

# Environmental Policies to Reduce College Drinking: An Update of Research Findings\*

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**ABSTRACT. Objective:** We provide an overview of environmental strategies that may reduce college drinking. The identified environmental strategies fall into three categories: (1) reducing alcohol use and related problems among *underage* college students, (2) reducing risky alcohol use and related problems among *all* college students, and (3) de-emphasizing the role of alcohol and creating positive expectations on campus. At the time of our 2002 review, few studies had assessed environmental policies and strategies in the context of college student alcohol use and related problems. The present article summarizes recent research on the effects of environmental policies and strategies affecting college students. **Method:** We updated our previous literature searches to identify peer-reviewed research studies evaluating the effects

of environmental strategies on college and general populations. **Results:** We identified 110 new studies addressing environmental strategies published between 1999 and 2006. Thirty-six of these studies focused on the college population. The extant research indicates that many environmental strategies are promising for reducing alcohol-related problems among the general population. Several recent studies suggest that these strategies, particularly combined strategies, also may be effective in decreasing alcohol-related problems among college populations. **Conclusions:** Further research is needed to continue expanding our understanding of environmental strategies to identify the most effective individual and combined strategies (*J. Stud. Alcohol Drugs* 68: 208-219, 2007)

**E**NVIRONMENTAL POLICIES AND STRATEGIES to reduce college alcohol use and problems include strategies aimed specifically at college students, as well as community-wide strategies that affect college students. These environmental policies and strategies are distributed into three categories: (1) reducing alcohol use and related problems among *underage* college students, (2) reducing alcohol use and related problems among *all* college students, and (3) de-emphasizing the role of alcohol and creating positive expectations on campus.

In an earlier review (Toomey and Wagenaar, 2002), we found that few studies had assessed environmental policies and strategies in the context of college student alcohol use and related problems. Rather, many strategies had been evaluated and found to be effective in reducing rates of alcohol use and related problems among the *general* population. Others had been recommended for the general or college populations but had received little or no evaluation.

In this article, we provide a summary of published research on those policies that were recently studied (i.e., peer-reviewed studies published in 1999 or later that were not included in the 2002 review), as well as reviewed research on multistrategy approaches targeting general and college populations. Studies were identified through literature searches on the Current Contents database.

## Reducing Alcohol Use and Related Problems Among Underage College Students

Many studies show that an age-21 minimum legal drinking age (MLDA) results in lower alcohol use, fewer traffic crashes, and possibly fewer other alcohol-related problems such as suicide and vandalism (Wagenaar and Toomey, 2002). Underage youth, however, continue to drink alcohol and experience alcohol-related problems. One reason is that the age-21 MLDA laws (including laws restricting use, purchase, and possession by underage youth as well as provision and sales to underage youth) have not been well enforced (Wagenaar and Wolfson, 1994, 1995).

Underage youth can easily obtain alcohol from social and commercial providers (Dent et al., 2005; Wagenaar et al., 1996; Wechsler et al., 2002a). Social providers may be individuals above or below the age of 21 who illegally provide alcohol to underage persons. Social provision of alcohol may occur at parties; in residences; at campus or community events; and in public areas such as parks, beaches, or outside alcohol establishments.

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Commercial providers are licensed alcohol establishments such as restaurants, bars, and liquor stores. Although most underage youth obtain alcohol through social sources, the likelihood of underage youth purchasing alcohol directly increases as they get older (Wagenaar et al., 1993; 1996). Recent studies show that the likelihood of illegal alcohol sales to underage youth is high, with estimated sales rates of 39% at off-premise establishments (e.g., liquor stores, convenience stores; Freisthler et al., 2003) and 50% at community festivals (Toomey et al., 2005).

### *Reducing social access to alcohol*

A variety of policies can be implemented to reduce social access to alcohol among underage college students, such as prohibiting self-service of alcohol at parties (Table 1). The only strategies that have been studied recently are those pertaining to beer kegs, which may increase underage access to alcohol at parties because of access to large quantities of very-low-cost or free alcohol. One recent study found that nearly one of every four off-premise

TABLE 1. Policies to decrease alcohol use and related problems among college students

