

The Role of Mass Media Campaigns in Reducing High-Risk Drinking among College Students*

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ABSTRACT. *Objective:* This article categorizes and describes current media campaigns to reduce college student drinking, reviews key principles of campaign design and outlines recommendations for future campaigns. *Method:* The article describes three types of media campaigns on student drinking: information, social norms marketing, and advocacy. Key principles of campaign design are derived from work in commercial marketing, advertising, and public relations and from evaluations of past public health campaigns. *Results:* Information campaigns on the dangers of high-risk drinking are common, but none has been rigorously evaluated. Quasi-experimental studies suggest that social norms marketing campaigns, which correct misperceptions of campus drinking norms, may be effective, but more rigorous research is needed. As of this writing, only one major media campaign has focused on policy ad-

vocacy to reduce college student drinking, but it is still being evaluated. Lessons for campaign design are organized as a series of steps for campaign development, implementation and assessment: launch a strategic planning process, select a strategic objective, select the target audience, develop a staged approach, define the key promise, avoid fear appeals, select the right message source, select a mix of media channels, maximize media exposure, conduct formative research, and conduct process and outcome evaluations. *Conclusions:* Future campaigns should integrate information, social norms marketing, and advocacy approaches to create a climate of support for institutional, community and policy changes that will alter the environment in which students make decisions about their alcohol consumption. (*J. Stud. Alcohol*, Supplement No. 14: 182-192, 2002)

AMERICANS HAVE long been intrigued by the potential power of the mass media to help solve social problems. Television, radio and print advertising can entice people to buy a wide range of products and services, and television entertainment programs and movies exert enormous influence over our ideas, values and behavior. Therefore, according to conventional wisdom, it should be possible to use mass communications to get people to act on behalf of their own health and well-being or to “do right” by important social causes. Based on this assumption, since World War II, federal, state and local governments, private foundations and other nongovernmental organizations have sponsored hundreds of public service campaigns to promote social rather than commercial “goods” (DeJong and Winsten, 1998).

It is not surprising, then, that prevention advocates would look to the mass media as an important aid in addressing

the problem of high-risk drinking among college students. Some advocates have pushed for reform or other restrictions on alcohol advertising (DeJong and Russell, 1995). Others have sought to influence entertainment producers to end the glorification of high-risk drinking on television and in the movies (Montgomery, 1989). More recently, prevention advocates have produced a small number of media campaigns designed to change student knowledge, attitudes and behavior.

How can the power of the mass media be used effectively to reduce high-risk drinking among college students? To explore that question, this article begins by reviewing three types of mass media campaigns focused on student drinking: information, social norms marketing, and advocacy. This is followed by a review of key lessons for campaign design derived from work in commercial marketing, advertising and public relations and from past public health campaigns. The article concludes by suggesting how future campaigns on student drinking might be constructed so that they work in sync with environmentally focused prevention efforts now being implemented on college campuses.

A Review of Current Campaigns

Most media campaigns focused on college student drinking have been campus based, using a mix of posters, flyers, electronic mail messages and college newspaper advertisements. More recently, a few regional, state and national media campaigns have begun to address this issue as well.

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The following review describes three types of campaigns. First, *information campaigns* try to raise awareness of the problem, usually with the intent of motivating students to avoid high-risk alcohol use. Second, *social norms marketing campaigns* try to correct misperceptions of current drinking norms, based on the idea that if students no longer have an exaggerated view of how much alcohol their peers are consuming, fewer of them will be led to engage in high-risk drinking. Third, *advocacy campaigns* attempt to stimulate support for institutional, community or public policy change. Unfortunately, evaluation data for all three types of campaigns are still very limited.

