

# Environmental Policies to Reduce College Drinking: Options and Research Findings

TRACI L. TOOMEY, PH.D.,<sup>†</sup> AND ALEXANDER C. WAGENAAR, PH.D.

*Division of Epidemiology, School of Public Health, University of Minnesota, 1300 South Second Street, Suite 300, Minneapolis, Minnesota 55454-1015*

**ABSTRACT.** *Objective:* The goal of this article is to provide an overview of environmental strategies that may reduce college drinking. Drinking behavior is influenced by many environmental factors, including messages in the media, community norms and attitudes, public and institutional policies and practices and economic factors. College student drinking may be influenced by environmental factors on and off campus. *Method:* A comprehensive search of MEDLINE, ETOH, Current Contents and Social Science Abstracts databases was conducted to identify research studies evaluating effects of environmental strategies on college and general populations. *Results:* The identified environmental strategies fall into four categories: (1) increasing compliance with

minimum legal drinking age laws, (2) reducing consumption and risky alcohol use, (3) decreasing specific types of alcohol-related problems and (4) de-emphasizing the role of alcohol on campus and promoting academics and citizenship. Although the extant research indicates that many environmental strategies are promising for reducing alcohol-related problems among the general population, few of these strategies have been evaluated for effects on the college population. *Conclusions:* Further research is needed to evaluate effects of alcohol control policies on alcohol consumption and its related problems among college students. (*J. Stud. Alcohol*, Supplement No. 14: 193-205, 2002)

CONCERN OVER drinking practices among college students has grown recently, in part because of well-publicized, alcohol-related tragedies that have occurred on campuses in the last few years. Because of this publicity, many people ask, "What has happened to our college campuses? Why are we seeing so many alcohol-related deaths?" In fact, the primary change may not be drinking levels or patterns among college students but rather society's increased awareness of the role alcohol plays in many problems, both on campus and off. Alcohol has been an integral part of many campuses for years—playing a role in campus celebrations, social functions and academic activities. Until recently, however, we had not quantified the contribution of alcohol to dropout rates, assaults, property damage and deaths and injuries occurring on and around campus. Colleges and universities are now struggling to identify effective strategies to address college drinking in an attempt to reduce alcohol-related problems among this population.

A parallel search for effective strategies to reduce alcohol-related problems is occurring in communities and states throughout the nation. A recurring discussion revolves around the types of approaches that are most effective in reducing alcohol use and its related problems. Traditional approaches have focused on individuals—providing interventions or treatment to individuals who are at highest risk

of alcohol-related problems, educating youth to resist peer pressure or fining and arresting those who break the law. These individually based approaches may be complemented by changing the broader environment, increasing the likelihood of long-term reductions in alcohol use and related problems (Bangert-Drowns, 1988; Moskowitz, 1989; Perry and Kelder, 1992; Rundall and Bruvold, 1988; Tobler, 1992). Individual drinking behavior is influenced by a myriad of environmental factors, such as messages in the media, community norms and attitudes, public and institutional policies and practices and economic factors (Wagenaar and Perry, 1994). Reductions in alcohol use and related problems may be achieved by changing such environmental factors (Edwards, 1994; National Institute on Alcohol Abuse and Alcoholism, 1997; Toomey et al., 1993).

Individually based strategies such as early intervention or treatment programs are designed to target individuals at highest risk—that segment of the population who are clinically identifiable as dependent on alcohol or those approaching dependence. A focus on treatment, however, is unlikely to achieve sizable, sustained reductions in alcohol-related problems at a population level because the majority of alcohol-related deaths, disability and damage is attributable to moderate drinkers who engage in occasional risky drinking, not those who are dependent on alcohol (Kreitman, 1986; Lemmens, 1995; Saunders, 1989). Risk is not a dichotomy, such that some drinkers are "high risk" and others are "safe." Instead, risk is a continuum. Drinking patterns in the general population are often not reflective of addictive

<sup>†</sup>Traci L. Toomey may be reached at the above address or via email at: [toomey@epi.umn.edu](mailto:toomey@epi.umn.edu).

psychopathological behavior, but rather are the results of social policies, institutional structures and social norms concerning alcohol in our society (National Institute on Alcohol Abuse and Alcoholism, 1997).

One promising individually based approach—social norms interventions—attempts to influence drinking behavior of a broad segment of the population by confronting misperceptions about normative drinking levels and attitudes toward alcohol use (Haines, 1996; Haines and Spear, 1996). Many individuals, particularly on college campuses, overestimate levels of alcohol consumption and permissiveness toward alcohol use among their peers. Awareness campaigns are used to adjust these misperceptions and to create awareness of true consumption rates and attitudes toward alcohol use. One problem with this type of approach by itself, however, may be that actual consumption rates on college campuses are unacceptably high, just not as high as perceived by many students. Social norms interventions, along with individually focused approaches, may be enhanced by combining them with environmental strategies that are effective in lowering consumption rates on campus. As environmental strategies are implemented, awareness campaigns could be used to make students aware of the changing drinking behaviors and norms on campus.

Researchers and practitioners have begun to identify numerous environmental strategies to reduce alcohol-related problems. The social environment that facilitates or encourages risky drinking practices is substantially shaped by public and institutional policies that can be changed to create healthier and safer communities. Wide arrays of alcohol policies have been identified (Toomey and Wagenaar, 1999). Research has shown that changes in many of these policies, by reducing the availability of alcohol, decrease alcohol consumption and related problems (Edwards, 1994; National Institute on Alcohol Abuse and Alcoholism, 1997; Toomey et al., 1993).

College student drinking is influenced by the broader community as well as the campus environment. College leaders shape campus policy. Many constituencies influence community and state-level policies. Campus leaders need to work with a variety of other institutions and community leaders to change the broader environment in which their students live, work and play. In this article, we identify strategies that can be implemented directly by college leaders on their campuses as well as community and state-wide strategies that campus leaders can work toward in collaboration with others.

Our primary goal is to describe several types of environmental strategies. First are those aimed at increasing adherence to minimum drinking age laws. Second are those that focus on reducing overall levels of consumption and risky alcohol use among the general college population. The third group of strategies focuses on reducing the incidence of very specific alcohol-related problems, such as

drinking and driving. The fourth group of strategies works to de-emphasize alcohol as a necessary part of college life and to increase expectations about academics and citizenship.

Descriptions of these four types of environmental strategies are useful to campus and community leaders seeking potential approaches to use to reduce alcohol use on and around campuses. These descriptions also are useful to researchers formulating new research questions and designing studies. Although alcohol control policies have been identified and implemented at local and state levels, many of the policies have not been evaluated to determine their effectiveness in preventing alcohol-related problems on or off campus (Wagenaar and Toomey, 2000). We provide a summary of relevant research of the effect of specific alcohol control policies on the general and college populations when available.

### **Increasing Effectiveness of the Minimum Legal Drinking Age**

The minimum legal drinking age (MLDA) is the most widely studied alcohol control policy (Wagenaar and Toomey, 2000). Many studies using the most robust research designs show that a higher MLDA results in lower alcohol use and fewer traffic crashes among 18- to 20-year olds (Toomey et al., 1996; Wagenaar, 1993; Wagenaar and Toomey, this supplement). The National Highway Traffic Safety Administration (1998) estimates that since 1975, the age-21 MLDA has prevented more than 17,000 traffic crash fatalities among youth. Other studies also show that the age-21 MLDA may also reduce other alcohol-related problems such as suicide and vandalism among young people (Jones et al., 1992; New York State Division of Alcoholism and Alcohol Abuse, 1984; Toomey et al., 1996).

Although the age-21 MLDA is saving thousands of lives, adolescents and young adults continue to drink alcohol and experience alcohol-related problems. One reason is that the age-21 MLDA has not been well enforced (Wagenaar and Wolfson, 1994, 1995). Wagenaar and Wolfson (1995) showed that enforcement of the MLDA in the early 1990s was low across the nation. When enforcement did occur, enforcement activity was most likely directed at the underage consumer, not the adult who illegally sold or provided alcohol. As a result, underage youth easily obtain alcohol from commercial and social providers.

Social providers include parents, siblings, coworkers and even strangers. Social providers may be over the age of 21, purchase alcohol legally and then illegally provide alcohol to an underage person. A social provider may also be an underage person who, once obtaining alcohol, then illegally provides alcohol to another underage person. Social provision of alcohol may occur at parties, in residences, at campus or community events or in public areas such as parks

or beaches. In addition, youth may approach adults outside alcohol establishments and ask adults to purchase alcohol. A recent multicomunity intervention trial has demonstrated that mobilized communities that change multiple institutional policies can significantly reduce social provision of alcohol to teens (Wagenaar et al., 2000).