Among underage college students	Among all college students
Decreasing social access to alcohol	Restricting where, when, and how alcohol is sold and distributed
Decrease number of large drinking parties	Reduce density of alcohol establishments
Prohibit alcohol use in public places	Increase cost of alcohol license
Patrol public areas	Restrict days/hours of sale
Restrict parties at hotels/motels	Prohibit sales on campus
Have alcohol-free parties/events	Monitor increases in availability due to privatization or community events
Prevent underage access at parties	Promote responsible alcohol service
Ban beer kegs	Serve standard sizes
Implement beer-keg registration	Prohibit pitchers
Limit quantity per request	Cut-off service to intoxicated individuals
Create separate drinking areas	Promote alcohol-free drinks/food
Do not allow self-service	Eliminate last-call announcements
Require server training	Require manager/server training
Check age identification	Enact dramshop liability
Increase awareness of laws	Reduce flow of alcohol at parties
Implement awareness campaigns	Ban beer kegs
Distribute warning fliers	Restrict/ban home deliveries
Enforce social provision laws	Limit quantity of alcohol at events
Use shoulder tap campaigns	Do not allow self-service
Spot check parties	Make alcohol-free drinks and food available
Hire security monitors	Serve low-alcohol content drinks
Enact noisy assembly ordinance	Increasing the price of alcohol
Enact social-host liability law	Restrict happy hours/price promotions
Decreasing commercial access to alcohol	Limit free alcohol
Limit alcohol sales	Increase alcohol excise tax
Prohibit sales on campus	Restricting where alcohol is consumed
Restrict/ban home deliveries	Restrict consumption to specific areas
Focus on alcohol establishment behavior	Create dry campuses/residences
Check age identification	Prohibit consumption in locations where heavy drinking occurs
Provide incentives for checking identification	
Develop monitoring system	
Train managers/servers	
Require server license	
Restrict age of seller	
Reduce use of false age-identification cards	
Penalize users and producers	
Design cards that are difficult to falsify	
Enforce commercial provision laws	
Implement compliance checks	
Enact administrative penalties	
Conduct walk-throughs	
De-emphasizing the role of alcohol and creating positive expectations on campus	
Avoid sponsorship of events by alcohol retailers/producers	
Restrict alcohol advertisements in college newspaper	
Offer recreational sports later at night and on weekends	
Establish a campus coffeehouse rather than a pub	
Conduct campus-wide social-norms campaigns	
Prohibit alcohol sales on campus	
Schedule core classes on Friday mornings	
Begin school year with a full 5-day week	
Encourage students to work, volunteer, or complete internships	
Encourage staff and faculty to live on campus	

establishments located near college campuses sold beer kegs (Kuo et al., 2003b), making beer kegs readily available to many college students.

States and communities may ban sales of beer kegs or require registration of these kegs in an effort to decrease the amount of alcohol at parties. Colleges also may regulate the use of beer kegs; specifically, beer kegs can be prohibited on campus. Kilmer and colleagues (1999), however, evaluated the effects of banning kegs at all fraternity/sorority houses at one university. One year following the ban, average drinks per occasion and drinks per week actually increased among fraternity/sorority members. Anecdotal reports from fraternity/sorority members indicated that students began drinking more liquor rather than beer. Nevertheless, the results from this study must be viewed cautiously, because the researchers used a convenience sample and did not use a comparison group.

#### *Reducing commercial access to alcohol*

Numerous policies have been identified to reduce underage access to alcohol at commercial establishments, such as systematically checking age identification (Table 1). The only strategies that have been studied recently are those pertaining to training owners and managers of alcohol establishments and to enforcement practices. Servers, owners, and managers of alcohol establishments need training on all aspects of responsible alcohol service, including how to detect and handle false age identification.

A few early research studies showed mixed results in the effectiveness of training programs in decreasing the likelihood of sales to underage youth and in improving server behaviors. The findings of two recent studies suggest that training programs alone are not enough to prevent sales to youth.

Drawing from studies that suggest that support from management is necessary to change server behavior (McKnight 1991, 1993; Saltz, 1987), Toomey and associates (2001) developed a five-session, one-on-one training program for owners and managers of alcohol establishments. An initial evaluation among a small number of establishments showed that the program was unlikely to prevent sales to underage youth. Similarly, Wagenaar and associates (2005) administered a one-session version of the program to 119 establishments and found that the program did not decrease the likelihood of underage sales.

The likelihood of training programs preventing alcohol sales to youth may be further lessened by the variability in the quality of existing training programs and laws. Toomey et al. (1998) found great variability in the quality of existing training programs. Mosher et al. (2002) found that the quality of state-level laws mandating or encouraging training of managers, servers, or both varied considerably, with only a few existing laws (incorporating "best practices") likely to be effective.

To prevent sales to underage people, training programs need to be combined with enforcement strategies, such as compliance checks. A compliance check entails an underage person attempting to purchase alcohol under the supervision of law enforcement. If the sale is made, penalties may be applied to the server, the license holder, or both.

