinking* Outlet density was correlated with frequent drinking (i.e., drank on 10+ occasions in past 30 days) for all drinkers ( $r = 0.73$ ,  $p = 0.04$ ) where there were multiple ties in rank, non-Greek affiliated students ( $r = 0.75$ ,  $p = 0.03$ ), women ( $r = 0.72$ ,  $p = 0.04$ ), underage students ( $r = 0.79$ ,  $p = 0.02$ ) which had multiple ties, and students who picked up binge drinking in college ( $r = 0.84$ ,  $p = 0.01$ ).

*Outlet density and drinking-related problems* Finally, outlet density was correlated with problem drinking (i.e., reporting 5+ problems since the beginning of the school year) among all drinkers ( $r = 0.79$ ,  $p = 0.02$ ), women ( $r = 0.90$ ,  $p = 0.002$ ), underage students ( $r = 0.73$ ,  $p = 0.04$ ), underage students ( $r = 0.79$ ,  $p = 0.02$ ), and students who reported picking up binge drinking in college ( $r = 0.76$ ,  $p = 0.03$ ).

*Outlet density and student demographic characteristics* When ranked by prevalence, student demographic characteristics at the study sites were unrelated to the rank ordering of outlet density.

## Discussion

We found associations between outlet density, heavy and frequent drinking and drinking-related problems among all student drinkers and among several subgroups. These associations are notable. If outlet density were a trivial factor we might not expect it to influence less committed and/or experienced drinkers (i.e., women or students who report picking up binge drinking in college). In fact, it appears that the "wettest" communities may be particularly risky for young people whose drinking does not reflect entrenched high-risk patterns.

Thorough investigation of these associations and mechanisms underlying them are needed.

Several lessons were learned in this exploration. First, license categories vary considerably across state and local boundaries, challenging both researchers and policymakers. Development and adoption of a standardized licensing system may make sense. We also found considerable variation in the quality and currency of license information from local licensing boards. It was helpful to supplement these data with data from electronic and physical sources, including web site, yellow pages and business directories. A skilled local evaluation staff was instrumental to both the creation of a license typology that could be applied across sites, and the collection of reliable local data.

Given the small sample of this study it will be important to take a broader more comprehensive look using national data. That larger look will address some of this study's limitations. We used an analytic technique appropriate for nonparametric data and small sample sizes. This technique did not allow us to control for other variables. We limited the chance that our findings were due to differences in underlying student characteristics by testing whether outlet density and student sample characteristics were related and confounding the observed relationships. They were not. Future work using a national survey sample will use multivariate multilevel methods to account for individual and community characteristics.

Cross-sectional data like ours constrain us from making causal inferences about the relationship between outlet density and drinking. While we cannot determine the chronological order of supply and demand patterns at these sites, it is unlikely that supply fully followed demand. AMOD sites were selected based on their very high levels of heavy episodic or binge drinking—levels that had been in place for several years as have their patterns of bar and alcohol outlet density. Finally, we used as our outlet measure total density within a

bounded geographic area specific to the AMOD college towns and students. This made sense for our purposes but findings cannot be generalized to other settings or populations.

#### Acknowledgements

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#### References

- Chaloupka, F J, Wechsler, H, 1996 Binge drinking in college: the impact of price, availability, and alcohol control policies. *Contemporary Economic Policy* 14 (4), 112–124.
- Chaloupka, F J, Grossman, M, Saffer, H, 1998 The effects of price on the consequences of alcohol use and abuse. *Recent Developments in Alcoholism* 14, 331–346.
- Douglas, K A, Collins, J L, Warren, C, Kann, L, Gold, R, Clayton, S, Ross, J G, Kolbe, L J, 1997 Results from the 1995 National College Health Risk Behavior Survey. *Journal of American College Health* 46 (2), 55–66.
- Environmental Systems Research Institute, Inc, © 2000 ArcView 3.1 [Computer Software] Redlands, CA.
- Gruenewald, P J, Millar, A B, Roeper, P, 1996 Access to alcohol: geography and prevention for local communities. *Alcohol Health & Research World* 20 (4), 244–251.
- Johnston, L D, O'Malley, P M, Bachman, J G, 1999 National Survey Results on Drug Use from the Monitoring the Future Study, 1975–1998. Vol II College Students and Young Adults. NIH Publication number 99–4661. National Institute on Drug Abuse, Bethesda, MD.
- Presley, C A, Meilman, P W, Cashin, J R, Lyster, R, 1996 Alcohol and Drugs on American College Campuses: Use, Consequences, and Perceptions of the Campus Environment. Vol IV 1992–94. Southern Illinois University, Carbondale, IL.
- SAS Institute, Inc, © 1999–2000 The SAS System Version 8.1 [Computer Software] Cary, NC.
- Scribner, R A, Cohen, D A, Fisher, W, 2000 Evidence of a structural effect for alcohol outlet density: a multilevel analysis. *Alcoholism: Clinical and Experimental Research* 24 (2), 188–195.
- Wechsler, H, Davenport, A, Dowdall, G, Moeykens, B, Castillo, S, 1994 Health and behavioral consequences of binge drinking in college: A national survey of students at 140 campuses. *Journal of the American Medical Association* 272 (21), 1672–1677.
- Wechsler, H, Dowdall, G W, Maenner, G, Gledhill-Hoyt, J, Lee, H, 1998 Changes in binge drinking and related problems among American college students between 1993 and 1997. Results of the Harvard School of Public Health College Alcohol Study. *Journal of American College Health* 47 (2), 57–68.
- Wechsler, H, Kuo, M, Lee, H, Dowdall, G W, 2000a Environmental correlates of underage alcohol use and related problems of college students. *American Journal of Preventive Medicine* 19 (1), 24–29.
- Wechsler, H, Lee, J E, Kuo, M, Lee, H, 2000b College binge drinking in the 1990s: a continuing problem. Results of the Harvard School of Public Health 1999 College Alcohol Study. *Journal of American College Health* 48 (5), 199–210.
- Weitzman, E R, Kawachi, I, 2000 Giving means receiving: the protective effect of social capital on binge drinking on college campuses. *American Journal of Public Health* 90 (12), 1936–1939.



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## Secondhand effects of student alcohol use reported by neighbors of colleges: the role of alcohol outlets

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### Abstract

This is a study of the secondhand effects of student alcohol use experienced by residents of neighborhoods near college campuses. We examined the relationship of a college's level of binge drinking and the number of alcohol outlets in the immediate area, to lowered quality of neighborhood life through such secondhand effects. Adults from 4661 households in the United States were interviewed through a stratified list-assisted random digit dialing telephone survey. The interview schedule included questions about residents' experiences of secondhand effects of alcohol use such as noise, vandalism or public disturbances. Reports about the quality of neighborhood life provided by respondents residing near colleges were compared with those of respondents who did not live near colleges, and reports of neighbors of colleges with high rates of binge drinking were compared with those of neighbors of colleges with lower rates. The presence of alcohol outlets in these areas was also compared. Residents near colleges and particularly near colleges with heavy episodic drinking reported the presence of more alcohol outlets within a mile. Those neighborhoods were characterized by lower socioeconomic status. Neighbors living near college campuses were more likely to report a lowered quality of neighborhood life through such secondhand effects of heavy alcohol use as noise and disturbances, vandalism, drunkenness, vomiting and urination. A path analysis indicated that the number of nearby alcohol outlets was an important factor mediating the relationship between colleges, especially those with high rates of binge drinking, and such secondhand effects. The results suggest that neighborhood disruptions around colleges due to heavy alcohol use may be reduced by limiting the presence of alcohol outlets in those areas, and the marketing practices that this engenders. © 2002 Elsevier Science Ltd. All rights reserved.

*Keywords:* Neighborhood, College students, Alcohol use, Environment, Alcohol-related disruption, Alcohol outlet density, Socioeconomic status, USA

### Introduction

In 1993, the Harvard School of Public Health College Alcohol Study (CAS) found that two in five US college students were binge drinkers (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994) and this rate

remained constant in two follow up surveys (1997 and 1999) over a 6-year period (Wechsler, Dowdall, Maenner, Gledhill-Hoyt, & Lee, 1998, 2000a). Among the problems associated with these high levels of alcohol use are what we have termed "secondhand" effects. Wechsler, Moeykens, Davenport, Castillo, and Hansen (1995b) found that non-binge drinking students residing on campuses where more than half of students were binge drinkers were twice as likely to experience secondhand effects than non-binge drinkers living on campuses with

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fewer binge drinkers. These secondhand effects include having sleep or study interrupted, having to take care of a drunken student, being insulted or assaulted, being the victim of unwanted sexual advances, or having personal property vandalized.

Heavy alcohol consumption by college students and others may be encouraged by a “wet” environment, that is, an environment in which alcohol is prominent and easily accessible (Edwards et al., 1995). Physical, social, and economic availability of alcohol is associated with alcohol consumption among the general population (Parke, Wolz, & Harford, 1978; Rush, Steinberg, & Brook, 1986; Abbey, Scott, Olinsky, Quinn, & Andreski, 1990; Abbey, Scott, & Smith, 1993; Gruenewald, Madden, & Janes, 1992; Gruenewald, Miller, & Treno, 1993) and among young adolescents and older teenagers (O’Malley & Wagenaar, 1991; Wagenaar, 1993; Wagenaar et al., 1996; Jones-Webb et al., 1997). High density of alcohol outlets has been found to be associated with higher rates of alcohol-related health and social problems such as homicide (Scribner, Cohen, Kaplan, & Allen, 1999), assaultive violence (Alaniz, Parker, Gallegos, & Cartmill, 1996; Alaniz, Cartmill, & Parker, 1998; Gorman, Speer, Labouvie, & Subaiya, 1998a; Scribner, MacKinnon, & Dweyer, 1995; Speer, Labouvie, & Ontkush, 1998), domestic violence (Gorman, Labouvie, Speer, & Subaiya, 1998b), traffic safety outcomes (Rabow & Watts, 1982; Jewell & Brown, 1995; Scribner et al., 1994), and mortality, morbidity and economic costs (Tatlow, Clapp, & Hohman, 2000; Mann, Smart, Anglin, & Adlaf, 1991; Rabow & Watts, 1982; Scribner, Cohen, & Farley, 1998; Gorsky, Schwartz, & Dennis, 1988; Smart, Mann, & Suuivali, 1998). Alcohol outlets and advertising appear to be over-concentrated in ethnic minority communities (Alaniz, 2000; Hackbarth, Silvestri, & Cosper, 1995; Altman, Schooler, & Basil, 1991; LaVeist and Wallace, 2000), implying that it is necessary to understand the socio-demographic and economic background of a community in coping with drinking problems.

As Gruenewald and others (1995) have pointed out, most of these studies find relationships between outlets, demographics, and drinking patterns, but most do not provide a theoretical basis for understanding such interrelations. One such theoretical approach receiving increased attention recently is the “routine activities” theory (Fox & Sobol, 2000). Most commonly applied to crime victimization, routine activity theorists find that more frequent “going out” increases one’s risk of victimization (Mustaine & Tewksbury, 1998). In the context of college drinking, one might argue that high rates of heavy drinking and alcohol-related problems among college students are “simply” the result of their frequent and routine activity of going out, particularly to bars and nightclubs. Thus, just as time spent walking the street increases exposure to risk of (one type of)

assault, time spent in bars increases exposure to the risk of experiencing secondhand effects of heavy drinking. The point remains, however, that a high density of bars and clubs around campuses may encourage heavier drinking among students.