Commercial providers are licensed alcohol establishments such as restaurants, bars and liquor stores. Such licensed establishments often exist on and around college campuses. Research shows that underage youth can purchase alcohol without age identification in half or more of purchase attempts (Forster et al., 1994, 1995; Preusser and Williams, 1992). Although social sources are where most underage youth obtain alcohol, the likelihood of purchasing their own alcohol increases as youth get older (Wagenaar et al., 1996). Rates of usage of specific types of alcohol sources specifically among college students are not known (Hingson et al., 1997).

The issue of underage alcohol use is particularly salient to college campuses where a large percentage of the student population is under age 21. Campus policies can be changed and enforced to ensure that the campus environment does not support underage drinking. The campus environment is also influenced by local and state policies; therefore, campus leaders may need to work with other community leaders to create changes in the broader environment to prevent illegal alcohol sales and provision of alcohol to underage people (Table 1).

#### *Reducing social access to alcohol*

A variety of community policies are used to decrease the prevalence of large drinking parties—situations where underage youth can easily obtain alcohol (Jones-Webb et al., 1997; Wagenaar et al., 1993, 1996). First, some communities prohibit alcohol use in public places such as parks and beaches, or restrict the hours that alcohol can be consumed in these locations. In addition, law enforcement officers patrol public areas to ensure that parties are not occurring despite the restrictions. To reduce the number of parties occurring in hotels and motels, some hotels restrict the age of room renter and number of guests allowed per room.

Within the borders of college campuses, underage individuals may attend parties in residence halls, fraternities and student centers and sometimes obtain alcohol at departmental and college events and celebrations. To decrease the number of parties where underage students have access to alcohol on campus, campus leaders may choose not to serve alcohol at all events or parties or at events where underage individuals are present. In addition to obtaining alcohol at large parties and events, underage individuals may get alcohol in their place of residence. Colleges and fraternity systems may create alcohol-free residence halls

TABLE 1. Strategies to increase effectiveness of the minimum legal drinking age

---

<i>Decrease social access</i>	
Decrease number of large drinking parties	
Prohibit alcohol use in public places	
Patrol public areas	
Restrict parties at hotels/motels	
Have alcohol-free parties/events	
Create alcohol-free residences	
Prevent underage access at parties	
Ban kegs	
Implement keg registration	
Limit quantity per request	
Create drinking areas	
Do not allow self-service	
Require server training	
Check age identification	
Increase awareness of laws	
Implement awareness campaigns	
Distribute warning fliers	
Enforce social provision laws	
Use shoulder tap campaigns	
Spot check parties	
Hire security monitors	
Enact noisy assembly policies	
Enact social host liability	
<i>Decrease commercial access</i>	
Limit alcohol sales	
Prohibit alcohol sales on campus	
Restrict/ban home deliveries	
Focus on establishment behavior	
Check age identification	
Provide incentives	
Develop monitoring system	
Train managers/servers	
Require server license	
Restrict age of seller	
Reduce use of false age identification	
Penalize users and producers	
Make ID difficult to falsify	
Enforce commercial provision laws	
Implement compliance checks	
Enact administrative penalties	
Complete walk throughs	
Enact dram shop liability	

---

and Greek houses to decrease younger residents' exposure to alcohol. Some colleges have completely banned alcohol from residence halls, whereas others have prohibited alcohol in certain areas of residence halls (Finn, 1996).

When alcohol is served at parties and events on and off campus, alcohol may be free flowing and not well monitored. Policies can be developed to ensure underage attendees do not have access to alcohol. One type of drinking party that may increase underage access to alcohol is a "kegger," where people have access to large quantities of very low cost or free alcohol. States and communities may ban sales of beer kegs to individuals in an effort to decrease the amount of alcohol at parties. College campuses may also regulate use of beer kegs; specifically, beer kegs can be prohibited on campus. Banning kegs, however, does not prevent event organizers from bringing in large quantities of cans or bottles of alcohol, and a ban at the state or

community level may be opposed by alcohol retailers and some consumers.

An alternative approach used to prevent underage access to beer from kegs is registration of kegs. Keg registration involves alcohol retailers placing a unique identifier on a keg and recording the purchaser's name and address at the time of sale, enabling law enforcement agents to identify and hold responsible the adult who provided the keg. Although college campuses cannot mandate local retailers to register kegs, campus leaders can encourage state or local policy-makers to implement such a policy or work with retailers to register beer kegs voluntarily.

At some community or campus events, an individual who is of age may legally acquire alcohol and then give it to an underage friend or colleague. To decrease the likelihood that this type of social provision will occur at an event, alcohol service can be limited to only one drink per person per request. At some events, specific areas are created where alcohol can be consumed; entrance can then be limited to individuals over age 21.

Another strategy to reduce underage access to alcohol on college campuses is to monitor the serving of alcohol at campus events, with no self-service allowed. Individuals designated to serve alcohol on campus can be trained how to check age identification and how to refuse alcohol service to underage individuals.

Many people throughout communities and campuses, including students, staff and faculty, are not even aware that the law prohibits provision of alcohol to people under age 21. Simply learning the MLDA law exists and awareness of potential legal liability or other consequences may deter provision of alcohol to underage people. Awareness campaigns can be used to educate people about this law and about potential consequences for not complying. As part of the Communities Mobilizing for Change on Alcohol Project (Wagenaar et al., 1994, 1999, 2000), local alcohol retailers distributed warning fliers to all customers purchasing alcohol. On college campuses, warning fliers or educational material can be distributed at orientation sessions, in published residence hall rules and regulations, in campus newspapers and via email.

Educating adults about consequences may not be sufficient to create a deterrent effect, however. Research shows that the most effective element of deterrence is perceived certainty of facing penalties for not complying with a law (Decker and Kohfeld, 1990; Grogger, 1991; Grosvenor et al., 1999; Ross, 1984, 1992). Therefore, to be effective, laws prohibiting provision of alcohol to underage people must be enforced. Few adults face penalties for supplying alcohol to underage persons (Wagenaar and Wolfson, 1994).

Communities and campuses can develop enforcement systems to identify and modestly penalize individuals who illegally provide alcohol. One type of enforcement effort is "shoulder tap" campaigns. Underage people, under the su-

pervision of law enforcement, approach an adult outside an alcohol establishment and ask the adult to purchase alcohol for them. If the adult purchases alcohol for the underage person, the adult is warned, cited or arrested. As shown by research in areas of drinking and driving, awareness campaigns connected to enforcement efforts can increase the effectiveness of these efforts (Blomberg, 1992).

Campus police can conduct random spot checks of events and parties on campus to ensure that serving of alcohol is monitored and that age identification is being checked. Enforcement policies can also be developed by specific units on college campuses. For example, residence halls can develop systems to enforce no-alcohol-provision laws as well as no-alcohol-use rules. However, a preliminary investigation in three residence halls at one college suggests that level of enforcement may vary by resident assistant and director of the residence hall (Rubington, 1991). To avoid placing resident assistants in the difficult role of being an enforcer at the same time that they are charged with developing close, supportive relationships with students, residence halls might hire security monitors or charge others to act as hall enforcers.

Enforcement agents in communities also face challenges when enforcing underage drinking laws—particularly when dealing with parties held in private residences. To reduce underage drinking at these parties, communities have passed ordinances to hold property owners responsible for underage parties on their property and to restrict level of noise emitted from parties (Minneapolis, MN Ord. §385.110; Farmington Hills, MI Ord. §80.455). Noisy assembly ordinances allow enforcement agents to enter a private residence under very specific circumstances; if underage drinkers are present, the enforcement agents can take action against the individual drinkers and attempt to identify the supplier of alcohol.

Although certainty of detection is most critical for creating a general deterrent effect (Decker and Kohfeld, 1990; Grogger, 1991; Grosvenor et al., 1999; Ross, 1984, 1992), many people focus instead on the severity of punishment, believing that if the punishment is severe enough, people are more likely to comply with a law or policy. Research indicates, however, that severe penalties do not deter people from breaking the law (Ross, 1984, 1992). If penalties are perceived as too severe, they become less well enforced, leading to less certainty of detection.

In addition to law enforcement efforts, social providers can also be deterred by changes in civil liability law. Through state statutes or case law, some states have created social host liability. If a person illegally gives alcohol to an underage person, and the underage person injures him- or herself or someone else, a third party can sue the provider for damages. Media campaigns concerning civil and criminal cases can increase the perceived risk of consequences and thus improve the deterrent effect of these efforts.