As found in earlier studies, two recent studies found compliance checks to be effective in reducing the likelihood of sales to youth. Scribner and Cohen (2001) concluded that compliance among off-premise establishments increased from 11% in the first round of checks to 40% in the second round (5 months later) but then decreased to 21% 1 year later.

Similarly, Wagenaar and colleagues (2005), using a more robust research design, assessed short- and long-term effects of compliance checks and found an immediate 17% reduction in the likelihood of sales to underage youth in on-premise (e.g., bars, restaurants) and off-premise establishments that had been checked by law enforcement. Within 3 months, these effects decayed to an 8.2% long-term reduction in on-premise establishments; no long-term effects were observed among off-premise establishments.

The effects of compliance checks did not spill over to other establishments in the same community that had not been checked. These results suggest that communities need to conduct compliance checks at all establishments—not just a random sample of establishments. Also, compliance checks, in the current environment of high sales rates to teens, need to be conducted more than once or twice per year to maintain a long-term reduction in the likelihood of alcohol sales to underage youth.

#### *Multiple-strategy approaches*

The Communities Mobilizing for Change on Alcohol (CMCA) Project used multiple environmental strategies to reduce youth access to alcohol from both social and commercial sources (Wagenaar et al., 1999). Community organizers were hired to implement a seven-stage grassroots organizing process within each of the seven intervention communities. These communities were compared with eight randomly assigned control communities.

Organizers and local-citizen strategy teams influenced changes in alcohol-control policies and practices of community institutions such as law enforcement agencies and alcohol merchants. In addition, 18- to 20-year-olds in the intervention communities were less likely than 18- to 20-year-olds in the control communities to provide alcohol to other teens, to try to buy alcohol, to drink in a bar, to consume alcohol, or to be arrested for driving under the influence (Wagenaar et al., 2000a; 2000b).

Although the project affected 18- to 20-year-olds, including college students, the study was not designed to assess the effect specifically on college students. These results

suggest, however, that reducing multiple sources of alcohol is promising for preventing underage alcohol use and related problems on college campuses.

In addition to multiple-strategy approaches at the local level, Wechsler et al. (2002a) assessed the effects of a combination of state-level policies targeting underage drinking among college students. States that had four or more of these laws had lower rates of underage alcohol use than states with fewer such laws.

### Summary

We identified 12 recent empirical studies addressing environmental issues related to underage alcohol use, three of which specifically address issues related to college students. Two of the 12 studies confirmed earlier findings that underage youth report having access to alcohol from a variety of commercial and social sources. Two other studies specifically addressed social access to alcohol. One found that beer kegs were readily available around college campuses, and the other suggested that caution is needed when implementing policies such as bans on beer kegs.

Five studies specifically addressed commercial access to alcohol. Two indicated that youth still have easy access to alcohol from licensed alcohol establishments and vendors at community festivals. Two studies added support to the previous literature that, alone, training programs at alcohol establishments are unlikely to prevent sales to underage youth. Two studies found that regular compliance checks can be effective in decreasing the likelihood of alcohol sales to individuals below age 21.

More methodologically robust studies are needed to evaluate the effectiveness of many of the identified environmental strategies that have not been evaluated on or off campus. Of the 31 policies we identified in this area, only 3 have been evaluated recently, and 21 have never been evaluated. Three articles describing a multistrategy intervention (CMCA) targeting both social and commercial access to alcohol showed significant reductions in alcohol use among 18- to 20-year-olds. One article showed that states with four or more laws targeting underage youth had lower rates of underage alcohol use than states with fewer such laws. Research is still needed, however, to evaluate multistrategy environmental interventions targeting underage alcohol use specifically among college students.

### Reducing Risky Alcohol Use and Related Problems Among All College Students

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, when, and how alcohol is sold and distributed, how

much alcohol costs, and where alcohol is consumed (Table 1). The results of numerous studies show that restricting the availability of alcohol leads to decreases in alcohol consumption among the general population (see Babor et al., 2003, for a review). As consumption rates go down within a population, so do many alcohol-related problems.