Alcohol use rates and related problems have been reduced by strategies to restrict alcohol availability. Coate and Grossman (1988) reported that as alcohol excise taxes increased, youth drinking rates and deaths resulting from motor vehicle accidents significantly decreased. O’Malley and Wagenaar (1991) found that as states increased minimum drinking age laws, alcohol use and problems associated with it significantly decreased. Chiu, Perez, and Parker (1997) reported that an alcohol ban, its lifting, and its re-imposition had statistically significant effects on the number of alcohol-related outpatient visits in a geographically isolated community. Restrictive alcohol control policies significantly affected injury death rates in a population with extremely high injury mortality (Berman, Hull, & May, 2000).

Colleges with large numbers of binge drinkers are characterized by greater visibility and availability of alcohol in their environment. College students’ binge drinking is associated with the degree of ease of access to alcohol (Wechsler, Kuo, Lee, & Dowdall, 2000b), location of a bar within a mile from campus (Wechsler et al., 1994), price (Chaloupka, Grossman, & Saffer, 1998; Wechsler et al., 2000b), and state alcohol control policies (Chaloupka et al., 1998).

Clearly, drinking levels and rates of alcohol-related problems are associated with state and local policies as well as alcohol availability, price, and marketing practices. For many dimensions of the policy and marketing environment (e.g., alcohol taxes, drinking age), we know that the causal influence runs from policy to drinking. For others (e.g., outlet density), the causal influences may be reciprocal, with the environment encouraging drinking, and heavy drinking encouraging deterioration of the community environment. The current study examines the interrelationships between a community environment that encourages drinking and a concentration of heavy drinkers (on college campuses) that shape the community environment. Specifically, we used surveys of community residents around colleges, along with surveys of student behavior on those campuses to answer the following questions:

- Are there more alcohol outlets in neighborhoods near colleges than in similar neighborhoods which are not near colleges?
- Do residents living in communities near a college experience more secondhand effects of alcohol use than residents of similar areas not near a college?
- Are the increased secondhand effects related to more alcohol outlets near a college?

- Do residents of areas near colleges with high levels of binge drinking experience more secondhand effects than residents of areas near colleges with low levels of binge drinking?

## Methods

### *Study procedure*

We conducted a telephone survey of adult residents of the contiguous United States plus the District of Columbia using a stratified list-assisted random digit dialing (RDD) sample purchased from Genesys Sampling Systems<sup>1</sup>. The list-assisted method used covers an estimated 96.5% of all households with telephones (Brick, Waksberg, & Starer, 1995). Actual coverage may be higher because the sample was selected at multiple points in time, so some households excluded early in the survey could have been included later on. Brick et al (1995) concluded that list-assisted RDD sampling is "efficient and not subject to important coverage bias".

The survey was conducted by Mathematica Policy Research of Princeton, NJ. The interview schedule included questions about residents' experiences of secondhand effects of heavy alcohol use such as noise, vandalism or public disturbances. Questions were patterned after those included in the Harvard School of Public Health College Alcohol Study student questionnaire (Wechsler, Dowdall, Davenport, & Castillo, 1995a; Wechsler, Kelly, Weitzman, Giovanni, & Sebring, 2000a). Respondents were also asked about their views on alcohol control policies, as well as personal background characteristics. The schedule was pre-tested on a small sample of respondents residing near colleges that were not part of the sampling frame. Minor revisions were done as a result of the pretest.

Survey interviews were conducted between March and August 1999. Up to 15 calls were attempted to obtain a completed interview for each sampled telephone number. English-speaking adults (age 18 and above) living in a household setting who were not full-time college students were eligible for the survey. In households with more than one eligible adult, one was randomly selected for the interview. Interviews were conducted by trained interviewers using conventional Computer Assisted Telephone Interviewing (CATI) methods.

A total of 9248 telephone numbers were called, with 4661 households identified. Of these, 2621 were study eligible and 2300 were successfully interviewed, yielding a completion rate of 86% and an estimated overall response rate of 50% using methods recommended by

<sup>1</sup>List assisted RDD sampling methods are described in Lepkowski (1988).

the Council of American Survey Research organizations (CASRO, Frankel, 1983). Despite the level of response, a comparison of selected demographic characteristics of the respondents with US census data indicated no significant differences, providing no strong evidence of selection bias on the basis of these variables.

### *Sampling design*

We defined 7 strata for sample selection. Strata 1–4 included areas near high and low binge schools. A high binge school is one of the 30 schools with the highest prevalence of binge drinking among the 116 colleges participating in the 1997 Harvard School of Public Health College Alcohol Study (CAS). Similarly, a low binge school is one of the 30 schools that were lowest in the prevalence of binge drinking (Wechsler et al., 1998). The high binge areas include strata 1 (published numbers) and 2 (unpublished). The low binge areas are covered by strata 3 (published) and 4 (unpublished). More precisely, strata 1 and 2 included telephone numbers associated with census tracts that were estimated to be within a 1 mile radius of colleges that had been classified as high binge drinking schools. Strata 3 and 4 were similarly near colleges that had been classified as low binge drinking schools. Published and unpublished refer to whether a household's telephone number appeared in the telephone directory. Published numbers were assigned to stratum 1 or 3 based on their street addresses. Unpublished numbers were assigned to stratum 2 or 4 if they belonged to a telephone exchange where at least 30% of the published numbers were assigned to stratum 1 or 3, respectively.

Strata 5 and 6 included households in counties that have colleges on the sample frame used in selecting the sample for the earlier student survey. Stratum 7 is the balance of the US. More specifically, stratum 5 included other counties with colleges provided the county had a large enough population to be selected with certainty when using probability proportional to size (PPS) methods. Stratum 6 included any other counties with one or more colleges on the sample frame. Stratum 7 comprised counties with no college on frame.

Telephone numbers in strata 1–4 also could have been sampled in either stratum 5 or 6. These multiple chances of selection were accounted for in sample weighting. The sample is a multistage design. Within strata 1, 2, 3, and 4 the primary sampling unit (PSU) is the college and the surrounding area. For stratum 6 the PSU is the county. In each case the secondary sampling unit is the household. The samples of households in strata 5 and 7 are not likely to be clustered.

Data were weighted to reflect differences in probability of selection and response rates across strata. Other components of the weights included adjustments for multiple telephone lines and for interruptions in

telephone service,<sup>2</sup> and post-stratification adjustments to national estimates of the population distribution by sex, age, race and home ownership.<sup>3</sup> All analyses were conducted using weighted data.

### Measures

Almost all of the measures in the study were obtained from responses to the completed interviews. Respondents were asked if they have seen or witnessed negative consequences of others' drinking (litter, noise or disturbance, vandalism, people who are drunk, fighting or assault on others, vomit or urination, and automobile accidents) one or more times in their neighborhood in the past year (secondhand effects). The number of neighbors experiencing four or more of these secondhand effects was examined. The secondhand effects were broken down into the incidents attributed to college students by asking if the college students were primarily responsible for the incident.

Community problems were measured by asking respondents if they thought neighborhood concerns and issues were a major problem or a problem in their neighborhood. Neighborhood concerns and issues included homelessness, crime, public drunkenness, drug use, vandalism, drunk driving, underage drinking, and loitering.

Respondents were asked to estimate the distance of the nearest college from their home: "How many miles from your home is the closest college or university (Please exclude community college in your answer)?" They were also asked to estimate how many alcohol outlets (on-premise and off-premise, separately) were located within 1 mile of their home.

In addition to survey data, we also used some variables from census data. Of the community background variables, estimates of income, racial composition, home ownership and age distribution were estimates at the telephone exchange level provided by Genesys Sampling Systems (Marketing Systems Group) or the US Census Bureau.

<sup>2</sup>Adjustments for interruption in telephone service allow the survey to compensate for the omission of non-telephone households. Very few households without telephone service on a given day never have telephone service. Most fall into what Keeter (1995) calls the "transient" category—having service some times and being without at others. By using a weight adjustment factor that is proportional to the number of months without telephone service, the transient telephone household population can be appropriately represented in sample estimates.

<sup>3</sup>Adjustments for home ownership were based on estimates provided by the sample vendor, Genesys Sampling Systems (Marketing Systems Group). Adjustments for age, race and sex were based on Census Bureau projections (Bureau of the Census, 2000).

### Analysis

SUDAAN V 7.5 (Shah, Barnwell, & Bieler, 1997) was used for all Chi-square tests and multiple logistic regression analyses. SUDAAN employs a Taylor series linearization to approximate correct standard errors for sample estimates given the multistage sampling design of the survey and the effects of sample weighting.  $2 \times 2$  Chi-square tests were used to examine the difference in socioeconomic backgrounds between communities defined by the distance (within and farther than 1 mile) from the closest college. Multiple logistic regressions were conducted to test if reported secondhand effects of drinking attributable to college students differed among residents of high and low heavy-episodic drinking school areas, and whether secondhand effects varied depending on the distance from the closest college. The logistic regressions controlled for socioeconomic background variables estimated at the telephone exchange level (racial composition, % income 0–10k, % owner occupied, % age 18–24, and rural/urban).

We used structural equation models to examine how the distance from the closest college or the college binge drinking rate is related to numbers of alcohol outlets and the number of secondhand effects (controlling community's socioeconomic characteristics). We created an index of socioeconomic status reflecting race, income, home ownership, and population age distribution to simplify the model and avoid potential multicollinearity. When we conducted the path analysis, we assumed a unidirectional causal relationship between alcohol outlets and the environment even though there was the possibility of a bi-directional relationship between the two. Since our major concern through the path model was to determine the mediating role of alcohol outlets between college binge drinking and secondhand effects, we used a recursive rather than non-recursive model. The initial path model was based on our hypotheses. Fit of the model was evaluated by comparative fit index (CFI), Bentler and Bonett's (1980) non-normed fit index (NNFI), Bentler and Bonett's (1980) normed fit index (NFI), and the Chi-square goodness of fit. The statistical viability of the restrictions in the model was determined by Lagrange Multiplier test. The SAS CALIS procedure was used for structural equation modeling (Hatcher, 1994).

### Results

#### *Community Background*

Income was significantly lower among respondents living within a mile than those living more than 1 mile from a college (Table 1). More African Americans, fewer whites, and, as expected, more young people aged 18–24

Table 1  
Socioeconomic characteristics of community by distance from college

	Prevalence in (%)			Chi-square <i>p</i> -value
	Total	More than 1 mile <sup>a</sup> ( <i>n</i> = 1692)	Within a mile <sup>a</sup> ( <i>n</i> = 526)	
More than 10% of households have annual income less than \$10,000				
Yes	56.2	53.8	72.7	0.0005
No	43.8	46.2	27.3	
More than 12% of individuals are African American (non-Hispanic)				
Yes	31.0	28.8	46.6	0.0028
No	69.0	71.2	53.4	
More than 11% of individuals are Hispanic				
Yes	28.4	27.7	33.1	0.3095
No	71.6	72.3	66.9	
More than 71% of individuals are White (non-Hispanic)				
Yes	61.8	64.3	43.9	0.0009
No	38.2	35.7	56.1	
More than 50% of housing units are owner occupied				
Yes	84.9	87.7	65.4	0.0001
No	15.1	12.3	34.6	
More than 10% of individuals are age 18–24				
Yes	20.9	17.4	38.8	<0.0001
No	79.1	82.6	61.2	

<sup>a</sup> Respondent's estimate of distance of home from college  
*n* = valid sample size

lived within a mile from the college. Areas within a mile of a college had a lower prevalence of homeowners.