Information campaigns

“Party Smart” is a media awareness campaign launched by Boston Mayor Thomas M. Menino as a response to the 1997 death of Scott Krueger, a freshman at the Massachusetts Institute of Technology who died from alcohol poisoning after a fraternity hazing. Each of the advertisements for this poster and billboard campaign uses a photograph taken from the point of view of a drinker, with the rhetorical tagline, “Remind you of last night?” One shows the blurry image of a toilet, the apparent target of an intoxicated drinker who needs to vomit. Another shows the splayed feet of a drinker lying in bed, the room spinning rapidly around him. A third shows a covey of young women pointing and laughing at a drinker (presumably a male) who has passed out or fallen on the floor.

The “Dirk” campaign, sponsored by the Ohio Department of Transportation, is a similar awareness campaign. Print advertisements are built around a fictional character, Dirk, who sets out to learn about the negative consequences of excessive alcohol consumption among Ohio college students. Television advertisements also focus on negative consequences. In one, the camera pans across a set of ringing alarm clocks and empty alcohol containers, then to a snoring student who is sleeping through a final exam. In the other advertisement, a young woman is sitting on a bed in a dorm room. A young man beside her wakes up, having no memory of who she is.

Mothers Against Drunk Driving has launched a print campaign, “Face the Brutal Truth About Underage Drinking,” to remind the public, especially young people, of the repercussions of underage drinking. Each advertisement shows a close-up of a distraught young man or woman with a caption that describes a possible negative consequence of drinking (e.g., “Alcohol consumption contributes to unwanted pregnancies”; “Alcohol kills more people under 21 than cocaine, marijuana, and heroin combined”; “Alcohol is involved in half of all sexual assaults on campus”).

Information campaigns focusing on negative consequences are unlikely to have much impact on college stu-

dents’ alcohol consumption. Students involved in high-risk drinking already know that alcohol misuse can lead to serious injury and death. They also know from their own experience, however, that dire consequences, while common enough to be noteworthy, are still relatively rare events, given that 81% of college students consume alcohol (Wechsler et al., 1998). As a result, serious injuries or death related to drinking are likely to be attributed to an error in the individual’s specific actions, rather than to predictable consequences of excessive alcohol consumption, as predicted by “just world” theory (Lerner, 1980).

It is also unlikely that the depiction of highly familiar but less serious negative drinking consequences, such as those in the Party Smart campaign, will penetrate the fog of denial that lets students continue to engage in high-risk drinking. Most young people take good health for granted, and many view long-term problems from their current drinking as too distant and unlikely to be of concern. Moreover, many young people do not understand the probabilistic nature of risk, and the inherent uncertainty facilitates denial. Finally, many young people overestimate their own capacity to change their behavior before long-term consequences become an issue (DeJong and Winsten, 1998).

The National Association of State Universities and Land Grant Colleges launched a different kind of information campaign in September 1999, with the endorsement of 113 university presidents. A one-page parody “advertisement” for “Binge Beer” was run in national and major regional newspapers to encourage parents to talk with their children about “binge drinking.” It should be noted that the advertisement generated extensive news coverage, which helped to extend the campaign’s message to a wider audience.

Although the advertisement was eye catching, the heart of the prevention message was buried, and it was not clear that it was directed to parents until the last line of copy. The “Binge Beer” ad may have succeeded in reminding a few parents that they should talk to their college-age son or daughter about the dangers of high-risk drinking, but no advice was provided on how to have that discussion. Several important messages have been identified that parents can convey to their college-age children (Devine and DeJong, 1998), but these were not indicated in the ad or a related website. An alternative strategy would have been to encourage parents to take an active role in helping their college-bound children choose a college that has implemented key programs and policies for creating a safe campus (DeJong and Zweig, 1998).

Social norms marketing campaigns

College students tend to overestimate how many of their peers engage in dangerous alcohol consumption. The disparity between actual and perceived drinking norms can be very large. If students believe that most other students drink

heavily and seek to conform to that perceived norm, then collective rates of high-risk drinking will be sustained or even increase. Incoming first-year students, independent from parental control for the first time and seeking guidance on how to fit into their new social environment, are especially vulnerable to exaggerated representations of drinking norms (Perkins, 1997).