### *Restricting where, when, and how alcohol is sold and distributed*

*Density of alcohol establishments.* Study findings suggest that factors related to licensed alcohol establishments may affect levels of alcohol consumption and related problems throughout communities. As in earlier studies, the recent studies examining the effects of the density of alcohol establishments on alcohol consumption and problems among the general population have found mixed results. These results have depended on the type of outcome, the type of alcohol establishment analyzed, or both (Britt et al., 2005; Cohen et al., 2006; Freisthler, 2004; Freisthler et al., 2004, 2005; Gorman et al., 2001, 2005; Gruenewald et al., 2002, 2006a; Gyimah-Brempong, 2001; LaScala et al., 2001; Lipton and Gruenewald, 2002; McCarthy, 2003; Meliker et al., 2004; Nielsen and Martinez, 2003; Nielsen et al., 2005; Pollack et al., 2005; Reid et al., 2003; Scribner et al., 1999, 2000; Tatlow et al., 2000; Treno et al., 2001, 2003; Xie et al., 2000; Zhu et al., 2004).

Three recent studies specifically examined the density of alcohol establishments near college campuses. These studies found that higher densities were associated with higher levels of drinking as well as high-risk alcohol use and drinking-related problems among college students (Weitzman et al., 2003a; Williams et al., 2004). The studies also found higher rates of vandalism, noise, and disturbances in neighborhoods near campuses (Wechsler et al., 2002b). The three college studies had cross-sectional rather than longitudinal designs, however, limiting our ability to make causal inferences from them.

*Hours and days of sale.* The availability of alcohol also may be affected by the hours and days of sale. Evaluations of these effects continue to be mixed, and no studies have specifically addressed the effects of hours and days of sale on college student drinking and related problems.

Three recent studies indicated that an increase in hours of sale at alcohol establishments was associated with increased use, increased problems, or both (Baker et al., 2000; Chikritzhs and Stockwell, 2002; Vingilis et al., 2006; Voas et al., 2002). Another study found no effect or simply a shift in the timing of problems (Vingilis et al., 2005). Similarly, one study found that increasing the days of sale was associated with more alcohol use, more related problems, or both (d'Abbs and Togni, 2000). Other studies found no relationship or found mixed results, depending on the type of outcome analyzed (Norstrom and Skog, 2003, 2005).

*Server training programs.* As with preventing illegal alcohol sales to underage students, owners and managers of alcohol establishments can implement policies that instruct the staff in how to prevent patrons from becoming intoxicated and to refuse sales to obviously intoxicated customers. Three recent studies have shown that sales to obviously intoxicated customers are common at both licensed establishments and community festivals, despite laws prohibiting such sales. Sales rates to pseudo-intoxicated buyers (persons feigning intoxication) at licensed establishments ranged from 58% to 79% across study areas (Freisthler et al., 2003; Toomey et al., 2004) and was 89% at community festivals (Toomey et al., 2005).

Although some previous studies have shown that server training programs can be effective in improving servers' handling of intoxicated individuals, server training by itself has not consistently led to refusing sales to intoxicated individuals (Johnsson and Berglund, 2003; Wallin et al., 2002, 2005). Toomey and associates (2001), however, found in a small demonstration project ( $n = 14$ ) that their one-on-one training program for owners and managers of alcohol establishments may prevent alcohol sales to obviously intoxicated patrons. They are currently evaluating the program in a large randomized trial.

*Dramshop liability.* Serving practices also may be altered by dramshop liability, which enables individuals to sue establishments for injuries sustained after illegal alcohol sales. Similar to previous research, two recent studies (Stout et al., 2000; Whetten-Goldstein et al., 2000) found that states with dramshop liability laws tended to have lower rates of traffic fatalities and drunk driving.

*Reducing distribution of alcohol at parties.* In addition to restricting sales of alcohol, reducing distribution of alcohol at parties can decrease risky alcohol consumption (Table 1). As discussed in the previous section, however, one strategy to reduce distribution—banning beer kegs—can lead to unintended consequences, such as increased drinking and switching to consumption of distilled spirits (Kilmer et al., 1999).

#### *Increasing the price of alcohol*

Consistent with previous studies, several recent studies found that higher prices are associated with lower levels of alcohol use (Angulo et al., 2001; Cameron and Williams, 2001; Farrell et al., 2003; French et al., 2006; Heeb et al., 2003; Kuo et al., 2003a). Other recent studies found mixed results, depending on the beverage type (Gius, 2005; Gruenewald et al., 2006b; Zhang and Casswell, 1999) or found little effect (Brinkley, 1999).

Studies on the effect of the price of alcohol on rates of alcohol-related problems—such as assaults, motor vehicle fatalities, and alcohol dependence—continue to be mixed. Four recent studies found that increased prices were associated with decreased negative consequences (Adrian et al.,

2001; Farrell et al., 2003; Matthews et al., 2006; Sivarajasingam et al., 2006). One study, however, found mixed results, depending on the type of outcome analyzed (McCarthy, 2003).