On-premise (bars/nightclubs) and off-premise (liquor stores) alcohol outlets were more often located within a mile from a college. Ninety-two percent of residents living within a mile from the closest college reported one or more alcohol outlets within a mile from their house compared to 75% of those who lived more than 1 mile away. After controlling for income, race, urbanism, and home ownership, respondents who lived within a mile from the nearest college were significantly more likely to report the presence of alcohol outlets nearby (adjusted OR = 2.83, 95% CI 1.47–5.47, *p* < 0.001, Table 2).

Community problems reported by respondents are presented in Table 3. Community problems reported most frequently were underage drinking (60.8%), crime (55.6%), vandalism (52.3%), and drunk driving (47.9%). Neighbors who lived within a mile from a college more often reported homelessness, crime, public drunkenness, drug use, underage drinking, and loitering than those living one or more miles from a college (Table 3).

#### Distance from college and secondhand effects

Respondents who lived within 1 mile from a college were significantly more likely to report noise and

disturbances, vandalism, drunkenness, and vomit and urination than those living more than a mile from the school. They were significantly more likely to report four or more such effects (Table 4).

College students were not viewed as primarily responsible for most of these secondhand effects. Only about one-fourteenth of the respondents viewed college students to be responsible for vomit/urination (7.8%), noise/disturbance (6.9%), fighting/assault (6.3%), and litter (6.1%). College students were more often viewed to be responsible for litter, noise/disturbance, vandalism, and drunkenness by respondents living within 1 mile from a college, than by those living more than a mile from the school. One in five (19.5%) respondents who lived within a mile from a college viewed college students to be responsible for at least one such effect, while one in twelve (8.3%) living more than a mile away did. Those who lived within a mile were significantly more likely to report at least one of these effects.

#### Secondhand effects in low and high binge drinking college sites

While more respondents in high binge drinking school areas than in low binge drinking areas reported the presence of alcohol outlets within a mile of their homes

Table 2  
Presence of alcohol outlets by distance of respondent's home from college

	More than 1 mile <sup>a</sup> ( <i>n</i> = 1692)	Within a mile <sup>a</sup> ( <i>n</i> = 526)		
	(%)	(%)	Adjusted ORs (95%CI) <sup>b</sup>	
Presence of bar/nightclub <sup>c</sup>	49.8	73.9	2.17	(1.32–3.57)***
Presence of liquor store	52.4	77.3	2.33	(1.32–4.17)***
Presence of other store that sells alcohol	63.9	74.2	1.20	(0.75–1.92)
Presence of any one of above alcohol outlets	74.9	92.1	2.83	(1.47–5.47)***

<sup>a</sup> Respondent's estimate of distance of home from closest college

<sup>b</sup> ORs are adjusted for % income, % race, rural/urban and % owner occupied OR = odds ratio 95% CI = 95% confidence interval

<sup>c</sup> One or more self-reported alcohol outlets within 1 mile from house

\*\*\**p* < 0.001, *n* = valid sample size

Table 3  
Reported community problems by distance of respondent's home from college

	More than 1 mile <sup>a</sup> ( <i>n</i> = 1692)	Within a mile <sup>a</sup> ( <i>n</i> = 526)		
	(%)	(%)	Adjusted ORs (95%CI) <sup>b</sup>	
Community problems <sup>c</sup>				
Homelessness	19.1	35.1	1.82	(1.11–3.03)*
Crime	53.7	68.4	1.75	(1.12–2.78)**
Public Drunkenness	30.3	43.1	1.61	(1.01–2.56)*
Drug use	44.7	58.8	1.67	(1.04–2.70)*
Vandalism	51.4	58.5	1.33	(0.87–2.04)
Drunk driving	48.0	47.2	1.09	(0.72–1.64)
Underage drinking	59.5	69.9	1.64	(1.05–2.50)*
Loitering	34.6	54.1	1.92	(1.23–2.94)***
Four or more problems reported	44.0	59.7	1.89	(1.22–2.94)***

<sup>a</sup> Respondent's estimate of distance of home from closest college

<sup>b</sup> ORs are adjusted for % income, % race, % age 18–24, rural/urban, and % owner occupied OR = odds ratio 95% CI = 95% confidence interval

<sup>c</sup> % reporting this as a problem

\**p* < 0.05, \*\**p* < 0.01, \*\*\**p* < 0.001, *n* = valid sample size

(90.3% vs 82.1%, adjusted OR = 2.33, 95% CI 1.45–3.70, *p* < 0.001), no significant difference in socioeconomic status was found between the two school areas.

Respondents who lived in high-binge school areas more often reported litter and noise/disturbance by college students than those in low-binge drinking school areas (Table 5). One in five (18.6%) respondents in high-binge drinking school sites reported at least one such secondhand effect, compared to only one in ten respondents in low-binge school areas.

#### *Role of alcohol outlets as mediating factor*

We conducted a path analysis to explore the degree to which alcohol outlets mediate the relationship between college factors (distance from college and college binge drinking levels) and the secondhand effects (Fig. 1). The Chi-square statistic was not significant and the CFI, NNFI, and NFI all exceeded 0.98, indicating the model fits the observed data well. All path coefficients shown

were significant at *p* < 0.05. Distance from the closest college and college binge drinking level had an indirect effect on rates of secondhand problems through the number of alcohol outlets in the area. No direct effect of distance from a college on secondhand problems was found. Socioeconomic status had both direct and indirect effects on secondhand problems. The indirect or mediated effects of college, student drinking, and socioeconomic status on secondhand problems is stronger than direct effects, indicating that the presence of alcohol outlets appears to be essential for colleges and their binge drinking students to have a significant effect on neighborhood disruption.

#### Discussion

A survey of a national sample of households revealed significant correlations between the distance from the nearest college and such secondhand effects of heavy

Table 4  
Reported secondhand effects of alcohol by distance of respondent's home from college

	More than 1 mile <sup>a</sup> ( <i>n</i> = 1692)		Within a mile <sup>a</sup> ( <i>n</i> = 526)	
	(%) <sup>0</sup>		(%)	ORs (95%CI) <sup>b</sup>
<b>Secondhand effects<sup>c</sup></b>				
Litter	72.8		79.3	1.22 (0.76–2.00)
Noise or disturbance	53.4		70.8	1.72 (1.10–2.70)*
Vandalism	31.7		48.7	2.00 (1.27–3.23)***
People who are drunk	35.6		58.5	2.00 (1.22–3.33)**
Fighting or assault to others	17.8		28.5	1.41 (0.85–2.38)
Vomit or urination	10.5		32.2	2.70 (1.54–4.76)***
Automobile accident or others	40.2		46.1	1.19 (0.78–1.79)
Four or more problems observed	30.8		53.2	2.00 (1.25–3.23)***
<b>College student-attributed secondhand effects<sup>d</sup></b>				
Litter	5.2		11.9	2.27 (1.09–4.76)*
Noise or disturbance	6.0		11.8	2.63 (1.20–5.88)*
Vandalism	1.7		8.9	5.00 (1.39–16.67)**
People who are drunk	4.3		12.5	2.94 (1.19–7.14)*
Fighting or assault to others	4.9		12.2	3.45 (0.81–14.29)
Vomit or urination	5.1		13.8	3.23 (0.75–14.29)
Automobile accident or others	3.2		5.4	2.27 (0.54–10.00)
Any one of above problems	8.3		19.5	2.78 (1.54–50.00)***

<sup>a</sup> Respondent's estimate of distance of home from college

<sup>b</sup> ORs are adjusted for % income, % race, and % owner occupied OR = odds ratio 95% CI = 95% confidence interval

<sup>c</sup> % reporting observing event one or more times

<sup>d</sup> % who observed event and attributed it to college students

\**p* < 0.05, \*\**p* < 0.01, \*\*\**p* < 0.001, *n* = valid sample size

Table 5  
Secondhand effects attributed to college students by respondents near high and low binge level colleges

	Low binge drinking school site ( <i>n</i> = 817)		High binge drinking school site ( <i>n</i> = 490)	
	(%)		(%)	Adjusted ORs (95%CI) <sup>a</sup>
<b>College student-attributed secondhand effects<sup>b</sup></b>				
Litter	4.7		15.8	3.36 (1.77–6.40)***
Noise or disturbance	8.3		13.9	1.97 (1.12–3.44)*
Vandalism	2.8		7.4	2.70 (0.76–9.68)
People who are drunk	7.9		15.8	2.32 (0.98–5.83)
Fighting or assault to others	4.0		5.8	1.60 (0.40–6.34)
Vomit or urination	1.1		8.7	3.93 (0.85–18.10)
Automobile accident or others	2.5		2.4	1.05 (0.32–3.44)
Any one of above problems	10.3		18.6	2.11 (1.21–3.68)**

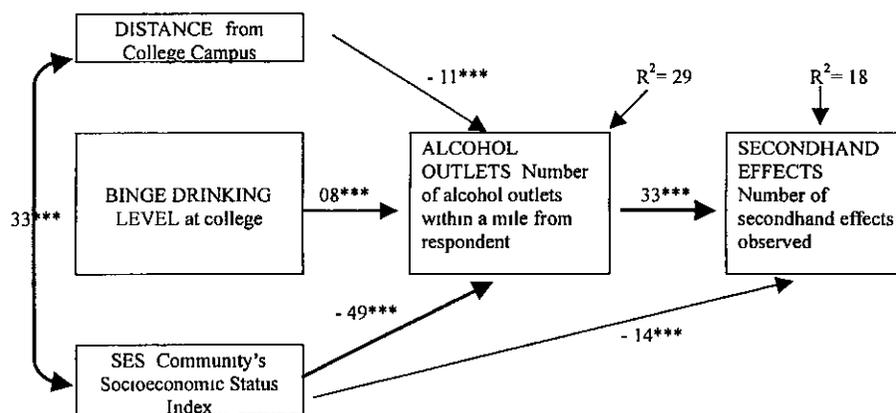
<sup>a</sup> ORs are adjusted for % income, % race, and % owner occupied OR = odds ratio 95% CI = 95% confidence interval

<sup>b</sup> % who observed event and attributed it to college students

\**p* < 0.05, \*\**p* < 0.01, \*\*\**p* < 0.001, *n* = valid sample size

alcohol use as noise, litter, and vandalism. Respondents residing near a college were at higher risk of experiencing such secondhand effects. They were also more likely to have alcohol outlets located near them. Path analysis indicated that residing near a college does not appear to be sufficient for experiencing high rates of secondhand problems. The colleges' contribution to neighborhood

problems appears to operate through the presence of alcohol outlets. Our findings suggest that alcohol outlets are more often located in areas near colleges, particularly those with high rates of binge drinking. Community residents in these areas are likely to experience higher rates of neighborhood disruption. Such an interpretation is consistent with the literature on alcohol



\*\*\*  $p < 0001$

$\chi^2(2) = 4.9661, p = 0.08, CFI = 0.9964, NNFI = 0.9822, \text{ and } NFI = 0.9941$

Valid samples = 2,206

Fig 1 Reduced path model of secondhand effects

outlet density in general, which finds that higher outlet densities increase perceived availability of alcohol, lower retail price through increased competition, lower total cost to the drinker (including travel time), increases consumption of alcohol, and increases violence and other crime and disruption associated with drinking (Abbey et al, 1990, Alaniz et al, 1998, Scribner, Cohen, & Fisher, 2000, Berman et al, 2000). Given the cross-sectional design of the current study, we cannot answer the question of which came first: Does the presence of a college, especially with a high rate of heavy drinking, encourage more alcohol outlets? Or does the presence of many competing alcohol outlets encourage high rates of heavy drinking by the students of the nearby college? Our results suggest however, that rates of neighborhood disruption around colleges may be significantly reduced by limiting the presence of alcohol outlets in those areas.