*Reducing commercial access to alcohol*

Several research studies show that the majority of licensed alcohol establishments will sell alcohol to someone who appears under age 21, without looking at age identification (Forster et al., 1994, 1995; Preusser and Williams, 1992). Underage students also have access to alcohol from commercial or licensed alcohol establishments on some campuses. Although many colleges prohibit alcohol sales on campus, some college campuses have obtained licenses to sell alcohol in student centers, stadiums and auditoriums. Research on rates of illegal sales to underage people on college campuses is not available.

Community and campus leaders can work with alcohol merchants to establish outlet policies to increase the rate of age identification checking among servers and sellers. A standard recommendation in most outlets is to check age identification of everyone who looks under age 30. On college campuses, however, a simple policy of checking age identification of all customers may be most prudent.

Owners and managers need to communicate clearly the expectation that age identification is consistently checked. Some establishments provide monetary incentives to staff when they identify false identification. Management may also set up monitoring systems to observe alcohol sales, decreasing the likelihood of alcohol sales to underage individuals (Wolfson et al., 1996).

Owners and managers of alcohol establishments need training to learn how to develop, communicate and enforce policies. A recent focus group study of owners and managers of bars and restaurants suggests that many owners and managers never receive such training and many establishments do not have written policies (Gehan et al., 1999). Support of management is necessary to change server behavior (Saltz, 1987).

Alcohol servers also need training to learn how to detect and handle false age identification and how to refuse alcohol service. The quality of existing server training programs varies, with few programs adequately covering underage sales issues and even fewer using science-based behavior-change techniques to improve server skills and confidence to refuse alcohol sales (Toomey et al., 1998). Although current training programs apparently improve server knowledge and attitudes about responsible alcohol service, training programs by themselves do not significantly reduce illegal alcohol sales rates (Howard-Pitney et al., 1991; McKnight, 1991).

Typically, management arranges such training; however, in some areas the burden is placed on the server, and they cannot be hired until they have been trained and have received a serving license (analogous to a hair stylist license). Although this process ensures that a server is trained prior to serving alcohol and can facilitate statewide minimum standards for training programs, it does not ensure support by management for responsible alcohol service.

Once age identification is routinely being checked, communities may also need to reduce the availability of false age identification. In a survey of high school seniors and 18- to 20-year olds in the Midwest, only a few respondents reported using false age identification to purchase alcohol (Wagenaar et al., 1996). False age identification might be more prevalent among college populations, however. Using a convenience sample from one university, Durkin et al. (1996) reported that 46% of 272 respondents indicated using false age identification to obtain alcohol. Students who belonged to fraternities and sororities were more likely to use false age identification than were other students. Communities may apply penalties to those caught using false age identification. To increase detection of false age identification, states are making new identification cards that are more difficult to duplicate (e.g., use of holograms) and that more clearly identify an underage person versus a person over 21 (e.g., use of different colors and location or profile of photograph for underage).

To prevent sales to underage people, training programs need to be combined with other strategies. To increase both servers' and management's perceived certainty of facing penalties for illegally selling alcohol to underage people, and thus create a stronger deterrent effect, law enforcement officers conduct compliance checks. An underage person attempts to purchase alcohol; if the sale is made, penalties may be applied to both the server and the license holder. Applying penalties to just the server will not increase management's support for responsible alcohol service. Graduated administrative penalties or fines may be applied to license holders whose establishments make illegal alcohol sales. Fines increase with each offense; multiple offenses should result in the license to sell alcohol being suspended or revoked. Studies indicate regular compliance checks substantially reduce illegal alcohol sales (Grube, 1997; Preusser et al., 1994), a result well established in literature on tobacco sales to teens (DiFranza et al., 1992; Hinds, 1992; Hoppock and Houston, 1990).

In addition to compliance checks, law enforcement officers may conduct a walk through of alcohol establishments, increasing their visibility. Serving practices may also be altered by potential dram shop liability, which enables individuals to sue alcohol establishments for injuries sustained after illegal alcohol sales. Wagenaar and Holder (1991b) found a 6.5% decrease in injury-producing, single-vehicle, nighttime traffic crashes following the well-publicized filing of a liability suit in Texas. Traffic crashes decreased another 5.3% after a second liability suit.

One type of risky, unmonitored sale that may particularly increase the likelihood of an alcohol sale to an underage person is home delivery of alcohol. More than half the states in the United States allow home delivery of alcohol (Fletcher et al., 2000). In mid-sized, Midwestern communities, 7% of 18- to 20-year olds and 10% of 12th graders

indicated that they had drunk alcohol that had been delivered to the home from retail establishments. In addition to retail home deliveries, concern has also recently increased over deliveries of alcohol ordered from the Internet. To prevent delivery to underage people, communities can ban or restrict home deliveries of alcohol. Law enforcement officers can also conduct compliance checks where the cooperating underage person arranges for alcohol to be delivered to a home, rather than attempting to conduct purchase attempts in alcohol establishments.

In addition, establishments and communities can restrict the age of those who deliver or serve alcohol. Forster et al. (1994, 1995) found that younger servers were more likely to sell alcohol to an underage person.

### Reducing Consumption Levels and Risky Alcohol Use among the General College Population

While many campuses are struggling to reduce underage drinking, they are also attempting to find ways to reduce high-risk drinking among students over age 21. To reduce overall levels of alcohol consumption and change patterns of risky alcohol use, states, communities, colleges and other institutions can place restrictions on where and how alcohol is sold and distributed, how much alcohol costs and where alcohol is consumed (Table 2). Research studies show that restricting availability of alcohol leads to decreases in alcohol consumption among the general population (for a review, see Edwards, 1994). As consumption rates go down within a population, so do many alcohol-related problems.

#### *Where, when and how alcohol is distributed*

Studies suggest that factors related to licensed establishments, such as density of businesses, hours and days of sale and responsible service of alcohol, affect levels of alcohol consumption and related problems throughout communities. Studies of the density or the number of alcohol licenses per population size have found a statistically significant relationship between density of alcohol outlets, consumption and related problems such as violence, other crime and health problems, although many of these studies are weaker cross-sectional designs (Gliksman and Rush, 1986; Gruenewald et al., 1993; Harford et al., 1979; Ornstein and Hannsens, 1985; Scribner et al., 1995; Smith, 1989; Stitt and Giacompassi, 1992). Chaloupka and Wechsler (1996) specifically studied college students and found higher levels of drinking, drinking participation and high-risk drinking among underage and older college students when a larger number of businesses were selling alcohol within one mile of campus.

Numbers of outlets may be restricted directly or indirectly through policies that make licenses more difficult to

TABLE 2. Strategies to reduce alcohol consumption and risky alcohol use among college students

---

*Where, when and how alcohol is distributed*

- Affect when and how alcohol is sold
  - Reduce density
  - Increase cost of license
  - Prevent privatization
  - Restrict days/hours of sale
  - Promote responsible alcohol service
    - Serve standard sizes
    - Prohibit pitchers
    - Cut off intoxicated individuals
    - Promote alcohol-free drinks/food
    - Eliminate last call announcements
    - Require manager/server training
- Reduce flow at parties
  - Ban beer kegs
  - Prohibit home deliveries
  - Limit quantity at events
  - Do not allow self-service
  - Make alcohol-free drinks and food available
  - Serve low-alcohol content drinks
- Increase price of alcohol
  - Restrict happy hours/price promotions
  - Limit free alcohol
  - Increase excise tax

*Where alcohol is consumed*

- Restrict consumption to specific areas
- Create dry campuses/residences
- Do not allow consumption in locations where heavy drinking occurs

---

obtain (e.g., through increasing the cost of a license). Several states limit the number of alcohol outlets and control the price of alcohol by maintaining state-run (rather than privately owned) outlets. A trend in the last few decades has been to privatize such state monopolies. Several studies show substantial long-term increases in alcohol sales following privatization (Holder and Wagenaar, 1990; Wagenaar and Holder, 1991a, 1995), although others only found short-term increases (Mulford et al., 1992). Until effects of such privatization are fully evaluated, states should consider preventing privatization because reversal of the privatization process is not politically feasible.

Availability of alcohol may also be affected by hours and days of sale. Evaluations of the effect of hours and days of sale of alcohol are mixed. Changes in hours of sale may not affect consumption levels (Hoadley et al., 1984; McLaughlin and Harrison-Stewart, 1992). A few studies suggest that changes in hours may affect rates of problem drinking, cirrhosis mortality and some types of alcohol-related problems (e.g., traffic crashes, violence) (Duffy and Pinot de Moira, 1996; Hooper, 1983; Smith, 1986). Other studies indicate no changes in problems or simply a shift in timing of problems (e.g., from the old closing to the new closing hour) (De Moira and Duffy, 1995; Duffy and Plant, 1986; Raymond, 1969). An inverse relationship may exist between days of sale and alcohol use and alcohol-related problems (Ligon and Thyer, 1993; Northridge et al., 1986; Ornstein and Hannsens, 1985; Smith, 1988). However, some

studies have found no significant relationship (Duffy and Plant, 1986; Hoadley et al. 1984; Ligon et al., 1996). Hours and days when alcohol may be served at campus events can be regulated, limiting alcohol service to weekends or after regular work hours to help separate alcohol use from activities that more closely align with the campus' core academic mission.