Two studies published since our last review evaluated the effect of alcohol prices on drinking among college students. Weitzman and colleagues (2003b) found that students in environments where alcohol is cheap and more accessible were more likely to consume alcohol heavily than peers without similar exposures. Williams and colleagues (2005) found that increasing the price of alcohol was associated with reductions in both moderate and heavy drinking by college students. Both studies included nationally representative samples but had cross-sectional study designs, decreasing our ability to make causal conclusions from them.

*Restrictions on "happy hours" or price promotions.* Policies affecting the price of alcohol include restrictions on happy hours or price promotions (e.g., two drinks for the price of one) and limiting the amount of free alcohol available at parties and campus events. A few earlier studies found that happy hours are linked to higher consumption and problems among general populations. One recent small study found that, among 189 undergraduate college students in an experimental laboratory setting, students exposed to advertised price discounts on alcohol and a longer duration of the discounts were more likely than comparison students to estimate higher rates of personal alcohol consumption (Christie et al., 2001).

In a much larger recent study, Kuo and associates (2003b) found that, among a random sample of alcohol establishments around college campuses, 63% of off-premise establishments and more than half of on-premise establishments had beer promotions; 73% of on-premise establishments had drink specials on weekends. They found that lower prices and promotions were associated with higher rates of heavy alcohol use on college campuses. In addition, Williams et al. (2004) found that state restrictions on happy hours were associated with decreased alcohol use among college students. The findings must be interpreted cautiously, however, because these were cross-sectional studies.

*Excise taxes.* Placing excise taxes on alcohol is another type of policy that affects price. As with prior studies, recent studies on the effects of raising taxes on alcohol consumption and related problems among the general population and youth show mixed results (Bishai et al., 2005; Dave and Kaestner, 2002; Dee and Evans, 2003; Dinardo and Lemieux, 2001; Gius, 2002; Markowitz et al., 2003; Markowitz, 2005; Mast et al., 1999; Mohler-Kuo et al., 2004; Sen, 2003; Xie et al., 2000; Young and Bielinska-Kwapisz, 2006). As in several previous studies, Williams and colleagues (2004) recently found that higher beer taxes were associated with slightly higher rates of alcohol consumption among college students.

*Restricting where alcohol is consumed*

*Restricting sales and consumption to certain areas.* States, communities, and colleges also can 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 it from becoming the main focus of the event. In a recent study, Toomey and associates (2005) found from a survey of 45 festival planners that 60% of the festivals restricted alcohol consumption to specific areas.

*"Dry" campuses.* Colleges also can choose to have dry campuses—not allowing any alcohol to be consumed on campus. Three new studies have examined this type of policy. Using a nationally representative sample and a cross-sectional study design, Wechsler and associates (2001a) found that students attending schools that ban alcohol use on campus were 30% less likely to be heavy episodic drinkers and more likely to be abstainers, compared with students attending schools that did not ban alcohol—whether they were high-risk alcohol users in high school or not.

Rates of secondhand effects (e.g., having property damaged, having sleep interrupted) were lower at schools that banned alcohol. Among students who reported that they drink, however, there was no difference between students on campuses with a ban and students on campuses without a ban, in terms of drinking styles or alcohol-related problems.

Williams et al. (2004) used a nationally representative, pooled cross-sectional sample and found that, on campuses that banned alcohol, students reported less alcohol use in the past 30 days and in the past year. Using a similar sample, Williams et al. (2005) found that, among schools with a low density of alcohol establishments near the campus, a campus-wide alcohol ban was associated with less likelihood that students will transition from moderate to heavy drinkers.

We cannot make conclusions about causal effects of alcohol bans, however. Other factors not measured in the studies may contribute to differences between students who choose to attend campuses that ban alcohol, compared with those who choose to attend schools that do not ban alcohol.

*Alcohol-free residence halls and fraternity/sorority houses.* Restricting alcohol in residence halls and fraternity/sorority houses can be employed to reduce alcohol use and problems among all college students. Four new studies looked at this type of campus policy. In cross-sectional analyses using nationally representative samples, no differences were found between students living in alcohol-free residences and students living in unrestricted residences for 30-day or past-year alcohol use (Williams et al., 2004) or for rates of heavy episodic drinking and the number of experienced secondhand effects (Wechsler et al., 2001b). Yet, students who lived in *substance-free* residences (i.e., allowing no alcohol or tobacco use) were less likely than

students living in unrestricted residences to drink heavily or to experience alcohol-related problems or secondhand effects of other students' drinking (Wechsler et al., 2001b, 2002a).