Other factors contribute to the presence of alcohol outlets around many colleges. Our results indicate neighborhoods near colleges are more likely to be lower socioeconomic areas. These conditions might increase the ease of obtaining alcohol licenses, and produce a higher presence of outlets. Others have reported particularly high rates of alcohol outlet density in poor urban areas (Goiman & Speer, 1997, LaVeist & Wallace, 2000), and residents of these neighborhoods are more likely to report a range of social problems such as homelessness, crime, public drunkenness and loitering.

Current attempts to change student behavior through education and brief motivational techniques are among the main interventions colleges are using to reduce heavy drinking. Results of this study suggest that dealing with

the high density of alcohol outlets and the marketing practices this engenders in neighborhoods immediately surrounding campuses may also be an important strategy. Strictly limiting licenses for new outlets and phasing out licenses of establishments that repeatedly violate serving and marketing regulations are means to reducing alcohol outlets. In many communities, half of all alcohol outlets regularly violate laws against selling or serving alcohol to those under the legal drinking age (Forster, Murray, Wolfson, & Wagenaar, 1995), and a recent study revealed three-quarters of outlets violate laws prohibiting sales to patrons who already show signs of obvious intoxication (Toomey et al, 1999). Active enforcement of these laws is needed through regular compliance checks of all alcohol outlets, especially in college areas where sales to minors and sales to intoxicated infractions may be particularly prevalent. Such enforcement has immediate benefits in reducing risky sales practices (Jeffs & Saunders, 1983, Preusser, Williams, & Weinstein, 1994), and may have further benefits via the revocation of the licenses of particularly problem-prone outlets, and a gradual reduction in alcohol outlets in college neighborhoods. Residents who suffer the secondhand effects of heavy drinking can be enlisted in this effort, using a type of 'neighborhood watch' operation. Raising licensing fees and alcohol taxes to pay for the prevention and cleanup of neighborhood disruption should be considered, especially since substantial majorities of the US general population support such policies (Wagenaar, Harwood, Toomey, Denk, & Zander, 2000).

Another noteworthy finding suggests that lower socioeconomic conditions around college campuses

may contribute to the presence of alcohol outlets. Disadvantaged neighbors may be less able to prevent the granting of licenses to sell alcohol. This may be part of a vicious circle: lower socioeconomic status near colleges may result in more alcohol outlets, more alcohol outlets may lead to more secondhand effects, and more secondhand effects may contribute to decreased real estate values and still lower SES. Efforts should be focused on how to disconnect the vicious circle.

A few cautions are important to consider when interpreting data from this study. The results are based on a telephone survey, and are subject to the limitations inherent in such methods. Persons without telephones cannot be part of the sample. However, in a large scale general population survey with adequate coverage and response rate the results for those who have phones were found to not differ significantly from those of the population as a whole (Aday, 1989). Sample attrition also occurs because of failure to obtain and complete interviews with the selected telephone numbers. The response rate of 50% may have introduced sampling bias. However, a comparison of selected demographic characteristics of the respondents with US census data indicated no significant differences. While other sources of bias may exist, the sample of respondents matches the characteristics of the general population.

In addition to possible sampling bias, self-reports may introduce a whole set of measurement error components (Del Boca & Noll, 2000). However, such errors are likely to be random, and should not alter the nature of the relationships. Since we examined relationships at the aggregate or neighborhood level, estimates of a college's heavy drinking rate or a neighborhood's alcohol outlets and level of alcohol-related disruption represent an average for overall respondents at that site, by which the potential measurement errors may be averaged out.

In our study, distance from the nearest college, and number of alcohol outlets within a mile of home were based on respondents' estimates rather than physical measures, and may not exactly reflect real distances and actual number of outlets. However, using an administrator survey developed to obtain information on campus alcohol policies from deans of students or other administrators, Wechsler, Lee, Kuo and Lee (2000c) also found a statistically significant association of campus drinking levels with administrators' report of alcohol outlets located within a mile of their college. These consistent results using reports of distance from nearest alcohol outlet obtained from two different types of respondents serve to validate the measure. Furthermore, while not reflecting actual miles, respondents may be reporting the number of alcohol outlets within the area that they perceived as "their neighborhood".

One possible source of error that may not be random, relates to the drinking behavior of respondents. It is possible that respondents who drank more frequently

were more aware of the outlets in their environment, and could provide more accurate, and probably fuller counts of them. Although we included questions about respondents' drinking behavior, we could not control for this factor because of the large number of no answers to this question (45%). Since most analyses were conducted with dichotomous variables (no outlet vs some outlets), the potential confounding effect of this factor may be minimized, though not fully discounted.

Another limitation in interpreting the results of the study is the cross-sectional design. While complex and expensive, future studies are needed to examine the role of alcohol outlets in heavy drinking on college campuses which track changes over time in both drinking rates and the density and practices of alcohol outlets. The best opportunities for such studies are most likely situations in which there are major changes in law, regulation or economic conditions that result in substantial changes in alcohol outlets over a relatively short period of time. Controlled time-series studies (Biglan, Ary, & Wagenaar, 2000) of such natural experiments in select college communities may help further our understanding of the apparently important role alcohol outlets play in encouraging heavy drinking on college campuses.

#### Acknowledgements

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#### References

- Abbey, A., Scott, R. O., Olinsky, D. M., Quinn, B., & Andieski, P. M. (1990). Subjective, social, and physical availability: II. Their simultaneous effects on alcohol consumption. *International Journal of Addiction, 25*(9), 1011–1023.
- Abbey, A., Scott, R. O., & Smith, M. J. (1993). Physical, subjective, and social availability: Their relationship to alcohol consumption in rural and urban areas. *Addiction, 88*(4), 489–499.
- Aday, L. A. (1989). *Designing and conducting health surveys*. San Francisco, CA: Jossey-Bass Inc.
- Alaniz, M. L. (2000). Community-identified alcohol issues in the Mexican American community: Research design and utilization. *Substance Use and Misuse, 35*(1–2), 157–169.
- Alaniz, L. A., Cartmill, R. S., & Parker, R. N. (1998). Immigrant and violence: The importance of neighborhood context. *Hispanic Journal of Behavioral Sciences, 20*(2), 155–174.
- Alaniz, M. L., Parker, R. N., Gallegos, A., & Cartmill, R. S. (1996). *Alcohol outlet density and Mexican American youth violence*. Final Progress Report, Inter-University Program for Latino Research, The Ford Foundation.

- Altman, D G, Schooler, C, & Basil, M D (1991) Alcohol and cigarette advertising on billboards *Health Education Research Theory and Practice*, 6(4), 487-490
- Bentler, P M, & Bonett, D G (1980) Significance test and goodness-of-fit in the analysis of covariance structures *Psychological Bulletin*, 88, 588-606
- Berman, M, Hull, T, & May, P (2000) Alcohol control and injury death in Alaska native communities Wet, damp and dry under Alaska's local option law *Journal of Student Alcoholism*, 61(2), 311-319
- Biglan, T, Ary, D, & Wagenaar, A C (2000) The value of interrupted time series experiments for community intervention and policy research *Prevention Science*, 1(1), 31-49
- Brick, J M, Waksberg, J, Culp, D, & Starer, A (1995) Bias in list-assisted telephone samples *Public Opinion Quarterly*, 59, 218-235
- Bureau of the Census (2000) *Projections of The voting age population for November, 1998* Report P25, 1132, Government Printing Office
- Chaloupka, F J, Grossman, M, & Saffer, H (1998) The effects of price on the consequences of alcohol use and abuse *Recent Developments in Alcoholism*, 14, 331-346
- Chiu, A Y, Perez, P E, & Parker, R N (1997) Impact of banning alcohol on outpatient visits in Barrow, Alaska *Journal of the American Medical Association*, 278(21), 1775-1777
- Coate, D, & Grossman, M (1988) Effects of alcohol beverage prices and legal drinking ages on youth alcohol use *Journal of Student Alcoholism*, 48, 167-175
- Del Boca, F K, & Noll, J A (2000) Truth or consequences The validity of self-report data in health services research on addictions *Addiction*, 95(Suppl 3), S347-S360
- Edwards, G, Anderson, P, Babor, T F, Casswell, S, Ferrence, R, & Giesbrecht, N, et al (1995) *Alcohol policy and the public good* (pp 125-152) New York Oxford University Press
- Forster, J L, Murray, D M, Wolfson, M, & Wagenaar, A C (1995) Commercial availability of alcohol to young people Results of alcohol purchase attempts *Preventive Medicine*, 24, 342-347
- Fox, J G, & Sobol, J J (2000) Drinking patterns, social interaction, and barroom behavior A routine activities approach *Deviant Behavior*, 21(5), 429-450
- Frankel, L R (1983) The Report of the CASRO Task Force on Response Rates In F Wiseman (Ed), *Improving data quality in a sample survey* Cambridge, MA Marketing Science Institute
- Gorman, D M, Labouvie, E W, Speer, P W, & Subaiya, A P (1998a) Alcohol availability and domestic violence *American Journal of Drug Alcohol Abuse*, 24(4), 661-673
- Gorman, D M, & Speer, P W (1997) Concentration of liquor outlets in an economically disadvantaged city in the Northeastern United States *Substance Use and Misuse*, 32(14), 2033-2046
- Gorman, D M, Speer, P W, Labouvie, E W, & Subaiya, A P (1998b) Risk of assaultive violence and alcohol availability in New Jersey *American Journal of Public Health*, 88, 97-100
- Gorsky, R D, Schwartz, E, & Dennis, D (1988) The mortality, morbidity, and economic costs of alcohol abuse in New Hampshire *Preventive Medicine*, 17(6), 736-745
- Gruenewald, P J, Madden, P, & Janes, K (1992) Alcohol availability and formal power and resources of state alcohol beverage control agencies *Alcoholism Clinical & Experimental Research*, 16(3), 591-597
- Gruenewald, P J, Miller, A B, & Treno, A J (1993) Alcohol availability and the ecology of drinking behavior *Alcohol Health and Research World*, 17(1), 39-45
- Gruenewald, P J, Treno, A J, Nephew, T M, & Ponicki, W R (1995) Routine activities and alcohol use-constraints on outlet utilization *Alcoholism Clinical & Experimental Research*, 19(1), 44-53
- Hackbarth, D P, Silvestri, B, & Cospser, W (1995) Tobacco and alcohol billboards in 50 Chicago neighborhoods Market segmentation to sell dangerous products to the poor *Journal of Public Health Policy*, 16(2), 213-230
- Hatcher, L (1994) *A step-by-step approach to using the sas system for factor analysis and structural equation modeling* Cary, NC SAS Research Institute Inc
- Jeffs, B W, & Saunders, W M (1983) Minimizing alcohol related offences by enforcement of the existing licensing legislation *British Journal of Addiction*, 78, 67-77
- Jewell, R T, & Brown, R W (1995) Alcohol availability and alcohol-related motor vehicle accidents *Applied Economics*, 27, 759-765
- Jones-Webb, R, Toomey, T L, Short, B, Murray, D M, Wagenaar, A, & Wolfson, M (1997) Relationship among alcohol availability, drinking location, alcohol consumption, and drinking problems in adolescents *Substance Use and Misuse*, 32(10), 1261-1285
- Keeter, S (1995) Estimating noncoverage bias from a phone survey *Public Opinion Quarterly*, 59, 196-216
- LaVeist, T A, & Wallace Jr, J M (2000) Health risk and inequitable distribution of liquor stores in African American neighborhood *Social Science and Medicine*, 51(4), 613-617
- Lepkowski, J (1988) Telephone sampling methods in the United States In Robert M Groves, et al (Ed), *Telephone survey methodology* New York Wiley
- Mann, R E, Smart, R G, Anglin, L, & Adlaf, E M (1991) Reductions in cirrhosis deaths in the United States Associations with per capita consumption and AA membership *Journal of Student Alcoholism*, 52(4), 361-00365
- Mustaine, E E, & Tewksbury, R (1998) Predicting risks of larceny theft victimization—a routine activity analysis using refined lifestyle measures *Criminology*, 36(4), 829-857
- O'Malley, P, & Wagenaar, A C (1991) Effects of minimum drinking age laws on alcohol use, related behaviors, and traffic crash involvement among American youth 1976-1987 *Journal of Student Alcoholism*, 52, 478-491
- Parker, D A, Wolz, M W, & Harford, T C (1978) The prevention of alcoholism An empirical report on the effects of outlets availability *Alcoholism Clinical & Experimental Research*, 2(4), 339-343
- Preusser, D F, Williams, A F, & Weinstein, H B (1994) Policing underage alcohol sales *Journal of Safety Research*, 25, 127-133
- Rabow, J, & Watts, R K (1982) Alcohol availability, alcoholic beverage sales and alcohol-related problems *Journal of Student Alcoholism*, 43(7), 767-801
- Rush, B, Steinberg, M, & Brook, R (1986) The relationships among alcohol availability, alcohol consumption and