As with preventing illegal alcohol sales to underage students, owners and managers of alcohol establishments can implement policies that instruct staff how to prevent patrons from becoming intoxicated and refuse sales to obviously intoxicated customers (Toomey et al., 2001). One recent study found that 79% of alcohol establishments will serve alcohol to patrons who appear obviously intoxicated (Toomey et al., 1999), despite laws prohibiting such sales. Examples of policies that management can implement are serving alcohol in standard sizes, limiting sales of pitchers of alcohol, cutting off service of alcohol to intoxicated patrons, promoting alcohol-free drinks and food and eliminating last call announcements. Although some of the existing server training programs have led to interventions such as offering food and alcohol-free beverages, training by itself has not led to cutting off sales to intoxicated individuals (Howard-Pitney et al., 1991; McKnight, 1987, 1991; Saltz, 1987).

Another strategy to reduce overall availability of alcohol is to restrict the flow of alcohol at parties and other events on and off campus. Many policies described earlier for preventing underage access to alcohol at parties can also be used to decrease the amount of drinking among older students. Overlapping community policies include banning beer kegs and prohibiting home deliveries of large quantities of alcohol. Overlapping policies for campus events include limiting the quantity of alcohol per person and monitoring or serving alcohol rather than allowing self-service. At one fraternity party, Geller and Kalsher (1990) found that attendees who obtained beer through self-service consumed more beer than those who got alcohol from a bartender. Event and party planners could also be required to serve food and offer a large selection of alcohol-free beverages. Another strategy is to serve low-alcohol content beverages. Geller et al. (1991) found that students attending a fraternity party where only low-alcohol content drinks were served consumed the same number of drinks but had a lower blood alcohol concentration (BAC) than did students at parties where regular alcohol content beer and mixed drinks were served.

### *Price of alcohol*

After the MLDA, alcohol control policies affecting price of alcohol are the next most-studied alcohol policies (Wagenaar and Toomey, 2000). Studies of price effects in the general population indicate that as the price of alcohol

goes up, consumption rates go down (Clements and Selvanathan, 1991; Duffy, 1981; Gao et al., 1995; Leung and Phelps, 1993; Levy and Sheflin, 1983; Österberg, 1995; Selvanathan, 1991). However, the level of effect on consumption varies by culture, drinking level, age group and type of alcohol (Coate and Grossman, 1988; Cook and Tauchen, 1982; Manning et al., 1995; Selvanathan, 1988, 1991). All types of drinkers appear to be affected by price, but the heaviest drinkers may be less affected by variations in price than other consumers (Manning et al., 1995). However, heavier drinkers in young populations are more affected by price than heavy drinkers in the general population (Chaloupka and Wechsler, 1996; Godfrey, 1997; Kenkel, 1993; Sutton and Godfrey, 1995). Inverse relationships are also seen between price of alcohol and several types of alcohol-related problems, including motor vehicle fatalities, robberies, rapes and liver cirrhosis mortality (Cook and Moore, 1993b; Cook and Tauchen, 1982; Ruhm, 1996). Grossman and Markowitz (1999) evaluated the effect of price of beer on violence among college students. Using self-report data from 122,416 students from 191 colleges and universities from 29 states, they found that higher price for beer was associated with a lower incidence of (1) getting into trouble with police or college authorities, (2) damaging property or pulling a fire alarm, (3) having an argument or fight and (4) being taken advantage of or taking advantage of someone sexually.

Several types of policies affect price of alcohol. One type of policy is restrictions on happy hours or price promotions (e.g., two drinks for the price of one, women drink for free). Babor et al. (1978) found that happy hours were associated with higher consumption among both light and heavy drinkers. Although not specific to college populations, the study has clear implications for college students; many bars surrounding campuses attract students by promoting drink specials. Restrictions on happy hours can be implemented by individual outlets, campuses (if a licensed establishment is on campus), local communities (if communities are not preempted by state law) and the state. In nonlicensed settings on campus where alcohol is served, event planners may want to limit the amount of free alcohol available.

Placing excise taxes on alcohol is another type of policy that affects price. Using national samples of youth, several studies indicate that raising alcohol excise taxes has particularly large effects in reducing youth drinking. Higher beer taxes are associated with less frequent drinking among 16- to 21-year olds (Coate and Grossman, 1988; Grossman et al., 1994); effects of tax increases are stronger among frequent and fairly frequent drinkers than among infrequent drinkers. Cook and Moore (1993a) found that students who went to high school in states that had higher taxes and higher MLDA were more likely to graduate from college. Using a nationally representative sample of college students,

Chaloupka and Wechsler (1996) found that indexing the federal beer tax to the rate of inflation since 1951 could lead to a 15% reduction in drinking participation among underage women, and a 17% and 21% reduction in high-risk drinking among underage women and women over 21, respectively.

#### *Where alcohol is consumed*

States, communities and campuses can also limit where alcohol is consumed. For example, at community events or festivals, alcohol sales and consumption can be restricted to certain areas to make alcohol less available and to prevent alcohol from becoming the main focus of the event. Colleges can choose to have "dry" campuses, not allowing any alcohol consumption on campus. Colleges may decide to allow alcohol to be used only in certain locations, such as banquet rooms. Alternatively, colleges may allow alcohol use throughout most of the campus, but restrict consumption in certain locations on campus where heavy drinking often occurs. For example, the University of Iowa has banned alcohol use in campus parking lots so that tailgating parties will be alcohol free (Mitka, 1998). The University of Arizona prohibits patrons from bringing alcohol into its sport stadium. Alcohol sales are also not allowed in the stadium. Spaite et al. (1990) found no change in injuries among patrons following the ban. However, no comparison group was used in this study, and there was anecdotal evidence that patrons continued to bring alcohol into the stadium even after the ban was passed.

#### **Strategies to Affect Specific Alcohol-Related Problems**

Environmental strategies can also target specific types of alcohol-related problems such as traffic crashes or violence. A goal of policies setting limits on BACs is to create a general deterrent effect among the entire population of drivers, lowering the aggregate levels of drinking and driving. Research studies indicate that coordination, vision, attention and driving performance are affected at BACs lower than 0.10% (Mortimer and Sturgis, 1975; Moskowitz and Burns, 1990; Moskowitz et al., 1985). As a result, many states have lowered the BAC limit to 0.08% (Hingson et al., 1997). BAC limits of 0.02% to 0.05% are not uncommon in other countries (Noordzij, 1979). Studies of these policy changes suggest that lower BACs may be effective in decreasing traffic crashes (National Highway Traffic Safety Administration, 1991).

Recognizing that youth are particularly at risk of a traffic crash while drinking and driving, states began creating youth-specific BAC laws. Currently all 50 states have a youth BAC law, with most states setting BAC limits of 0.00% to 0.02% for individuals under age 21. One study found significant decreases in single-vehicle, nighttime fa-

tal crashes involving young drivers following implementation of youth BAC laws in 12 states (Hingson et al., 1994). Another study across 30 states found a 19% reduction in driving after drinking following the new laws (Wagenaar et al., 2001).

Depending on their age, college students may be affected by either adult or youth BAC limits. Although BAC laws are set at the state level, awareness campaigns could be implemented on college campuses to make these policies more effective. Blomberg (1992) found that an intensive awareness campaign designed to educate youth about the BAC law for their age group resulted in fewer alcohol-related traffic crashes compared with areas that were not exposed to the awareness campaign.

Another type of alcohol-related problem that can be targeted by environmental strategies is aggressive behavior, particularly in bars (Graham and Homel, 1997). Aspects of the physical environment that frustrate customers such as overcrowding with poor traffic flow design, bad air quality and bad music are associated with more aggression (Graham and Homel, 1997; Graham et al., 1980; Homel et al., 1992). Service of food may help reduce aggressive behavior by slowing down absorption of alcohol and also by creating an atmosphere where alcohol is not the sole focus of customers (Graham, 1985).

Specific strategies can be developed to prevent a wide variety of other alcohol-related problems on and around campus. However, campus and community leaders may need to consider whether resources should be used to target a specific type of problem or to target overall drinking rates, which could potentially reduce a wide array of alcohol-related problems.