Odo et al. (1999) found that, following the implementation of a policy prohibiting alcohol use in all residence halls and fraternity/sorority houses, students in these types of residences were less likely than students living elsewhere to drink, but no difference was seen in high-risk drinking rates. Limitations of that study are that it was conducted at only one school and had a postintervention-only design.

*Restricting consumption where heavy drinking occurs.* Colleges may allow alcohol use throughout most of the campus but restrict consumption in certain locations on campus where heavy drinking often occurs, such as in parking lots and at campus stadiums. Borman and Stone (2001) assessed the effects of a ban on beer sales at football games at the University of Colorado at Boulder. They found that game-day incidence rates for arrests, assaults, ejections from the stadium, and student referrals to the student affairs office were lower for the year following the policy enactment, compared with rates for the year before the ban. No comparison group was used, however, limiting our ability to firmly attribute differences to the policy change.

*Multistrategy approaches*

Multistrategy approaches have been used to address drinking and alcohol-related problems among the general population as well as among college students. For example, during the early to mid-1990s, the Community Prevention Trial was conducted to evaluate the effects of multiple environmental approaches to reduce alcohol use among the general population (Holder et al., 2000). Each of the three intervention communities implemented five strategies (community mobilization, responsible beverage service training in bars, compliance checks, sobriety checkpoints, and media advocacy). Compared with three comparison communities, rates of consumption, sales to minors, and alcohol-involved traffic crashes were significantly lower in the intervention communities following the implementation of these environmental strategies.

A few recent studies have assessed the effects of multiple policy or environmental strategies on alcohol use by college students and related problems. Following a rise in alcohol-related problems at homecoming games, the University of Arizona instituted new policies in 1995 targeting homecoming. The result was fewer tents that sold alcohol, the elimination of beer kegs, professional bartenders to serve alcohol, systems to check age identification, and more booths selling food and nonalcoholic beverages (Johannessen et al., 2001). Following the policy changes, a decrease in neighborhood complaints related to homecoming was observed. No comparison group was used in this study, however.

A campus/community coalition in Albany, NY, was formed to reduce problems related to student drinking in neighborhoods surrounding local college campuses (Gebhardt et al., 2000). The coalition implemented a multi-component intervention that included (1) education for students about penalties for using false age identification and about existing laws and ordinances related to student parties in their apartments, (2) increased police presence in off-campus student neighborhoods, (3) encouragement of landlords to adhere to laws requiring them to provide safe and secure apartments for students, (4) a voluntary agreement signed by tavern owners to follow specific guidelines for their advertisements, (5) monitoring of advertisements by community members, and (6) law enforcement and licensing authorities meeting with tavern and restaurant owners to discuss responsible service of alcohol. Although patterns were not completely clear and no comparison groups were included, the authors concluded that their work led to decreases in alcohol-related problems in local neighborhoods, including noise-ordinance violations.

In 1997, a new policy was passed restricting alcohol use on all state college and university campuses in Massachusetts. The policy included (1) restricting alcohol to specific, supervised locations; (2) requiring registration of campus events involving alcohol use; (3) creating enforcement procedures for campus policies and local, state, and federal laws; (4) working with enforcement agencies in surrounding communities; (5) creating new penalties for student violators; and (6) notifying parents if their son or daughter received an alcohol violation.

Knight and associates (2003) assessed student alcohol use and policy enforcement levels across campuses 1 year after the policy was implemented. The level of enforcement of the policy varied by campus. Campus-security reports indicated that higher levels of enforcement were moderately associated with lower levels of heavy alcohol use by students. This was a cross-sectional study, and no other variables were controlled for in the analyses, however.

The "A Matter of Degree Program" is a demonstration project funded by the Robert Wood Johnson Foundation, beginning in 1997 (Nelson et al., 2005b; Weitzman et al., 2004). Ten intervention sites were selected, based on high rates of heavy alcohol use by students and the college president's support of the implementation of environmental strategies targeting student alcohol use. Thirty-two colleges that also had high rates of heavy drinking served as comparison sites. The intervention colleges were expected to address availability, price, promotions, and advertising of alcohol on and around campus.

Changes over time were first evaluated for all 10 intervention sites and compared with the 32 comparison sites. The intervention sites did not differ over time, compared with the comparison colleges, in alcohol use in the past year, heavy alcohol use, frequent heavy alcohol use, or al-

cohol-related problems and secondhand effects. Compared with comparison sites, the percentage of students missing class because of alcohol use, driving after drinking alcohol, and riding with a high or drunk driver decreased in the 10 intervention sites over time.