- alcohol-related damage in the province of Ontario and the state of Michigan 1955-1982 *Advances in Alcohol Substance Abuse*, 5(4), 33-45
- Scribner, R A, Cohen, D A, & Farley, T A (1998) A geographic relation between alcohol availability and gonorrhea rates *Sex Transmission Diseases*, 25(10), 544-548
- Scribner, R A, Cohen, D A, & Fisher, W (2000) Evidence of a structural effect for alcohol outlet density A multilevel analysis *Alcoholism Clinical & Experimental Research*, 24(2), 188-195
- Scribner, R, Cohen, D, Kaplan, S, & Allen, S H (1999) Alcohol availability and homicide in New Orleans Conceptual considerations for small area analysis of the effect of alcohol outlet density *Journal of Student Alcoholism*, 60(3), 310-316
- Scribner, R A, MacKinnon, D P, & Dwyer, J H (1994) Alcohol outlet density and motor vehicle crashes in Los Angeles county cities *Journal of Student Alcoholism*, 55, 447-453
- Scribner, R A, MacKinnon, D P, & Dwyer, J H (1995) The risk of assaultive violence and alcohol availability in Los Angeles County *American Journal of Public Health*, 85(3), 335-340
- Shah, B V, Barnwell, B G, & Bieler, G S (1997) *Sudan user's manual, release 7.5* Research Triangle Park, NC Research Triangle Institute
- Smart, R G, Mann, R E, & Suurvali, H (1998) Changes in liver cirrhosis death rates in different countries in relation to per capita alcohol consumption and alcoholics anonymous membership *Journal of Student Alcoholism*, 59(3), 245-249
- Speer, P W, Gorman, D M, Labouvie, E W, & Ontkush, M J (1998) Violent crime and alcohol availability Relationships in an urban community *Journal of Public Health Policy*, 19(3), 303-318
- Tatlow, J R, Clapp, J D, & Hohman, M M (2000) The relationship between the geographic density of alcohol outlets and alcohol-related hospital admissions in San Diego County *Journal of Community Health*, 25(1), 79-88
- Toomey, T L, Wagenaar, A C, Kilian, G, Fitch, O, Rothstein, C, & Fletcher, L (1999) Alcohol sales to pseudo-intoxicated bar patrons *Public Health Reports*, 114(4), 337-342
- Wagenaar, A C (1993) *Minimum drinking age and alcohol availability to youth Issues and research needs* Research Monograph 25, US Department of Health and Human Services, National Institute on Alcohol Abuse and Alcoholism, Rockville, MD
- Wagenaar, A C, Harwood, E M, Toomey, T L, Denk, C E, & Zander, K M (2000) Public opinion on alcohol policies in the United States Results from a national survey *Journal of Public Health Policy*, 21(3), 303-327
- Wagenaar, A C, Toomey, T L, Murray, D M, Short, B J, Wolfson, M, & Jones-Webb, R (1996) Sources of alcohol for underage drinkers *Journal of Student Alcoholism*, 57, 325-333
- Wechsler, H, Davenport, A, Dowdall, G, Moeykens, B, & Castillo, S (1994) Health and behavioral consequences of binge drinking in college A national survey of students at 140 campuses *Journal of the American Medical Association*, 272, 1672-1677
- Wechsler, H, Dowdall, G W, Davenport, A, & Castillo, S (1995a) Correlates of college student binge drinking *American Journal of Public Health*, 85, 921-926
- Wechsler, H, Dowdall, G W, Maenner, G, Gledhill-Hoyt, J, & Lee, H (1998) Changes in binge drinking and related problems among American college students between 1993 and 1997 *Journal of the American College of Health*, 47, 57-68
- Wechsler, H, Kelly, K, Weitzman, E R, Giovanni, J P, & Seibring, M (2000a) What colleges are doing about student binge drinking A survey of college administrators *Journal of the American College of Health*, 48, 219-226
- Wechsler, H, Kuo, M, Lee, H, & Dowdall, G W (2000b) Environmental correlates of underage alcohol use and related problems of college students *American Journal of Preventive Medicine*, 19(1), 24-29
- Wechsler, H, Lee, J E, Kuo, M, & Lee, H (2000c) College binge drinking in the 1990s A continuing problem results of the Harvard school of public health 1999 college alcohol study *Journal of the American College of Health*, 48, 199-210
- Wechsler, H, Moeykens, B, Davenport, A, Castillo, S, & Hansen, J (1995b) The adverse impact of heavy episodic drinkers on other college students *Journal of Student Alcoholism*, 56, 628-634

University of Colorado at Boulder

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**ATTACHMENT #6**

September 28, 2004

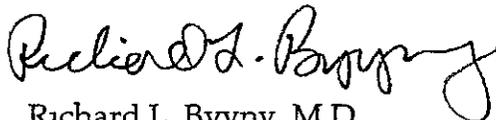
Members of the Beverages Licensing Authority  
City of Boulder  
c/o Ms Anne Large, Deputy City Clerk  
P.O. Box 791  
Boulder, Colorado 80306

Dear Ms. Large:

I write to reiterate Vice Chancellor Ron Stump's statements in his letter to you dated September 13, 2004. The University of Colorado at Boulder is opposed to the high proliferation of liquor licenses in close proximity to the Boulder campus. Data has shown that there is a direct relationship between the density of establishments selling alcohol so close to a college campus and the binge drinking and drinking-related problems among college students. I urge you not to approve this or any other liquor licenses in Boulder.

Please take note of the information the University's Mr. Bob Maust has already shared with the Beverages Licensing Authority when considering the applications for liquor licenses in proximity to the University of Colorado at Boulder campus

Sincerely,



Richard L. Byyny, M.D.  
Chancellor

cc President Elizabeth Hoffman  
Members of the Board of Regents  
Vice Chancellor Ron Stump  
Frank Bruno, Boulder City Manager  
Peter Dietze, Esq  
Robert Maust, Student Affairs Coordinator  
John C Price  
Timothy McMurray  
Priscilla Cornielle  
Peter Gowan  
Cam Marshall



## **Membership of UniverCity Oversight Group**

The membership of this group varies, depending on the meeting topic, but usually includes City Council members, city staff and University administration and members of the community

### City Council

Tom Eldridge  
Crystal Gray  
Gordon Riggle  
Mark Ruzzin

### CU Representatives

Cindy Carlisle, CU Regent  
Ron Stump, Vice Chancellor for Student Affairs  
Paul Tabolt, Vice Chancellor for Administration  
UCSU Director of City Relations (position rotates)

### City Staff

Frank Bruno, City Manager  
Linda P. Cooke, Municipal Court Judge  
Mary Huron Hunter, Neighborhood & Public Relations Manager  
Jennifer Korbelik, University Liaison  
Sandra Llanes, City Attorney's Office  
Maureen Rait, Director of Public Works for Development & Support Services  
Lynne Reynolds, Municipal Court Administrator  
Kim Stewart, Police Commander  
Terry Stonich, Information Resources Manager

### Community Members

Karen Abrams, Hill Alliance/UHGID  
Brittany Anas, Daily Camera Staff Writer  
Doug Crigler, Goss Grove Neighborhood Association  
Bill Curtis, UHGID  
Sheila Horton, Boulder County Apartment Association  
Mark Heinritz, Responsible Hospitality Group (RHG)/Hill Alliance  
Daniel Ong, Eastridge Neighborhood  
Jan Otto, University Hill Neighborhood Association (UHNA)  
Peter Richards, Flatirons Neighborhood  
Lisa Spalding, UHNA  
Jane Stoyva, UHNA

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# The Marketing of Alcohol to College Students

## The Role of Low Prices and Special Promotions

Meichun Kuo, ScD, Henry Wechsler, PhD, Patty Greenberg, MA, Hang Lee, PhD

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**Background:** Heavy episodic or binge drinking has been recognized as a major problem on American college campuses affecting the health, safety, and education of students. The present study examines the alcohol environment surrounding college campuses and assesses the impact on students' drinking. This environment includes alcohol promotions, price specials, and advertising at drinking establishments that serve beer for on-premise consumption as well as retail outlets that sell beer for off-premise consumption.