Prevention experts have speculated that this dynamic might be turned around through a campus-based media campaign that corrects students' misperceptions about their peers' alcohol consumption. Quite simply, if students more accurately perceive how much drinking is really going on, then this should change their perception of the norm, which in turn should lead to reductions in high-risk drinking. The effort to get this message out—using publicity events, student newspapers, posters, email messages, and other campus-based media—is called a social norms marketing campaign (Perkins, Social norms, this supplement).

This approach has been tested on several different campuses. Northern Illinois University implemented a 5-year program to change perceptions of student norms regarding high-risk drinking (Haines and Spear, 1996). A subsequent student survey found an 18% reduction in perceived heavy episodic drinking (69.3% versus 57.0%) and a 16% reduction in actual heavy episodic drinking (43.0% versus 37.6%). Northern Illinois University has continued to implement the media campaign for several years, producing steady declines in the rate of self-reported high-risk drinking (Haines, submitted for publication).

Additional preliminary studies have been conducted at Hobart and William Smith Colleges, the University of Arizona, and Western Washington University. Although all of the evaluation designs are subject to criticism, the consistent pattern of findings reported by these campuses is impressive, especially in light of survey data showing relatively little change at the national level (Perkins, Social norms, this supplement). Additional research is needed to explore campus-based social norms campaigns.

In Montana, the social norms approach is being tried in a state-funded media campaign called "Most of Us." This campaign is directed to all young people in Montana under age 25, including college students, and its objective is similar to that of college-based campaigns. A baseline survey confirmed that misperceptions about how much alcohol young people actually drink are widespread among all subgroups of 18- to 25-year olds in the state (Linkenbach and Perkins, submitted for publication). A quasi-experimental evaluation of the campaign is currently underway.

Advocacy campaigns

As of this writing, there is only one major media campaign focused on college student drinking that has sought to create a climate of support for environmental change.

Launched in late 1997 by the Center for Science in the Public Interest, "Had Enough!" is being piloted at Cornell University, the University of Arkansas at Little Rock, and the University of North Carolina at Chapel Hill. The campaign targets the many students who are tired of having the quality of their education and their safety compromised by the high-risk drinking of others, with the hope that they will channel their anger into advocacy.

"Had Enough!" uses newspaper advertisements, posters and flyers to draw students to a website (HadEnough.org), which then urges them to "get involved" in fighting "binge drinking" on their campus. Each advertisement presents a multiple-choice drinking quiz, such as the following:

You're driving your trashed friend back from a party when she declares she's going to hurl. To assist, you: a) Tell her to stick her head out the window and let it rip. b) Quickly swerve over and open the door so she doesn't get any in your car. c) With one hand on the wheel, hold her hair back while she barfs in her purse. d) NONE OF THE ABOVE.

The last alternative is marked with an asterisk, which draws attention to the key line of copy. In this example, it reads: "You didn't come to college to baby-sit a binge drinker. To really be helpful, advocate for change. Visit www.HadEnough.org."

The website is designed to reinforce the visitor's negative opinion about high-risk drinking and provide a resource for students who want to "do something about it." Under the banner "Binge Drinking Blows," the home page begins, "Had enough on your campus? Haven't we all about had enough of the effects binge drinking has on the quality of campus life? Well, join the club. There are plenty of us that are sick and tired of drunken nuisances. And with good reason." It offers general advice to students on how to address the problem, such as organizing alcohol-free activities during orientation or joining a local coalition on alcohol issues, and provides a basic primer on the importance of institutional and government policy for addressing the problem. At the three pilot sites students are linked to activities, programs, and advocacy efforts specific to their campuses. Evaluation of the campaign is still underway.