#### **Strategies to De-Emphasize Alcohol and Create Positive Expectations on Campus**

Colleges and communities can also create other environmental changes to de-emphasize the role of alcohol on and around campus or change expectations about student behavior.

#### *Strategies to de-emphasize the role of alcohol*

A discussion topic for every college campus is the appropriate role of alcohol in an academic environment. Should alcohol be allowed on campus? Should alcohol be allowed at academic functions or only social functions? Does alcohol on campus facilitate the academic mission or does alcohol get in the way of the mission? Should the campus profit from alcohol sales and promotion on campus? Decisions that college campuses make about these questions may influence perceptions and behaviors of staff and students.

Regardless of when and how alcohol is used on campus, a variety of strategies can be used to de-emphasize alcohol



on campus. For example, colleges may elect to avoid sponsorship of campus events by alcohol retailers or producers. Campus newspapers can also restrict alcohol advertisements and promotions. College newspapers can also prioritize reporting stories about alcohol-related problems on and around campus (Gomberg, 1999).

Campuses can also create alcohol-free residence halls and Greek houses. Alcohol-free residences may also demonstrate that students can be social without alcohol use, particularly if the alcohol-free residence is in a central location (Finn, 1996). Such residences also provide a place for students who do not want to experience "secondhand" effects of other students' alcohol use. In a survey of students living in an alcohol-free residence hall on one campus, 59% of the respondents chose a substance-free hall because of academic issues (e.g., wanting a quiet place to study) and 78% to avoid roommate problems associated with drinking and other drug use (Finn, 1996).

Campuses may develop other strategies to create positive environments that students can enjoy without alcohol use. For example, campuses can offer recreational sports later at night and on weekends or, instead of having a campus pub, campuses can establish a coffeehouse.

#### *Strategies to improve citizenship/academic excellence*

Changes in campus policies that increase citizenship and promote academic excellence may also help reduce alcohol use and problems on campus. Conceptually, these changes may be similar to changes in communities that help reduce crime and violence. For example, some communities have planted gardens to provide food for communities, to increase community involvement, to beautify the community and to increase citizen visibility. A side product of this activity appears to be reduced vandalism and drug trafficking (Davis and Lurigio, 1996).

Although many students are weekend drinkers and drink alcohol primarily on Fridays and Saturdays, some students begin their weekends on Thursdays because many campuses do not schedule classes on Fridays. To address this issue, some colleges schedule core courses on Friday mornings and mandate classroom attendance, which forces students to prioritize academic commitments through Friday (Rabow and Duncanshill, 1995). At the University of Vermont, the start of the school year was changed to avoid Labor Day. This campus wanted students to start school with a full, 5-day week to give the message that "a student's academic experience will be rigorous" (Mitka, 1998, p. 500).

Chaloupka and Wechsler (1996) found that working students were less likely to be involved in high-risk drinking. Students who have to work in addition to study may have less time and opportunity to drink alcohol. Although the cross-sectional design of the study does not allow causal interpretation, a future study could evaluate whether active

job placement or volunteering programs lead to less alcohol use among students. If so, encouraging students to work, volunteer or complete internships may not only increase skill levels, civic responsibility and community connections but also decrease alcohol-related problems.

Chaloupka and Wechsler (1996) also found that students who live on campus or in fraternities and sororities are more likely to engage in high-risk drinking than students who live off campus. Other studies have also found a higher level of alcohol use among students involved in fraternities and sororities compared with students not involved with these organizations (Cashin et al., 1998). Students more prone to heavy drinking may be more likely to choose to live in sororities or fraternities or live on campus because of the emphasis on drinking found in these settings. Another explanation may be that students who live off campus live among nonstudents who will not tolerate excessive drinking, noise and disruption. To increase expectations about responsible behavior in living situations, colleges could encourage staff and faculty to live in on-campus housing.

#### **Considerations for Campus and Community Leaders**

Although information about optimal implementation procedures or effectiveness of many other environmental strategies is limited, particularly for college-specific populations, the existing research literature can still guide selection of environmental strategies. Strategies that have been effective in other contexts and with other populations may be generalizable to college populations and campuses. However, all new strategies, whether individually or environmentally focused, should be evaluated to determine their effects on targeted outcomes and to detect potential unintended consequences.

Within a given college, policy changes may be necessary within the Greek system, residence halls, sports organizations, departments and student centers as well as at the campus-wide level. Policy development across campus can be coordinated so that all campus policies complement each other and combine into a comprehensive package of policies (Hingson et al., 1997). Representatives from organizations across campus, including students, should be included in development of policies to increase support for policies. However, complete consensus is not necessary to achieve successful policy changes.

Because student drinking behavior is also influenced by the off-campus environment, local, state and national policy changes are also necessary. Off-campus institutions such as alcohol establishments and work sites also need to change their alcohol policies. Campus leaders can collaborate with other community members to achieve these changes. To make policies most effective, people need to know that the policy exists and believe they will face consequences if

they do not comply with the policy (Blomberg, 1992; Ross, 1992).

Examples of specific questions campus leaders can ask when developing environmental strategies to address alcohol-related problems include:

- What type of problem needs to be addressed (e.g., high rates of heavy drinking, fights during sporting events, underage drinking)?
- What environmental strategy is most likely to address this problem?
- At what level should this strategy be implemented (e.g., at sports stadium, campus-wide, community-wide, statewide)?
- Who should be at the table when developing environmental strategies? Who should participate at the start, and who should be brought in only after a supportive base for action is established?
- What existing environmental strategies are currently being implemented?
- How well are existing policies being enforced? Would enforcement of existing policies be more effective than implementing new policies?
- How can environmental and individually focused approaches complement each other?
- What resources are needed to implement new strategies? Are resources available?
- How will new strategies be evaluated and fine-tuned to maximize effect?

### Considerations for Researchers

Relatively few of available alcohol prevention policies have been well evaluated. The two most well studied alcohol control policies—MLDA and excise taxes—have primarily been assessed for effects on alcohol consumption and traffic crashes (Wagenaar and Toomey, 2000). Other policy issues such as alcohol outlet density and advertising have been fairly well studied; others such as keg registration and restrictions at community events have not been studied at all. Although alcohol control policies can be implemented at institutional, local, state and national levels, most alcohol policies have been evaluated only at the national and state levels. Policies like server training have been fairly well evaluated at one type of institution—on-sale alcohol establishments (e.g., bars and restaurants)—but not evaluated for other types of institutions (e.g., college campuses).

Few researchers have evaluated the effects of alcohol policies on drinking and resulting problems specifically on college campuses. Of 241 analyses assessing the effects of the age-21 MLDA, 31 analyses specifically evaluated the effect of MLDA on college campuses. Of these, only five were studies of high methodological quality—that is, those that include a longitudinal design, comparison groups and probability sampling or use of a census (Wagenaar and

Toomey, this supplement). Although several studies have evaluated effects of price of alcohol and excise taxes on youth, we identified only two studies assessing effects specifically on college students. One of these studies also evaluated the effects of other environmental policies, including alcohol sales on campus and density of alcohol outlets near campus. Although the study used a nationally representative sample of students in 140 U.S. colleges and universities, the study was limited to a cross-sectional design, preventing assessment of causal relationships.

Colleges have many policy options for addressing drinking among students. However, much research is needed to determine the most effective policy approaches on campus and off campus to reduce underage and heavy drinking by college students. A starting point is to implement and evaluate effects of policies that have been proven effective with other populations to determine their effectiveness with a college population.

Specific examples of research questions include:

- How effective is each type of campus policy in reducing college drinking and heavy drinking?
- How effective is each type of campus policy in reducing specific types of alcohol-related problems?
- How many campuses implement these policies?
- How well are existing policies enforced? What factors influence enforcement levels?
- Does increased enforcement increase effectiveness? How much enforcement is necessary?
- Do awareness campaigns addressing specific policies increase effectiveness?
- What process is most effective for developing campus policies?
- How do community and state alcohol policies affect college drinking and problems?
- How can colleges be most effective in collaborations to influence local and state policy?
- How effective are other environmental strategies developed by colleges in reducing college drinking?

### Conclusions

Studies using robust research designs indicate that reducing alcohol availability through policy change reduces alcohol consumption and related problems. Although research evaluating the effect of alcohol policies and other environmental strategies on drinking and related problems among college students is limited, campus leaders can choose from a broad list of environmental strategies, many of which have been evaluated and found promising in other settings. Researchers and campus leaders need to collaborate to evaluate effects of environmental strategies and to develop guidelines for optimal combinations of policies and other efforts to shape the campus environment around alcohol.