**Methods:** The study used student self-report data from the 2001 College Alcohol Study (CAS) and direct observational assessments by trained observers who visited alcohol establishments in communities where the participating colleges were located. The analytic sample included more than 10,000 students as well as 830 on-premise and 1684 off-premise establishments at 118 colleges.

**Results:** Alcohol specials, promotions, and advertisements were prevalent in the alcohol outlets around college campuses. Almost three quarters of on-premise establishments offered specials on weekends, and almost one half of the on-premise establishments and more than 60% of off-premise establishments provided at least one type of beer promotion. The availability of large volumes of alcohol (24- and 30-can cases of beer, kegs, party balls), low sale prices, and frequent promotions and advertisements at both on- and off-premise establishments were associated with higher binge drinking rates on the college campuses. In addition, an overall measure of on- and off-premise establishments was positively associated with the total number of drinks consumed.

**Conclusions:** The regulation of marketing practices such as sale prices, promotions, and advertisements may be important strategies to reduce binge drinking and its accompanying problems. (Am J Prev Med 2003,25(3) 204-211) © 2003 American Journal of Preventive Medicine

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### Introduction

Heavy episodic or "binge" drinking (the consumption of  $\geq 5$  drinks in a row for men and  $\geq 4$  for women, at least once in the past 2 weeks) has been recognized as a major problem on American college campuses by college presidents,<sup>1-2</sup> alcohol researchers,<sup>3</sup> the National Institute on Alcohol Abuse and Alcoholism (NIAAA),<sup>4</sup> and the U.S. Surgeon General.<sup>5</sup> Several national studies have found that approximately two out of five college students are binge drinkers.<sup>6-11</sup> Binge drinking has been associated with problems such as property damage, physical injuries, unwanted sexual advances, and encounters with po-

lice.<sup>9,11-13</sup> In addition, binge drinking is associated with secondhand effects such as interruption of study or sleep, having to babysit a drunken student, or being victim of a physical and sexual assault.<sup>13,14</sup> With regard to any type of alcohol consumption, it is estimated that 1400 college students die each year from alcohol-related injuries.<sup>15</sup>

Alcohol availability is associated with increased alcohol consumption among the general population as well as among young adults and older adolescents.<sup>16-19</sup> Heavy alcohol consumption by college students and others is encouraged by a "wet" environment, in which alcohol is prominent and easily accessible.<sup>20-21</sup> Previous studies have documented the effect of price on alcohol consumption in the general population and among young adults and adolescents. In general, as the price of alcohol increases, consumption rates decrease.<sup>22-25</sup> Conversely, as the price of alcohol decreases, consumption rates increase. Moreover, young people are more affected by price of alcohol.<sup>26-28</sup> Alcohol outlets near college campuses commonly use various discounts and promotions to attract students, and alcohol promotions and specials may increase

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consumption. For example, Babor et al.<sup>29</sup> found that both heavy and light drinkers drank more than twice as much alcohol during simulated "happy hours" as they did during times without such promotions.

Some previous studies of price have used aggregated data of retail price that did not specifically take into account the unique marketing of the sale of alcohol surrounding the college campus.<sup>23,26</sup> Other studies used "perceived alcohol availability," obtained directly from the respondents and possibly biased by the respondents' own drinking status.<sup>30,31</sup>

The purpose of the present study was to describe the alcohol environment surrounding college campuses. Establishments selling alcohol for on-premise and off-premise consumption, alcohol promotions, price specials, and alcohol advertising were examined, as well as the effects of these environmental factors on students' drinking. Data from the 2001 Harvard School of Public Health College Alcohol Study (CAS), which gathered drinking information on more than 10,000 students nationwide, were analyzed. In addition, detailed information on prices, specials, and promotions at individual stores surrounding the 119 college campuses was obtained from independent observations.

## Methods

### Study Design and Population

The 2001 CAS surveyed students at 119 colleges who participated in each of the three previous CAS surveys. The participating schools were located in 38 states and the District of Columbia. Administrators at each participating school provided a list of 215 subjects, who were randomly selected from full-time undergraduate students enrolled during the 2000–2001 school year using the same procedure conducted in previous CAS surveys.

Starting in February 2001, questionnaires were mailed to 25,585 students identified in December 2000 or January 2001 as attending the college. At the time of the mailing, some students were no longer in school due to withdrawal or leave of absence, and some had incorrect mailing addresses, thus reducing the target sample to 21,055 students. The response rate was 52% ( $n=10,904$ ). Since the demographic characteristics of the student sample for each school may not be a perfect reflection of the true demographic characteristics of that school and could bias these results, data were weighted based on gender, age and ethnicity to account for colleges' varying sampling fractions. Details of the sampling methods and inclusion criteria are described elsewhere.<sup>9,11</sup>

The sample of 119 colleges represented a national cross-section of students enrolled at 4-year colleges. Sixty-nine percent of the responders attended public colleges and 31% attended private colleges, thus approximates the U.S. national distribution of 68% and 32%, respectively, for full-time 4-year college students.<sup>32</sup> Forty-seven percent of responders attended large (>10,000 students), 23% medium-sized (5001–10,000 students), and 29% small (<5001 students) colleges. The U.S. national distribution is 37%, 24%, and 40%, respectively.<sup>32</sup> The higher percentage of colleges with large enroll-

ments in this sample was due to the sampling procedure of probability proportionate to size. Sixty-nine percent of responders attended schools in large- or medium-sized cities, compared to 71% of students nationwide, and 13% attended religiously-affiliated schools, compared to 16% nationwide.<sup>32</sup> Five percent of students attended all-women's colleges.

### Alcohol Environment Assessment

Alcohol environment assessments of neighborhoods surrounding the college campuses were conducted at each of the 119 participating colleges. Battelle Centers for Public Health Research and Evaluation was contracted to conduct the field observations. A marketing systems group was subcontracted to provide a sample of on- and off-premise beer venues within a 2-mile radius of participating colleges using the self-reported Standard Industrial Classification code. The radius was determined using the street address of the campus. Telephone screening of each establishment in the sample was conducted to make sure that they sold or served alcohol. Off-premise establishments were defined as retail outlets that sold beer (e.g., liquor stores, convenience stores, groceries) for off-premise consumption, and on-premise establishments were defined as drinking establishments that served beer (e.g., bars, clubs, restaurants) for on-premise consumption.

Unobtrusive observations were conducted in both on- and off-premise establishments. In the off-premise establishments, the data collectors monitored the availability of a variety of pack configurations of beer (singles, 6-, 12-, 24-, and 30-can packages, party balls [beach-ball-sized beer containers that hold about 55 12-oz glasses of beer or 2.5 cases of 12-oz cans], and kegs), the lowest price of 12- and 24-packs and the brands offering those low prices, beer promotions such as volume discounts, coupons, and special prices, the presence of alcohol protective messages (e.g., age-of-sale warnings and health-related messages), the level of exterior and interior advertising, and other characteristics (including the presence of security or police, the ability to sell beer on Sundays, the availability of delivery, the presence of a drive-up window, and hours of operation). Similarly, with on-premise establishments, data collectors noted serving sizes, prices, and interior and exterior signage in addition to promotions, activities, and events that might attract students.

Due to time constraints, the number of off-premise establishments observed per site was limited to 20, and the number of on-premise establishments observed per site was limited to 8. If there were more establishments than needed, the observers were instructed to visit those closest to campus or frequented by the students. In some areas, it was necessary to expand the radius to capture at least two on- and off-premise establishments. Among 119 schools, a total of 1690 off-premise establishments were observed. On-premise establishment data for three college campuses were not available (two colleges were located in "dry" towns, with the closest on-premise venue was at least 15 miles away, and observers were not able to complete the observations for one college campus due to the late hours at which the establishments opened). A total of 830 on-premise establishments were observed among 116 colleges.

Field data collectors received more than 22 hours of training, including both classroom instruction and supervised practice in the community. In addition, each observer's

competence in the study protocol was certified before data collection began. Furthermore, an inter-rater reliability study was undertaken as a measure of quality control. The proportion of agreement among observers was assessed using repeated measurements<sup>33</sup> as multiple observers independently collected data in 16 venues. This test demonstrated inter-rater agreement in 1395 out of 1508 items, for an overall level of agreement of 92.5%.

## Measures

**College binge-drinking rate.** Heavy episodic or binge drinking has been defined as the consumption of at least five drinks in a row for men or four drinks in a row for women during the 2 weeks preceding their completion of the questions<sup>11,34</sup>. A college's binge-drinking rate was the percentage of students classified as binge drinkers on the basis of the aggregated self-report responses of students at that school to the binge drinking questions.

**High school binge drinking.** Students were asked "During your last year in high school, how many drinks did you usually have when you drank alcohol?" A high school binge drinker was defined as usually having five drinks for men or four drinks for women.

**Past 30-day drinking rate and annual drinking rate.** A college's drinking rate for the past 30 days and annual drinking rate was the percentage of students who had a drink in that time period based on the aggregated self-report responses of students to the question "When did you last have a drink?"

**Total number of drinks in the past 30 days.** Two variables were used to measure this outcome: (1) the number of occasions the respondent had a drink of alcohol in the 30 days before the survey, and (2) the number of drinks the respondent usually had on those occasions. A drink was defined in the questionnaire as either a 12-oz bottle or can of beer, a 4-oz glass of wine, a 12-oz bottle or can of wine cooler, or a shot of distilled spirits (either straight or in a mixed drink). Possible responses to the number of occasions were 0, 1–2 occasions (coded as 1.5), 3–5 occasions (coded as 4), 6–9 occasions (coded as 7.5), 10–19 occasions (coded as 14.5), 20–39 occasions (coded as 29.5), and 40 or more occasions (coded as 40). Those students who did not drink in the past 30 days were coded as usually drinking zero drinks.

**On-premise establishment index score.** The on-premise establishment index included the summed score of eight items, each was dichotomized as yes versus no for beer specials, special promotions in the following 30 days, low sale prices (for single drinks, pitchers or the largest volume), interior signage of alcohol promotions, exterior signage of alcohol promotions, no interior signage of alcohol warnings, no exterior signage of alcohol warnings, and any age verification policies.

**Off-premise establishment index score.** The off-premise establishment index included the sum of a score of five items; each was dichotomized as yes versus no for the sale of kegs or party balls, low sale prices on 12- or 24-packs of beer, any beer promotions, exterior advertisements "all over the place," and interior advertisements covering "all over the place."

**Total alcohol environment score.** The total alcohol environment (the "wetness") score was the sum of the on- and off-premise establishments' index scores.

## Data Analysis

The analytic sample included 10,823 students at 118 colleges. One college for which data about on-premise establishments were not available was dropped. At 118 college sites, 1684 off-premise establishments and 830 on-premise establishments were observed. The percentages of the characteristics for on- and off-premise establishments were reported, and the average percentage of these characteristics for each college campus was calculated. Pearson correlation coefficients were used to examine the association between the average percentage of these characteristics for each college campus and college binge-drinking rates among 118 schools.