The University of Delaware recently launched an eclectic poster campaign under the slogan, "University of Delaware. Party School?" One series of posters includes elements similar to "Had Enough!" but without providing sources for additional information. For example, one poster shows a disarrayed dormitory room. Under the headline "Wasted," the copy reads: "Your room. Someone threw up in the wastebasket; cans and bottles are everywhere. And, who's that guy passed out on your bed?" "Haven't we had enough?" At the bottom appears the standard line, "University of Delaware. Party School?" Unfortunately, judging from the photograph of the dorm room, the answer appears to be "Yes."

Another series of posters seeks to communicate a positive image in contrast to the university's "party school" reputation. For example, under the headline "Trashed," one poster shows a group of student workers for the university's recycling program and another shows Greek organization volunteers participating in a roadside cleanup program. A third, headlined "Party Animal," shows the university mascot and students participating in a fundraiser for the March of Dimes. The references to high-risk drinking are unfortunate, as they may subtly reinforce the university's drinking school image and undermine the central message. Also, showing that certain students are not part of the high-risk drinking scene fails to communicate clearly what the real norms on campus are.

A more traditional series of posters highlights the negative consequences of high-risk drinking: (1) "Wasted. All that time spent partying instead of hitting the books. Failed classes equal wasted time, wasted money, wasted effort." (2) "Mug Night. It was a great party, wasn't it? Maybe he didn't know a police record will prevent him from entering law school." (3) "Attitude Adjustment. He seemed like such a nice guy...until he had a few drinks. Then, his attitude changed: He got abusive and you got scared." Each poster concludes with the line, "Haven't we had enough?" Unfortunately, the posters do not refer students to an additional source of information.

Lessons from Past Public Health Campaigns

Given these modest efforts, it is helpful to explore how the mass media might be used more effectively to address the issue of college student drinking. Decades of work on public service campaigns have taught public health advocates a great deal about how to harness the power of the mass media. An overview of key lessons is presented here, organized as a set of guidelines that can be used to stimulate ideas, manage the process of campaign development and implementation, and evaluate campaign results. These guidelines have their origins in two major traditions: (1) commercial marketing, advertising and public relations and (2) public health practice.

Launch a strategic planning process

Public service campaign planning often begins with the wish to "do something" about a problem using the mass media. What often ensues is a review of how other campaigns have used the media, with the assumption that their methods can be imitated or adapted for the new campaign. For example, the value of television public service announcements seems to be regarded as self-evident, leading even small organizations with limited means to spend valuable time and resources in developing them and then pushing them in front of media gatekeepers, who have an

ever-shrinking store of free advertising slots to dispense (Hammond et al., 1987).

The problem is that campaign planners are thinking about which media technique to use without first having a clear strategic objective in mind. Ideally, the objective should be one that applies to the sponsoring organization's entire programmatic effort, not just the media campaign alone. Furthermore, the nature and scope of the media campaign should be outlined in tandem with the organization's other activities. This is the only way to guarantee that the media campaign will be consistent with and support the larger goals and objectives of the organization.

Select a strategic objective

The first step in designing a public health campaign is to select a strategic objective for the entire program, of which the media campaign is one part. Campaign planners can then consider how the mass media might best be used to advance that objective. Thinking about media options in the absence of an overall strategy is shortsighted and very likely to lead to disappointing campaign results.

A consideration of strategic options is well informed by a social ecological framework, which recognizes that health behavior change is affected by multiple levels of influence: individual factors, interpersonal and social processes, institutional factors, community factors and public policy (Stokols, 1996). Accordingly, broad objectives for the overall program could include: (1) individual behavior change, (2) changes in interpersonal and social processes, (3) support for institutional or community-based interventions or (4) promotion of public action for environmental change (DeJong et al., 1998). The most profound decision to be made by campaign planners is which of these areas should be the focus of their strategy.