In a second set of analyses, the intervention sites were separated into low and high environmental intervention groups, based on the number of discrete environmental interventions implemented. Among the high-implementation sites, significant decreases were observed for six of the seven alcohol use measures, nine of the 11 alcohol-related harm measures, five of the nine alcohol-related secondhand effect measures, and all of the drinking-driving measures. Perceived difficulty in obtaining alcohol increased over time in high-implementation colleges, but no difference was observed for low-implementation colleges, compared with comparison sites.

One significant limitation of this study is that campuses were not randomly assigned to the intervention condition. Intervention campuses were selected partly because their presidents were willing to give high priority to the intervention, and thus they may have been more likely than comparison sites to have lower alcohol consumption over time. It also is not clear in this study what types of environmental strategies were implemented on the high-intervention campuses and which specific strategies were most effective.

Nelson and colleagues (2005a) also examined the effects of the combination of select local- and state-level alcohol control policies. They found that the presence of more alcohol policies was associated with lower high-risk drinking rates among college students.

We must interpret the results of each of these studies with caution, given the study limitations, such as a lack of comparison groups or a lack of random assignment of colleges to a condition. Taken together, however, these studies suggest that the use of multiple environmental strategies is promising for reducing high-risk alcohol use and alcohol-related problems among college students. Further research is needed to fully evaluate the multistrategy approach and to identify which specific combinations of environmental strategies are most effective.

### *Summary*

Eighty-eight studies focusing on environmental strategies targeting high-risk alcohol use have been published since our last review. Twenty of these studies focused specifically on college-related issues. Many new studies examined the effects of densities of alcohol establishments on alcohol consumption, related problems, or both, but they found mixed results. Yet, the three studies specific to college campuses show that higher densities of alcohol establishments are associated with increased consumption, problems, or both.

Three recent studies also have found that sales to intoxicated patrons at licensed establishments and community festivals are common, despite the fact that these sales are illegal. Training alcohol servers and managers in how to reduce these sales is a promising strategy but needs to be further evaluated.

Two studies provide further evidence that dramshop liability strategies are associated with lower rates of alcohol-related traffic crashes. The authors of six college-specific studies published since our last review conclude that increased alcohol prices or taxes are associated with decreases in risky alcohol use and alcohol-related problems. Bans on alcohol use in college residences or throughout campus also have been shown to be associated with lower levels of consumption and related problems.

Finally, several studies have shown that multistrategy approaches on college campuses may be effective. Many of these recent studies, however, used cross-sectional study designs or did not randomly assign the intervention sites to a condition—making it difficult to conclude that environmental strategies were responsible for the outcomes. Of the 24 policies identified in this area, 11 have never been evaluated. Future studies should continue to assess specific and multistrategy environmental approaches, using randomized controlled trials or controlled-time-series designs that are large enough to allow an assessment of causal effects.

### **De-Emphasizing the Role of Alcohol and Creating Positive Expectations on Campus**

#### *Social-norms campaigns*

A variety of strategies can be used to de-emphasize alcohol on campus, such as avoiding alcohol-industry sponsorship of campus events (Table 1). A recent approach to de-emphasizing alcohol use on campus is social-norms campaigns. These campaigns were developed based on findings that college students consistently overestimate the amount of alcohol that other students on their campus consume (Kypri and Langley, 2003; Perkins, 2002; Perkins et al., 2005). In a recent national study, Perkins and associates (2005) found that students' perceptions about campus drinking norms are related to their own alcohol use—even after controlling for demographic factors and actual campus drinking rates. The reason is perhaps that the intoxication of a few students in social situations is vividly remembered and discussed by students and given disproportionate weighting.

Social-norms campaigns communicate the rate of student alcohol use on campus as measured through surveys, with the assumption that, as students' misperceptions about other students' alcohol use are corrected, their own level of alcohol use will decrease. We review below studies evaluating campus-wide, or population-level, social-norms campaigns.

A recent survey conducted in 2002 indicated that 49% of the 747 surveyed 4-year residential colleges and universities throughout the United States had implemented a social-norms campaign (Wechsler et al., 2004). Recent studies of social-norms campaigns have had mixed findings, possibly due, in part, to many studies having weak designs (e.g., lack of control groups, small sample size, being conducted on only one campus, low response rates, lack of control variables). Three recent studies found that social-norms campaigns resulted in reductions in students' misperceptions of peer alcohol use and reductions in student alcohol use (Glider et al., 2001; Mattern and Neighbors, 2004; Smith et al., 2006). None of the studies, however, had a comparison group, and the authors could not rule out alternative explanations for the study findings.