Multiple regressions were conducted to examine whether the on- and off-premise establishment index scores and total alcohol environment scores had effects on the total number of drinks consumed by students in the past 30 days. Generalized Estimating Equations (GEE)<sup>35–36</sup> were used to obtain robust standard errors of the estimated regression coefficients of the multiple regression models fit to the clustered outcomes from the study sampling scheme. Standardized scores (mean=5, SD=2) were used for on- and off-premise establishment index scores and total alcohol environment scores in the regression models. Since the overall response rate to the survey was 52%, the potential for bias from the nonresponse rate may have been introduced in the regression estimates. The association between colleges' response rates and their binge-drinking rates was examined by means of Pearson correlation coefficient, and was not significantly different from zero ( $r=0.170$ ,  $p=0.064$ ). As a precaution, however, the authors controlled for college response rate in the final model.

## Results

### Off-Premise Establishment Characteristics and College Binge-Drinking Rates

Among 1684 off-premise establishments surrounding 118 college campuses, about half of the establishments sold 24- or 30-can cases, almost a quarter of the off-premise establishments sold kegs, and about 5% of the off-premise establishments sold party balls (Table 1). The availability of large volumes of beer (24- or 30-can cases, party balls, or kegs) was associated with higher binge-drinking rates. Colleges with higher percentages of establishments selling large volumes of beer had higher binge-drinking rates.

Average prices for 12-packs of beer and 24-packs of beer were \$6.08 (\$2.79–\$11.29) and \$11.74 (\$5.89–\$24.00), respectively. The average price of a 24-can case

**Table 1. Off-premise characteristics and the association with binge-drinking rate**

Variables	% (N=1684)	Correlation <sup>a</sup> (n=118)	p value
<b>Type of beer sold</b>			
6-pk 12 oz cans	97.7	-0.17	0.073
12-pk 12 oz cans	93.6	0.01	0.881
24-can case	55.5	0.28	0.003
30-can case	43.3	0.25	0.006
Party ball	5.3	0.22	0.015
Beer kegs	23.1	0.33	<0.001
<b>Promotions</b>			
Volume discounts	15.3	0.21	0.025
Cents-off coupons	2.6	0.22	0.018
Advertised special price offer	61.3	0.37	<0.001
Freebies (e.g., calendars, mugs)	0.7	0.18	0.047
Mail-in coupons or points	1.7	0.07	0.421
Other	4.0	0.003	0.970
Any of above	63.1	0.35	<0.001
<b>Alcohol protective message</b>			
Alcohol sale warning	45.6	0.13	0.172
Alcohol health-related message	7.6	0.009	0.921
General age-of-sale warning	53.5	0.11	0.218
Any of above	74.2	0.15	0.117
<b>Store interior advertising/logos</b>			
Free from any alcohol advertising/logos	13.5	-0.23	0.0114
Only in sections where items are sold	48.8	-0.12	0.1934
Alcohol ads/logos in other areas of store	22.7	0.06	0.4865
Alcohol ads/logos covering all available space	15.0	0.26	0.0052
<b>Store exterior/property advertising for alcohol</b>			
No advertisement	36.5	-0.29	0.0012
Discreet	22.8	0.13	0.1652
Moderate	22.7	0.09	0.3373
All over the place	18.0	0.16	0.0746
<b>Other store characteristics</b>			
Is alcohol sold on Sunday	62.7	-0.16	0.090
Is delivery available	7.1	0.195	0.035
<b>Off-premise index score (mean score)</b>	1.50 (1.17)	0.39	<0.001

<sup>a</sup>Pearson correlation coefficients were used to examine the association between college binge-drinking rates and average percentage of off-premise characteristics at 118 colleges

of beer was negatively associated with binge-drinking rate ( $r = -0.24$ ,  $p = 0.009$ ), that is, the lower the price, the higher the college binge-drinking rate. The same was not found for the average price of a 12-pack of beer.

About 63% of the off-premise establishments offered promotions such as volume discounts, advertised price specials, or coupons. These promotions were significantly correlated with college binge-drinking rates. More than half of the off-premise establishments displayed warnings in the stores, but the correlation of displaying an alcohol protective message with binge-drinking rates was not statistically significant.

Both interior and exterior advertising were correlated with college binge-drinking rates. For campuses with more off-premise establishments that were free from alcohol advertising, the college binge-drinking rates were significantly lower.

The off-premise establishment index score was also significantly related to college binge-drinking rates

( $r = 0.39$ ,  $p < 0.001$ ). The results indicated that campuses with higher off-premise establishment index scores had higher binge-drinking rates.

### On-Premise Establishment Characteristics and College Binge-Drinking Rates

Among the 830 on-premise locations surrounding college campuses, the prices for a single drink, pitcher, or the largest volume were significantly correlated with college binge-drinking rates. The lower average alcohol sale price among on-premise establishments surrounding the college campus, the higher the college binge-drinking rate (Table 2).

About 73% of the on-premise locations offered specials on weekends, and about 45% of the on-premise locations were offering promotions in the next 30 days. The presence of weekend beer specials was highly correlated with college binge-drinking rates, and on-premise establishments planning alcohol promotions

**Table 2.** On-premise characteristics and the association with college binge-drinking rate

Variables	% (n=830)	Correlation* (n=116)	p value
<b>Price</b>	Mean Price (range)		
Single	\$1.95 (\$0.25-7.00)	-0.36 <sup>b</sup>	<0.0001
Pitcher	\$5.48 (\$0.01-13.50)	-0.25 <sup>b</sup>	0.01
Largest volume	\$4.47 (\$0.01-13.50)	-0.39 <sup>b</sup>	<0.0001
<b>Beer Specials on Thursday, Friday or Saturday</b>			
Free	1.6	0.07	0.429
Free with purchase of something else	1.8	0.07	0.431
2 or 3 for single price	11.0	0.14	0.129
"All you can eat/drink" at single price	3.3	0.19	0.04
Special price	72.5	0.42	<0.0001
Any of above	73.4	0.42	<0.0001
<b>Promotions in next 30 days</b>			
Merchandise promotions	9.1	0.09	0.355
Special price of alcohol	35.3	0.34	0.0002
Sponsored entertainment/event	24.4	0.22	0.015
Other	4.4	0.10	0.31
Any of above	45.0	0.37	<0.0001
<b>Age verification</b>			
Identifications manually checked at door	41.5	0.15	0.105
Identification device checked at door	1.5	-0.0004	0.99
Identifications manually checked at table	78.4	0.13	0.166
Identification device checked at table	1.8	0.04	0.649
Underage prohibited	28.0	-0.09	0.33
Any of above	94.3	0.2	0.02
<b>Exterior alcohol promotion</b> (volume discount, promotion/event, price special)	30.4	0.24	0.011
<b>Exterior age warning</b> (must be age 21 to drink, must be age 21 to enter)	26.1	-0.09	0.3319
<b>Interior alcohol promotion</b> (volume discount, promotion/event, price special)	48.3	0.13	0.16
<b>Interior age warning</b> (must be age 21 to drink, must be age 21 to enter)	49.9	-0.02	0.8110
<b>On-premise index score (mean score)</b>	3.71 (1.80)	0.42	<0.0001

\*Pearson correlation coefficients were used to examine the association between college binge drinking rates and average percentage of on-premise characteristics at 118 colleges.

<sup>b</sup>Correlation between mean price and binge-drinking rate

in the next 30 days were also significantly correlated with college binge-drinking rates. College campuses with more on-premise establishments offering weekend beer specials or special promotions had higher binge-drinking rates.

More than 90% of the on-premise establishments had established policies to verify the age of their patrons. Observed use of age verification policies in the establishments was correlated with higher binge-drinking rates. Likewise, colleges with more exterior advertising of alcohol promotions had higher binge-drinking rates. However, interior alcohol promotion advertising was not correlated with college binge-drinking rates.

The on-premise establishment index score was also significantly related to college binge-drinking rates ( $r=0.42$ ,  $p<0.0001$ ). The results indicated that campuses with higher on-premise establishment index scores had higher binge-drinking rates.

### Total Alcohol Environment

The mean total alcohol environment score for the 118 colleges was  $5.18 \pm 1.76$ . The authors examined whether or not the total alcohol environment scores among 118 colleges varied by region, enrollment size, and urban/rural area. The results showed significant regional differences ( $F_{(3)} = 6.67$ ,  $p < 0.001$ ). The north-central region had significantly higher scores (mean =  $6.12 \pm 1.76$ ) than the south (mean =  $4.97 \pm 1.55$ ) and west (mean =  $4.09 \pm 1.44$ ), but not the northeast region (mean =  $5.13 \pm 1.76$ ). The total alcohol environment score did not differ significantly by school size categorized as <1000 (mean =  $4.31 \pm 2.05$ ), 1000-5000 (mean =  $4.97 \pm 1.78$ ), 5000-10,000 (mean =  $5.49 \pm 1.61$ ), and >10,000 (mean =  $5.28 \pm 1.77$ ) ( $F_{(3)} = 1.21$ ,  $p = 0.309$ ). There was also no significant difference between rural (mean =  $5.53 \pm 1.77$ ) and urban (mean =  $5.06 \pm 1.72$ ) areas, ( $F_{(1)} = 1.65$ ,  $p = 0.202$ ).

**Table 3.** Total alcohol environment and colleges' drinking rate ( $n=118$ )

Variables	Total alcohol environment score	
	Correlation coefficient	<i>p</i> value
Binge-drinking rate	0.49	<0.001
Past 30-days drinking rate	0.41	<0.001
Annual drinking rate	0.35	<0.001

The association between the total alcohol environment score and the student's drinking rate was examined (Table 3). The results showed that the total alcohol environment score was significantly correlated with college binge-drinking rates ( $r=0.49$ ), past 30-day drinking rates ( $r=0.41$ ), and past-year drinking rates ( $r=0.35$ ). The higher the alcohol environment score, the higher the percentage of binge drinkers, past-30-day drinkers, or past-year drinkers on campus.

#### Alcohol Environment Around College Campuses and Number of Drinks Consumed by Students

The association between the number of drinks consumed by students in the past 30 days and the alcohol environment around college campuses was examined (Table 4). The results showed that the off-premise establishment index score was positively associated with the total number of drinks consumed by the students in the past 30 days, adjusting for gender, underage status, race, and response rate. Students from schools with higher off-premise establishment index scores consumed more drinks in the past 30 days. The effect of the on-premise establishment index score was not significant. The total alcohol environment index score was positively associated with the total number of drinks consumed by the students. To decrease the likelihood that selection bias results in more pre-college binge drinkers attending colleges with higher rates of heavy drinking, the relationship between the total alcohol environment and number of drinks consumed among students who did not binge drink in high school was

examined. The results for high school nonbinge drinkers were similar to the results shown in Table 4 (the estimate of total alcohol environment score was 1.20 [0.35],  $p=0.0005$ ).