Selection of a strategic objective should be informed by a thorough analysis of the problem at issue, its causes and the full range of possible solutions. The ultimate decision should be based on a determination of which option will provide the greatest leverage for generating change. In some cases, it will be clear that an issue is not yet on the public agenda, and a basic informational campaign will be needed, directed either to the public at large or to policy-makers and principal opinion leaders. Or there may be a lack of knowledge, erroneous beliefs or skill deficits that must be addressed before further progress is possible. There may be social or interpersonal factors at work in the community that can provide a strategic opportunity. In some cases, it will be clear that the key to producing behavior change is to alter institutional or community factors that are driving the problem. Or it may be that broad changes in laws or regulations are most needed.

There is no easy formula. In the end, the decision must rest on informed judgment, grounded in a systematic analy-

sis and consideration of the problem. Campaign planners often assume that their campaign message should be designed to educate people about their individual behavior. That may sometimes be appropriate, but often it will be more important to use the media to stimulate action in support of institutional, community or policy change. This can be done through advertising messages or by influencing how news reporters cover the story (Wallack and DeJong, 1995).

Select the target audience

In general, campaign messages should be directed to a well-defined target audience specified in terms of its geographic, demographic, psychological and problem-relevant characteristics (Lefebvre and Flora, 1998). With a focus on stimulating action in support of institutional, community or policy change, the audience should be defined as critical decision makers, who can be reached either directly or through mobilized public opinion. Determining the type of audience that should be targeted for a public service campaign or how narrowly or broadly that audience should be defined depends heavily on the nature of the problem, lessons learned from past work to address it and the availability of resources. Ideally, members of a target audience should share similar knowledge, concerns and motivations that affect their behavior, and they should be reachable through similar media, organizational or interpersonal channels.

Develop a staged approach

Very few mass communication campaigns can be expected to stimulate an immediate change in people's health-related behavior. Hence, rather than focusing on immediate behavior change, it is often more realistic to concentrate on achieving intermediate objectives that will contribute to behavior change in the long term using a staged approach. Campaigns to promote change in interpersonal and social processes or build support for policy change can also benefit from this type of structure.

According to models of the behavior change process, change results when people are led through the following steps (Roberts and Maccoby, 1985):

1. *Awareness.* A media campaign needs to raise consciousness of the problem, prompt reevaluation of personal risk and encourage consideration of individual or collective action (Dearing and Rogers, 1996).
2. *Knowledge and beliefs.* The campaign must bring about a change in beliefs and attitudes about the behavior being promoted. It is critical to anticipate and address the audience's points of resistance.
3. *Behavioral skills.* Behavior change often requires the development of new skills (e.g., self-monitoring, refusal behaviors),

which can be taught using media by modeling or step-by-step instruction (Bandura, 1986).

4. *Self-efficacy.* The conviction that one can execute a particular behavior (called self-efficacy) is predictive of subsequent behavior change (Bandura, 1986). Observing others' experience is an important way of developing efficacy expectations.
5. *Supports for sustaining change.* Learning and maintaining a new pattern of behavior requires that people know how to monitor their behavior; apply self-reinforcement strategies; and anticipate, eliminate or cope with stimuli that trigger unwanted or competing behaviors (DeJong, 1994). Mass communications can be used to teach these self-management techniques.

To apply the behavior change model, campaign planners should establish where in the behavior change process the target audience can presently be found. The campaign should try to move the audience sequentially through the remaining steps, noting that it is possible for a set of messages to move an audience through several stages at once, depending on the difficulty of the behavioral objective.

Define the key promise

In general, campaign messages are more likely to be effective if they call on the target audience to take some kind of specific action. The selected action should be one that serves to work in tandem with other program elements and advance the broader strategic objective. For instance, community residents might be encouraged to call a telephone hotline to receive information about a public health problem. At the policy level, targeted government officials might be urged to pass a budget that will allow for stricter law enforcement. Once the desired action is identified, ways to motivate the target audience must be identified.