## References

- BABOR, T.F., MENDELSON, J.H., GREENBERG, I. AND KUEHNLE, J. Experimental analysis of the "happy hour": Effects of purchase price on alcohol consumption. *Psychopharmacology* **58**: 35-41, 1978.
- BANGERT-DROWNS, R.L. The effects of school-based substance abuse education: Meta-analysis. *J. Drug Educ.* **18**: 243-264, 1988.
- BLOMBERG, R.D. Lower BAC limits for youth: Evaluation of the Maryland .02 law, DOT HS 807-860, Springfield, VA: National Technical Information Service, 1992.
- CASHIN, J.R., PRESLEY, C.A. AND MEILMAN, P.W. Alcohol use in the Greek system: Follow the leader? *J. Stud. Alcohol* **59**: 63-70, 1998.
- CHALOUKKA, F.J. AND WECHSLER, H. Binge drinking in college: The impact of price, availability, and alcohol control policies. *Contemp. Econ. Policy* **14** (4): 112-124, 1996.
- CLEMENTS, K.W. AND SELVANATHAN, S. The economic determinants of alcohol consumption. *Aust. J. Agric. Econ.* **35**: 209-231, 1991.
- COATE, D. AND GROSSMAN, M. Effects of alcoholic beverage prices and legal drinking ages on youth alcohol use. *J. Law Econ.* **31**: 145-171, 1988.
- COOK, P.J. AND MOORE, M.J. Drinking and schooling. *J. Hlth Econ.* **12**: 411-429, 1993a.
- COOK, P.J. AND MOORE, M.J. Violence reduction through restrictions on alcohol availability. *Alcohol Hlth Res. World* **17**: 151-156, 1993b.
- COOK, P.J. AND TAUCHEN, G. The effect of liquor taxes on heavy drinking. *Bell J. Econ.* **13**: 379-390, 1982.
- DAVIS, R.C. AND LURIGIO, A.J. *Fighting Back: Neighborhood Antidrug Strategies*, Thousand Oaks, CA: Sage, 1996.
- DECKER, S.H. AND KOHFELD, C.W. Certainty, severity, and probability of crime: A logistic analysis. *Policy Stud. J.* **19**: 2-21, 1990.
- DE MOIRA, A.C.P. AND DUFFY, J.C. Changes in licensing law in England and Wales and alcohol-related mortality. *Addict. Res.* **3**: 151-164, 1995.
- DI FRANZA, J.R., CARLSON, R.P. AND CAISSE, R.E. Reducing youth access to tobacco. *Tobacco Control* **1**: 58, 1992.
- DUFFY, J.C. AND DE MOIRA, A.C.P. Changes in licensing law in England and Wales and indicators of alcohol-related problems. *Addict. Res.* **4**: 245-271, 1996.
- DUFFY, J.C. AND PLANT, M.A. Scotland's liquor licensing changes: An assessment. *Brit. Med. J.* **292**: 36-39, 1986.
- DUFFY, M. The influence of prices, consumer incomes and advertising upon the demand for alcoholic drink in the United Kingdom: An econometric study. *Brit. J. Alcohol Alcsm* **16**: 200-208, 1981.
- DURKIN, K.F., WOLFE, T.W. AND PHILLIPS, D.W., 3rd. College students' use of fraudulent identification to obtain alcohol: An exploratory analysis. *J. Alcohol Drug Educ.* **41** (2): 92-104, 1996.
- EDWARDS, G. (Ed.) *Alcohol Policy and the Public Good*, New York: Oxford Univ. Press, 1994.
- FINN, P. Substance-free residence halls: The promise and the practice. *J. Amer. Coll. Hlth* **45**: 51-58, 1996.
- FLETCHER, L.A., TOOMEY, T.L., WAGENAAR, A.C., SHORT, B. AND WILLENBRING, M.L. Alcohol home delivery services: A source of alcohol for underage drinkers. *J. Stud. Alcohol* **61**: 81-84, 2000.
- FORSTER, J.L., MCGOVERN, P.G., WAGENAAR, A.C., WOLFSON, M., PERRY, C.L. AND ANSTINE, P.S. The ability of young people to purchase alcohol without age identification in northeastern Minnesota, USA. *Addiction* **89**: 699-705, 1994.
- FORSTER, J.L., MURRAY, D.M., WOLFSON, M. AND WAGENAAR, A.C. Commercial availability of alcohol to young people: Results of alcohol purchase attempts. *Prev. Med.* **24**: 342-347, 1995.
- GAO, X.M., WAILES, E.J. AND CRAMER, G.L. A microeconomic model analysis of US consumer demand for alcoholic beverages. *Appl. Econ.* **27**: 59-69, 1995.
- GEHAN, J.P., TOOMEY, T.L., JONES-WEBB, R., ROTHSTEIN, C. AND WAGENAAR, A.C. Alcohol outlet workers and managers: Focus groups on responsible service practices. *J. Alcohol Drug Educ.* **44** (2): 60-71, 1999.
- GELLER, E.S. AND KALSHER, M.J. Environmental determinants of party drinking: Bartenders vs. self-service. *Environ. Behav.* **22**: 74-90, 1990.
- GELLER, E.S., KALSHER, M.J. AND CLARKE, S.W. Beer versus mixed-drink consumption at fraternity parties: A time and place for low-alcohol alternatives. *J. Stud. Alcohol* **52**: 197-204, 1991.
- GLIKSMAN, L. AND RUSH, B.R. Alcohol availability, alcohol consumption and alcohol-related damage: II. The role of sociodemographic factors. *J. Stud. Alcohol* **47**: 11-18, 1986.
- GODFREY, C. Can tax be used to minimise harm? A health economist's perspective. In: PLANT, M., SINGLE, E. AND STOCKWELL, T. (Eds.) *Alcohol: Minimising the Harm: What Works?* London, England: Free Association Books, 1997, pp. 29-42.
- GOMBERG, L. Covering AOD issues in the collegiate press. *Catalyst* **5**: 1-2, 1999.
- GRAHAM, K. Determinants of heavy drinking and driving problems: The contribution of the bar environment. In: SINGLE, E. AND STORM, T. (Eds.) *Public Drinking and Public Policy*, Toronto, Canada: Addiction Research Foundation, 1985, pp. 71-84.
- GRAHAM, K. AND HOMEL, R. Creating safer bars. In: PLANT, M., SINGLE, E. AND STOCKWELL, T. (Eds.) *Alcohol: Minimising the Harm: What Works?* London, England, Free Association Books, 1997, pp. 171-192.
- GRAHAM, K., LA ROCQUE, L., YETMAN, R., ROSS, T.J. AND GUISTRA, E. Aggression and barroom environments. *J. Stud. Alcohol* **41**: 277-292, 1980.
- GROGGER, J. Certainty vs. severity of punishment. *Econ. Inq.* **29**: 297-309, 1991.
- GROSSMAN, M., CHALOUKKA, F.J., SAFFER, H. AND LAIXUTHAI, A. Effects of alcohol price policy on youth: A summary of economic research. *J. Res. Adolesc.* **4**: 347-364, 1994.
- GROSSMAN, M. AND MARKOWITZ, S. Alcohol regulation and violence on college campuses, National Bureau of Economic Research Working Paper No. 7129, JEL No. I10, 1999.
- GROSVENOR, D., TOOMEY, T.L. AND WAGENAAR, A.C. Deterrence and the adolescent drinking driver. *J. Safety Res.* **30**: 187-191, 1999.
- GRUBE, J.W. Preventing sales of alcohol to minors: Results from a community trial. *Addiction* **92** (Suppl. 2): S251-S260, 1997.
- GRUENEWALD, P.J., PONICKI, W.R. AND HOLDER, H.D. The relationship of outlet densities to alcohol consumption: A time series cross-sectional analysis. *Alcsm Clin. Exp. Res.* **17**: 38-47, 1993.
- HAINES, M.P. *Social Norms Approach to Preventing Binge Drinking at Colleges and Universities*, Newton, MA: Higher Education Center for Alcohol and Other Drug Prevention, Department of Education, 1996.
- HAINES, M. AND SPEAR, S.F. Changing the perception of the norm: A strategy to decrease binge drinking among college students. *J. Amer. Coll. Hlth* **45** (3): 134-140, 1996.
- HARFORD, T.C., PARKER, D.A., PAULTER, C. AND WOLZ, M. Relationship between the number of on-premise outlets and alcoholism. *J. Stud. Alcohol* **40**: 1053-1057, 1979.
- HINDS, M.W. Impact of a local ordinance banning tobacco sales to minors. *Publ. Hlth Rep.* **107**: 355-358, 1992.
- HINGSON, R., BERSON, J. AND DOWLEY, K. Intervention to reduce college student drinking and related health and social problems. In: PLANT, M., SINGLE, E. AND STOCKWELL, T. (Eds.) *Alcohol: Minimising the Harm: What Works?* London, England, Free Association Books, 1997, pp. 143-170.
- HINGSON, R., HEEREN, T. AND WINTER, M. Lower legal blood alcohol limits for young drivers. *Publ. Hlth Rep.* **109**: 738-744, 1994.
- HOADLEY, J.F., FUCHS, B.C. AND HOLDER, H.D. The effect of alcohol beverage restrictions on consumption: A 25-year longitudinal analysis. *Amer. J. Drug Alcohol Abuse* **10**: 375-401, 1984.
- HOLDER, H.D. AND WAGENAAR, A.C. Effects of the elimination of a state monopoly on distilled spirits' retail sales: A time-series analysis of Iowa. *Brit. J. Addict.* **85**: 1615-1625, 1990.
- HOMEL, R., TOMSEN, S. AND THOMMENY, J. Public drinking and violence: Not just an alcohol problem. *J. Drug Issues* **22**: 679-697, 1992.