#### Conclusions

In examining the marketing of alcohol in the communities surrounding college campuses, it was found that alcohol specials, promotions, and advertisements were prevalent in the alcohol outlets around college campuses. Approximately three quarters of on-premise establishments offered specials on weekends, and almost half of the on-premise establishments and more than 60% of off-premise establishments offered some type of beer promotion. The results indicated that the "wet" alcohol environment around campuses—including lower sale prices, more promotions, and alcohol advertising at both on- and off-premise establishments—was correlated with higher binge-drinking rates on the college campuses. In addition, the alcohol environment was directly associated with the number of drinks consumed by the students in the past 30 days. Examination of the relationship of the alcohol environment and drinking among high school nonbinge drinkers suggests that it may be the "wet" alcohol environment surrounding the colleges and not the self-selection of students who choose to attend these colleges that is the basis for increased alcohol consumption. The authors found that the lower the price of beer in the surrounding community, the higher the binge-drinking rate at the college. This is consistent with previous findings that alcohol consumption by young people (in this case, college students) is affected by price. In line with this are the findings that alcohol promotions, price specials, and large-volume discounts are associated with higher binge-drinking rates. Surprisingly, a positive association was found between checking identification in on-premise establishments and college binge-drinking rates. There may be two possible explanations. First, since age verification is an enforcement issue, there may be increased enforcement efforts in those communities with higher rates of problem

**Table 4.** Alcohol environment and total number of drinks

Variables	Model 1		Model 2		Model 3	
	Estimate (SE)	<i>p</i> value	Estimate (SE)	<i>p</i> value	Estimate (SE)	<i>p</i> value
Intercept	-7.68 (7.09)	0.279	-3.72 (5.99)	0.534	-5.48 (5.78)	0.272
Off-premises index score	1.68 (0.51)	<0.0001				
On-premises index score			1.24 (0.72)	0.084		
Total alcohol environment score					1.60 (0.62)	0.009
Gender	15.02 (1.15)	<0.0001	14.96 (1.17)	<0.0001	14.94 (1.16)	<0.0001
Underage	-1.00 (0.99)	0.314	-0.85 (0.99)	0.379	-1.01 (0.95)	0.2882
White	12.24 (1.10)	<0.0001	12.48 (1.27)	<0.0001	11.92 (1.25)	<0.0001
Response rate	0.12 (0.16)	0.434	0.08 (0.16)	0.602	0.09 (0.15)	0.531

drinking among college-aged students. Second, on-premise drinking establishments in low binge-drinking communities may cater to nonstudents, perhaps experiencing less pressure to apply age verification measures.

Efforts to reduce problems associated with college binge drinking have focused primarily on education and changes in behavior. However, the results of this study suggest that the regulation of marketing practices (e.g., sale prices, promotions, and exterior advertisements) may be important strategies.

Previous studies on alcohol pricing have often used broad, aggregate data that did not capture specific environmental factors surrounding college campuses. The current study included more detailed factors, such as weekend price specials, promotions, and large-volume discounts, which specifically target college populations. Other studies have used respondents' perceptions and recall of alcohol marketing practices to describe the alcohol environment.<sup>30,31</sup> These can be influenced by the respondents' own drinking behaviors. The present study obtained direct observations by trained observers about the marketing practices of alcohol establishments near the college campuses. Thus, the data about students' own drinking and about the marketing practices in the surrounding communities came from two independent sources.

The results of this study must be viewed within the context of its limitations. First, the CAS is subject to the limitations of self-report surveys. However, such surveys have been widely used and are considered generally valid in examining alcohol responses.<sup>37-38</sup> Second, potential bias may have been introduced through nonresponse. However, several procedures were used to test for this in both surveys, with no evident effect on the findings. While it is not possible to fully eliminate the potential of bias introduced through nonresponse, the authors tried to minimize the impact through weighting procedures. In addition, the impact of the response rate was examined through dichotomized or categorical analyses, and no significant relationship was found. Furthermore, the binge-drinking rates reported in this study were almost identical to those found in other national surveys<sup>6-8,10</sup> of tobacco use<sup>6-8,39,40</sup> and illicit drug-use rates.<sup>8</sup>

Finally, since this is a correlational study, causality cannot be determined. Marketing practices that reduce cost may increase drinking levels, and heavy drinking by students may induce bars and restaurants to cater to and compete for their patronage through price lowering promotions. However, it is harder to maintain that high demand lowers prices.

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## References

- 1 The Carnegie Foundation for the Advancement of Teaching. *Campus life in search of community*. Princeton NJ: Princeton University Press, 1990.
- 2 Wechsler H, Wuethrich B. *Dying to drink: confronting binge drinking on college campuses*. Emmaus PA: Rodale Books, 2002.
- 3 Dowdall GW, Wechsler H. Studying college alcohol use: widening the lens, sharpening the focus. *J Stud Alcohol Suppl* 2002;14:14-22.
- 4 National Institute on Alcohol Abuse and Alcoholism. National Advisory Council on Alcohol Abuse and Alcoholism Subcommittee on College Drinking, 1998. Available at: [www.niaaa.nih.gov/about/college/default.htm](http://www.niaaa.nih.gov/about/college/default.htm). Accessed September 28, 2001.
- 5 U.S. Department of Health and Human Services. *Healthy people 2010: understanding and improving health and objectives for improving health*. 2nd ed. Vol 2. Washington DC: U.S. Government Printing Office, 2000.
- 6 Centers for Disease Control and Prevention. *Youth risk behavior surveillance: national college health risk behavior survey—United States*. MMWR CDC Surveill Summ 1997;46:1-54.
- 7 Johnston LD, O'Malley PM, Bachman JG. *National survey results on drug use from the Monitoring the Future Study, 1975-1998, Vol II, College students and young adults*. NIH Publication no 99-4661. Bethesda MD: U.S. Department of Health and Human Services, 1999.
- 8 Substance Abuse and Mental Health Services Administration. *National household survey on drug abuse series: summary of findings from 1999 national household surveys on drug abuse*. Rockville MD: Office of Applied Studies, August 2000.
- 9 Wechsler H, Lee JE, Kuo M, Seibring M, Nelson T, Lee H. Trends in college binge drinking during a period of increased prevention efforts: finding from four Harvard School of Public Health College Alcohol Study Surveys 1993-2001. *J Am Coll Health* 2002;50:203-22.
- 10 Presley CA, Meilman PW, Cashin JR. Alcohol and drugs on American college campuses: use, consequence, and perceptions of the campus environment, Vol IV 1992-1994. Carbondale IL: The Core Institute, 1996.
- 11 Wechsler H, Davenport A, Dowdall G, Moeckens B, Castillo S. Health and behavioral consequences of binge drinking in college: a national survey of students at 140 campuses. *JAMA* 1994;272:1672-7.
- 12 Wechsler H, Dowdall W, Davenport A, Castillo S. Correlates of college student binge drinking. *Am J Public Health* 1995;85:921-6.
- 13 Perkins HW. Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *J Stud Alcohol Suppl* 2002;14:91-100.
- 14 Wechsler H, Moeckens B, Davenport A, Castillo S, Hansen J. The adverse impact of heavy episodic drinkers on other college students. *J Stud Alcohol* 1995;56:628-34.
- 15 Hingson R, Heeren T, Zakocs RC, Kopstein A, Wechsler H. Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18-24. *J Stud Alcohol* 2002;63:136-44.
- 16 Gruenewald PJ, Madden P, Janes K. Alcohol availability and formal power and resources of state alcohol beverage control agencies. *Alcohol Clin Exp Res* 1992;16:591-7.
- 17 Gruenewald PJ, Miller AB, Trepo AJ. Alcohol availability and the ecology of drinking behavior. *Alcohol Health Res World* 1993;17:39-45.
- 18 Jones-Webb R, Toomey TL, Short B, Murray DM, Wagenaar A, Wolfson M. Relationship among alcohol availability, drinking location, alcohol consumption, and drinking problem in adolescents. *Subst Use Misuse* 1997;32:219-28.
- 19 Wagenaar AC. Minimum drinking age and alcohol availability to youth: Issue and research needs. *Research Monograph 25*. Rockville MD: U.S. Department of Health and Human Services, National Institute on Alcohol Abuse and Alcoholism, 1993.
- 20 Edward G, Anderson P, Babor TF, et al. *Alcohol policy and the public good*. New York: Oxford University Press, 1995, 125-52.
- 21 Weitzman ER, Folkman A, Folkman KL, Wechsler H. The relationship of alcohol outlet density to heavy & frequent drinking-related problems among college students at eight universities. *Health Place* 2003;9:1-6.
- 22 Österberg E. Do alcohol prices affect consumption and related problems? In: Holder HD, Edwards G, eds. *Alcohol and public policy: evidence and issues*. New York: Oxford University Press, 1995, 145-163.
- 23 Levy D, Sheflin N. New evidence on controlling alcohol use through price. *J Stud Alcohol* 1983;44:929-37.
- 24 Grossman N, Coate D, Arluck GM. Price sensitivity of alcoholic beverages in the United States. In: Moore MH, Gerstein DR, eds. *Control issues in*

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- alcohol abuse prevention strategies for states and communities. Greenwich CT JAI Press, 1987,169-98
- 25 Coate D, Grossman M Effects of alcoholic beverage prices and legal drinking ages on youth alcohol use J Law Econ 1988,31 145-71
  - 26 Chaloupka FJ, Wechsler H Binge drinking in college the impact of price, availability and alcohol control policies. Contemp Econ Policy 1996,14 112-24
  - 27 Kenkel DS Prohibition versus taxation reconsidering the legal drinking age Contemp Econ Policy 1993,11 48-57
  - 28 Sutton M, Godfrey CA Grouped data regression approach to estimating economic and social influences on individual drinking behaviour Health Econ 1995,4 237-47
  - 29 Babor TF, Mendelson JH, Greenberg I, Kuehnle J Experimental analysis of the "happy hour" effects of purchase price on alcohol consumption Psychopharmacology 1978,58 35-41
  - 30 Jones-Webb R, Murray D, Short B, et al Environmental predictors of drinking and drinking-related problems in young adults. J Drug Educ 1997, 27 67-82
  - 31 Wechsler H, Lee JE, Hall J, Wagenaar AC, Lee H Secondhand effects of student alcohol use reported by neighbors of colleges the role of alcohol outlets Soc Sci Med 2002,55 425-35
  - 32 US Department of Education, Office of Research and Improvement. Enrollment in Postsecondary Institutions, 1997 Available at <http://nces.ed.gov/pubs2000/2000160.pdf> Accessed January 25, 2002
  - 33 Dunn G Design and analysis of reliability studies New York Halsted Press, 1989
  - 34 Wechsler H, Dowdall G, Davenport A, Rimm E A gender-specific measure of binge drinking among college students. Am J Public Health 1995,85 982-5
  - 35 Liang KY, Zeger SL Longitudinal data analysis using generalized linear models. Biometrika 1986,73 13-22
  - 36 Zeger SL, Liang KY, Albert PS Models for longitudinal data. a generalized estimating equation approach Biometrics 1988,44 1049-60
  - 37 Cooper AM, Sobell MB, Sobell LC, Maisto SA Validity of alcoholics' self-reports. duration data. Int J Addict 1981,16 401-6
  - 38 Midanik L Validity of self report alcohol use a literature review and assessment. Br J Addict 1988,83 1019-30
  - 39 Centers for Disease Control and Prevention Cigarette smoking among adults United States, 1997 MMWR Morb Mortal Wkly Rep 1999,48 993-6
  - 40 Centers for Disease Control and Prevention Tobacco use United States, 1900-1999 MMWR Morb Mortal Wkly Rep 1999,48 986-93