One recent study found that a social-norms campaign had no effect on perceptions of alcohol use or alcohol consumption levels (Thombs et al., 2004). Several other recent studies found that social-norms campaigns may reduce misperceptions about peer alcohol use but either have no effect on or *increase* student alcohol use (Clapp et al., 2003; Gombert et al., 2001; Granfield, 2005; Swanson et al., 2004; Thombs and Hamilton, 2002; Werch et al., 2000). In another recent study, Russell and associates (2005) found that a potential problem with social-norms campaigns is the construction of the messages and the design of the advertisements. In an assessment of the advertisement used in one campaign, they found that, although students may have liked the advertisement, it may not have adequately communicated the main message of the social-norms campaign.

In a national study, Wechsler and associates (2003) assessed changes in students' misperceptions about peer alcohol use and actual rates of alcohol use at 37 colleges that had reported implementing social-norms campaigns between 1997 and 2001, as compared with 61 campuses that had not implemented this approach. They observed no decreases in drinking rates on campuses that had implemented a social-norms campaign but saw increases in two of the five drinking measures on these campuses. No changes in drinking rates were observed in the comparison colleges.

The limitations of this study, however, are that campuses that reported implementing the social-norms campaigns had higher baseline rates of student alcohol use than campuses that did not have campaigns (i.e., the controls were not an equivalent comparison group). As noted by the authors, they did not assess the individual quality of each of the social-norms campaigns in terms of content, quality of the advertisements, scope, and duration.

Given the potential risk of increases in student alcohol use, campus-wide social-norms campaigns should be implemented with caution. Any further studies of social-norms campaigns should include multiple campuses and randomized study designs, and the quality of campaign implementation should be assessed. The National Institute on Alcohol



Abuse and Alcoholism (NIAAA) and the Department of Education has funded Dr. William DeJong to conduct a large randomized trial to more fully assess the effects of these campaigns.

### Summary

We identified 16 new studies addressing environmental strategies to de-emphasize alcohol, all focusing on social-norms campaigns. In the last NIAAA report on college student alcohol use, social-norms campaigns were listed as a promising strategy. Although each of the recent studies on social-norms campaigns has limitations, the majority of these new studies suggest that social-norms campaigns should be used cautiously. Several studies suggest that the campaigns do not decrease alcohol use and may, in fact, increase alcohol use.

Further methodologically robust studies are needed to determine whether the lack of positive effects of social-norms campaigns is a result of the type of strategy or a result of the campaigns being inadequately implemented in terms of type and dissemination of the messages. Furthermore, given that only 1 of the 10 policies we identified in this area has recently been studied, more research is needed on other strategies that de-emphasize the role of alcohol and create positive expectations on campuses.

### Conclusion

In our 2002 article, we concluded that the findings of numerous studies indicated that reducing alcohol availability through policy change reduces alcohol consumption and related problems among the general population. Yet, few studies evaluated the effects of alcohol policies on college students. In our current review, we identified 110 new empirical studies, 36 of which focus on issues related to college students. (Note that some studies assessed environmental factors that fit in more than one of our three sections.)

The combined findings of previous and recent studies suggest that environmental policies and strategies can reduce alcohol use and alcohol-related problems among college students. Whereas some policies may create enough of an environmental change by themselves to affect a significant reduction in alcohol use among college students, some policies and strategies may need to be implemented in combination with others to be effective. The findings of recent studies suggest that a multistrategy approach may reduce alcohol use and related problems among college students, although there currently are no specific recommendations on which combination of approaches is optimal.

Recent studies also suggest that not all approaches are effective. For example, server and manager alcohol training programs by themselves are not likely to prevent illegal alcohol sales to underage college students. Social-norms

campaigns are another example of an approach that should be used cautiously, because some campaigns appear to have iatrogenic effects (i.e., increased alcohol use).

Many recommended environmental strategies have received little or no evaluation. One reason may be difficulty in implementing environmental strategies. Many campuses, however, have implemented environmental policies and strategies (Hirschfield et al., 2005; Mitchell et al., 2005; Wechsler et al., 2000; West and Graham, 2005), but most have not been studied.

Another reason may be publication bias. A limitation of our review is that we included only studies that have been published in the peer-reviewed literature; studies that did not have positive findings may not have been published. Some of the published studies that we reviewed, however, did report null or negative findings. In addition, it is possible that funding evaluations of environmental strategies is not a priority of many funding agencies.

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