- HOOPER, F. The relationship between alcohol control policies and cirrhosis mortality in United States counties. Paper presented at the annual conference of American Public Health Association, Dallas, Texas, 1983.
- HOPPOCK, K.C. AND HOUSTON, T.P. Availability of tobacco products to minors. *J. Fam. Pract.* **30**: 174-176, 1990.
- HOWARD-PITNEY, B., JOHNSON, M.D., ALTMAN, D.G., HOPKINS, R. AND HAMMOND, N. Responsible alcohol service: A study of server, manager, and environmental impact. *Amer. J. Publ. Hlth* **81**: 197-199, 1991.
- JONES, N.E., PIEPER, C.F. AND ROBERTSON, L.S. The effect of legal drinking age on fatal injuries of adolescents and young adults. *Amer. J. Publ. Hlth* **82**: 112-115, 1992.
- JONES-WEBB, R., TOOMEY, T., MINER, K., WAGENAAR, A.C., WOLFSON, M. AND POON, R. Why and in what context adolescents obtain alcohol from adults. *Subst. Use Misuse* **32**: 219-228, 1997.
- KENKEL, D.S. Prohibition versus taxation: Reconsidering the legal drinking age. *Contemp. Policy Issues* **11**: 48-57, 1993.
- KREITMAN, N. Alcohol consumption and the preventive paradox. *Brit. J. Addict.* **81**: 353-363, 1986.
- LEMMENS, P.H.H.M. Individual risk and population distribution of alcohol consumption. In: HOLDER, H.D. AND EDWARDS, G. (Eds.) *Alcohol and Public Policy: Evidence and Issues*, New York: Oxford Univ. Press, 1995, pp. 38-61.
- LEUNG, S.F. AND PHELPS, C.E. My kingdom for a drink . . . ? A review of estimates of the price sensitivity of demand for alcoholic beverages. In: HILTON, M.E. AND BLOSS, G. (Eds.) *Economics and the Prevention of Alcohol-Related Problems*, NIAAA Research Monograph No. 25, NIH Publication No. 93-3513, Rockville, MD, Department of Health and Human Services, 1993, pp. 1-31.
- LEVY, D. AND SHEFLIN, N. New evidence on controlling alcohol use through price. *J. Stud. Alcohol* **44**: 929-937, 1983.
- LIGON, J. AND THYER, B.A. The effects of a Sunday liquor sales ban on DUI arrests. *J. Alcohol Drug Educ.* **38** (2): 33-40, 1993.
- LIGON, J., THYER, B.A. AND LUND, R. Drinking, eating, and driving: Evaluating the effects of partially removing a Sunday liquor sales ban. *J. Alcohol Drug Educ.* **42** (1): 15-24, 1996.
- MANNING, W.G., BLUMBERG, L. AND MOULTON, L.H. The demand for alcohol: The differential response to price. *J. Hlth Econ.* **14**: 123-148, 1995.
- McKNIGHT, A.J. An Evaluation of a Host Responsibility Program, DOT HS 807 380, Washington: National Highway Traffic Safety Administration, Department of Transportation, 1987.
- McKNIGHT, A.J. Factors influencing the effectiveness of server-intervention education. *J. Stud. Alcohol* **52**: 389-397, 1991.
- McLAUGHLIN, K.L. AND HARRISON-STEWART, A.J. The effect of a temporary period of relaxed licensing laws on the alcohol consumption of young male drinkers. *Int. J. Addict.* **27**: 409-423, 1992.
- MITKA, M. Persuading youths that hops ain't hip. *JAMA* **280**: 499-500, 1998.
- MORTIMER, R.G. AND STURGIS, S.P. Effects of low and moderate levels of alcohol on steering performance. In: ISRAELSTAM, S. AND LAMBERT, S. (Eds.) *Alcohol, Drugs and Traffic Safety*, Toronto, Canada: Addiction Research Foundation, 1975, pp. 329-345.
- MOSKOWITZ, H. AND BURNS, M. Effects of alcohol on driving performance. *Alcohol Hlth Res. World* **14**: 12-14, 1990.
- MOSKOWITZ, H., BURNS, M.M. AND WILLIAMS, A.F. Skills performance at low blood alcohol levels. *J. Stud. Alcohol* **46**: 482-485, 1985.
- MOSKOWITZ, J.M. The primary prevention of alcohol problems: A critical review of the research literature. *J. Stud. Alcohol* **50**: 54-88, 1989.
- MULFORD, H.A., LEDOLTER, J. AND FITZGERALD, J.L. Alcohol availability and consumption: Iowa sales data revisited. *J. Stud. Alcohol* **53**: 487-494, 1992.
- NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION. The Effects Following the Implementation of an .08 BAC Limit and an Administrative Per Se Law in California: Final Report, Washington: Research Evaluation Association, 1991.
- NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION. Traffic Safety Facts 1997, Report No. DOT HS 808806, Washington: Department of Transportation, 1998.
- NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM. Ninth Special Report to the U.S. Congress on Alcohol and Health, NIH Publication No. 97-4017, Rockville, MD: Department of Health and Human Services, 1997.
- NEW YORK STATE DIVISION OF ALCOHOLISM AND ALCOHOL ABUSE. Drinking Age Laws and Vandalism Arrests: Preliminary Findings 1976-1981, Albany, NY: New York State Division of Alcoholism and Alcohol Abuse, May 1984.
- NOORDZIJ, P.C. The Introduction of a Statutory BAC Limit of 50 mg/100 ml and Its Effect on Drinking and Driving Habits and Traffic Accidents, Voorburg, Netherlands: Institute of Road Safety Research SWOB, 1979.
- NORTHRIDGE, D.B., McMURRAY, J. AND LAWSON, A.A. Association between liberalisation of Scotland's liquor licensing laws and admissions for self poisoning in West Fife. *Brit. Med. J.* **293**: 1466-1468, 1986.
- ORNSTEIN, S.I. AND HANNSENS, D.M. Alcohol control laws and the consumption of distilled spirits and beer. *J. Consum. Res.* **12**: 200-213, 1985.
- ÖSTERBERG, E. Do alcohol prices affect consumption and related problems? In: HOLDER, H.D. AND EDWARDS, G. (Eds.) *Alcohol and Public Policy: Evidence and Issues*, New York: Oxford Univ. Press, 1995, pp. 145-163.
- PERRY, C.L. AND KELDER, S.H. Prevention. In: LANGENBUCHER, J.W., McCRADY, B.S., FRANKENSTEIN, W. AND NATHAN, P.E. (Eds.) *Annual Review of Addictions Research and Treatment*, Vol. 2, New York: Pergamon Press, 1992, pp. 453-472.
- PREUSSER, D.F. AND WILLIAMS, A.F. Sales of alcohol to underage purchasers in three New York counties and Washington, DC. *J. Publ. Hlth Policy* **13**: 306-317, 1992.
- PREUSSER, D.F., WILLIAMS, A.F. AND WEINSTEIN, H.B. Policing underage alcohol sales. *J. Safety Res.* **25**: 127-133, 1994.
- RABOW, J. AND DUNCAN-SCHILL, M. Drinking among college students. *J. Alcohol Drug Educ.* **40** (3): 52-64, 1995.
- RAYMOND, A. Ten o'clock closing: The effect of the change in hotel bar closing time on road accidents in the metropolitan area of Victoria. *J. Aust. Road Res.* **3** (10): 3-17, 1969.
- ROSS, H.L. Social control through deterrence: Drinking-and-driving laws. *Ann. Rev. Sociol.* **10**: 21-35, 1984.
- ROSS, H.L. *Confronting Drunk Driving: Social Policy for Saving Lives*, New Haven, CT: Yale Univ. Press, 1992.
- RUBINGTON, E. Drinking sanctions and freshman residence halls: An exploratory case study. *Contemp. Drug Probl. Summer* **18**: 373-387, 1991.
- RUHM, C.J. Alcohol policies and highway vehicle fatalities. *J. Hlth Econ.* **15**: 435-454, 1996.
- RUNDALL, T.G. AND BRUVOLD, W.H. A meta-analysis of school-based smoking and alcohol use prevention programs. *Hlth Educ. Q.* **15**: 317-334, 1988.
- SALTZ, R.F. The roles of bars and restaurants in preventing alcohol-impaired driving: An evaluation of server intervention. *Eval. Hlth Prof.* **10**: 5-27, 1987.
- SAUNDERS, B. Alcohol and other drugs: The prevention paradoxes. *Commun. Hlth Stud.* **13**: 150-155, 1989.
- SCRIBNER R.A., MacKINNON, D.P. AND DWYER, J.H. Risk of assaultive violence and alcohol availability in Los Angeles County. *Amer. J. Publ. Hlth* **85**: 335-340, 1995.
- SELVANATHAN, E.A. Alcohol consumption in the UK, 1955-85: A system-wide analysis. *Appl. Econ.* **20**: 1071-1086, 1988.
- SELVANATHAN, E.A. Cross-country alcohol consumption comparison: An application of the Rotterdam demand system. *Appl. Econ.* **23**: 1613-1622, 1991.

- SMITH, D.I. Comparison of patrons of hotels with early opening and standard hours. *Int. J. Addict.* **21**: 155-163, 1986.
- SMITH, D.I. Effect on traffic accidents of introducing Sunday alcohol sales in Brisbane, Australia. *Int. J. Addict.* **23**: 1091-1099, 1988.
- SMITH, D.I. Effect on liver cirrhosis and traffic accident mortality of changing the number and type of alcohol outlets in Western Australia. *Alcsm Clin. Exp. Res.* **13**: 190-195, 1989.
- SIPAITE, D.W., MEISLIN, H.W., VALENZUELA, T.D., CRISS, E.A., SMITH, R. AND NELSON, A. Banning alcohol in a major college stadium: Impact on the incidence and patterns of injury and illness. *J. Amer. Coll. Hlth* **39** (3): 125-128, 1990.
- STITT, B.G. AND GIACOPASSI, D.J. Alcohol availability and alcohol-related crime. *Crim. Justice Rev.* **17**: 268-279, 1992.
- SUTTON, M. AND GODFREY, C. A grouped data regression approach to estimating economic and social influences on individual drinking behaviour. *Hlth Econ.* **4**: 237-247, 1995.
- TOBLER, N.S. Drug prevention programs can work: Research findings. *J. Addict. Dis.* **11** (3): 1-28, 1992.
- TOOMEY, T.L., JONES-WEBB, R.J. AND WAGENAAR, A.C. Policy—alcohol. In: LANGENBUCHER, J.W., MCCRADY, B.S., FRANKENSTEIN, W. AND NATHAN, P.E. (Eds.) *Annual Review of Addictions Research and Treatment*, Vol. 3, Tarrytown, NY: Pergamon Press, 1993, pp. 279-292.
- TOOMEY, T.L., KILIAN, G., FITCH, O.B., FLETCHER, L. AND WAGENAAR, A.C. Characteristics and rates of illegal alcohol sales to pseudo-intoxicated patrons. Paper presented at the American Public Health Association's 127th Annual Meeting, Chicago, IL, November 7-11, 1999.
- TOOMEY, T.L., KILIAN, G.R., GEHAN, J.P., PERRY, C.L., JONES-WEBB, R. AND WAGENAAR, A.C. Qualitative assessment of training programs for alcohol servers and establishment managers. *Publ. Hlth Rep.* **113**: 162-169, 1998.
- TOOMEY, T.L., ROSENFELD, C. AND WAGENAAR, A.C. The minimum legal drinking age: History, effectiveness, and ongoing debate. *Alcohol Hlth Res. World* **20**: 213-218, 1996.
- TOOMEY, T.L. AND WAGENAAR, A.C. Policy options for prevention: The case of alcohol. *J. Publ. Hlth Policy* **20**: 192-213, 1999.
- TOOMEY, T.L., WAGENAAR, A.C., GEHAN, J.P., KILIAN, G., MURRAY, D. AND PERRY, C.L. Project ARM: Alcohol risk management to prevent sales to underage and intoxicated patrons. *Hlth Educ. Behav.* **28**: 186-199, 2001.
- WAGENAAR, A.C. Minimum drinking age and alcohol availability to youth: Issues and research needs. In: HILTON, M.E. AND BLOSS, G. (Eds.) *Economics and the Prevention of Alcohol-Related Problems*, NIAAA Research Monograph No. 25, NIH Publication No. 93-3513, Rockville, MD: Department of Health and Human Services, 1993, pp. 175-200.
- WAGENAAR, A.C., FINNEGAN, J.R., WOLFSON, M., ANSTINE, P.S., WILLIAM, C.L. AND PERRY, C.L. Where and how adolescents obtain alcoholic beverages. *Publ. Hlth Rep.* **108**: 459-464, 1993.
- WAGENAAR, A.C., GEHAN, J.P., JONES-WEBB, R., TOOMEY, T.L., FORSTER, J.L., WOLFSON, M. AND MURRAY, D.M. Communities mobilizing for change on alcohol: Lessons and results from a 15-community randomized trial. *J. Commun. Psychol.* **27**: 315-326, 1999.
- WAGENAAR, A.C., AND HOLDER, H.D. A change from public to private sale of wine: Results from natural experiments in Iowa and West Virginia. *J. Stud. Alcohol* **52**: 162-173, 1991a.
- WAGENAAR, A.C. AND HOLDER, H.D. Effects of alcoholic beverage server liability on traffic crash injuries. *Alcsm Clin. Exp. Res.* **15**: 942-947, 1991b.
- WAGENAAR, A.C. AND HOLDER, H.D. Changes in alcohol consumption resulting from the elimination of retail wine monopolies: Results from five U.S. states. *J. Stud. Alcohol* **56**: 566-572, 1995.
- WAGENAAR, A.C., MURRAY, D.M., GEHAN, J.P., WOLFSON, M., FORSTER, J.L., TOOMEY, T.L., PERRY, C.L. AND JONES-WEBB, R. Communities mobilizing for change on alcohol: Outcomes from a randomized community trial. *J. Stud. Alcohol* **61**: 85-94, 2000.
- WAGENAAR, A.C., MURRAY, D.M., WOLFSON, M., FORSTER, J.L. AND FINNEGAN, J.R. Communities mobilizing for change on alcohol: Design of a randomized community trial. *J. Commun. Psychol.* **CSAP Special Issue**: 79-101, 1994.
- WAGENAAR, A.C., O'MALLEY, P. AND LAFOND, C. Lowered legal blood alcohol limits for young drivers: Effects on drinking, driving, and driving-after-drinking behaviors in 30 states. *Amer. J. Publ. Hlth* **91**: 801-804, 2001.
- WAGENAAR, A.C. AND PERRY, C.L. Community strategies for the reduction of youth drinking: Theory and application. *J. Res. Adolesc.* **4**: 319-345, 1994.
- WAGENAAR, A.C. AND TOOMEY, T.L. Alcohol policy: Gaps between legislative action and current research. *Contemp. Drug Probl.* **27**: 681-733, 2000.
- WAGENAAR, A.C., TOOMEY, T.L., MURRAY, D.M., SHORT, B.J., WOLFSON, M. AND JONES-WEBB, R. Sources of alcohol for underage drinkers. *J. Stud. Alcohol* **57**: 325-333, 1996.
- WAGENAAR, A.C. AND WOLFSON, M. Enforcement of the legal minimum drinking age in the United States. *J. Publ. Hlth Policy* **15**: 37-53, 1994.
- WAGENAAR, A.C. AND WOLFSON, M. Deterring sales and provision of alcohol to minors: A study of enforcement in 295 counties in four states. *Publ. Hlth Rep.* **110**: 419-427, 1995.
- WOLFSON, M., TOOMEY, T.L., MURRAY, D.M., FORSTER, J.L., SHORT, B.J. AND WAGENAAR, A.C. Alcohol outlet policies and practices concerning sales to underage people. *Addiction* **91**: 589-602, 1996.