Commercial advertisers think in terms of a key promise—that is, the single most important benefit that the audience will receive if they do what the campaign message is asking of them. Personal concerns or barriers that might deter the audience from taking action must also be considered. To “sell” the key promise, the campaign message must provide support statements that explain why the promised benefit serves the target audience's interests and why the advantages of taking this action outweigh any disadvantages. The key promise and support statements are brought together to create a net impression, which can be thought of as a summary of what members of the target audience should say to themselves after seeing or hearing the message.

Identifying the key promise is a critical step. Commercial advertisers understand that people are more likely to attend to and remember messages that meet their needs or support their values. Hence, commercial advertising often plays on people's insecurities, desires and aspirations and then “positions” the advertised product or service as a means of meeting those needs immediately. In contrast, public health advocates tend to think more narrowly in terms of

promised health benefits. In fact, those benefits may not be primary motivators for the target audience, which may have other, more immediate concerns. When crafting a campaign message, consideration should be given to a broader range of benefits that might appeal to the target audience (DeJong and Winsten, 1998).

Avoid fear appeals

There is continuing controversy about the use of fear appeals or scare tactics. Their use is based on a firmly held belief that people can be motivated to stop life-threatening or otherwise dysfunctional behaviors through an emotionally charged portrayal of that behavior's negative consequences. Most experts have concluded that fear campaigns are extremely difficult to execute, rarely succeed and should be used only under limited circumstances (Job, 1988). Indeed, they argue that there is a real risk that fear appeals will backfire, making the problem behavior even more resistant to change (DeJong and Winsten, 1998).

Despite these considerations, fear appeals continue to have strong intuitive appeal and are frequently used by advertising professionals in public service campaigns. One reason is that focus group participants usually rate emotional or arousing fear appeals as highly motivating and effective, but this is true even when subsequent experimental studies show those appeals to be ineffective (Job, 1988). The reason for the continuing allure of fear-based messages is clear: In general, the threat of punishment is relied on to control behavior when its causes are insufficiently understood or those causes are difficult to change (Bandura, 1986).

Lack of clarity about what constitutes a fear appeal compounds the confusion. In their zeal to promote alternative approaches, some experts extend their concerns about fear appeals to any message that focuses on negative consequences of certain behaviors. In fact, however, people need to be made aware of threats to their health if this is new information for them, and they need occasional reminders of those facts, especially when the audience has low anxiety about a problem (DeJong and Winsten, 1998). Also, it is legitimate to use public policy to create new threats, such as stricter law enforcement, about which the public then needs to be informed (DeJong and Atkin, 1995). The threat of punishment, primarily through legal sanctions, is a basic instrument of social policy—one frequently used to achieve public health objectives.

On the other hand, once people are already aware of a problem or have been notified about changes in policy, other means of influencing their behavior must be found, such as modeling appropriate skills, demonstrating the benefits of alternative behaviors, promoting participation in community-based programs or encouraging active support for further policy changes. Unfortunately, most public ser-

vice campaigns never get past the stage of reinforcing people's awareness of the problem and stay stuck in a negative approach.

Select the right message source

The choice of the named campaign sponsor is fundamental. The persuasiveness of the message will depend on the trustworthiness and credibility of its source, as perceived by the target audience. In some cases, this can create a dilemma for the agency supporting the campaign. Its leadership may want the public (or its funders) to know of their sponsorship, but at the same time being prominently named might serve to undermine the target audience's receptivity to the message.

The use of celebrities should be approached cautiously for several reasons (DeJong and Winsten, 1998). First, the message may be overwhelmed by the celebrity's presence and ultimately forgotten. Second, celebrities can lose their luster; among adolescent fans in particular, perceptions of entertainment and sports stars change very quickly and unpredictably. Third, celebrities can suddenly become newsworthy in ways that directly undermine the campaign or are otherwise inappropriate. In the case of alcohol and other drug prevention messages, there is a fourth consideration: Adolescents often view celebrity messages skeptically because they suspect the celebrity was paid to deliver the message or they believe that many stars are substance users (Harvard Business School, 1987).

A celebrity should be selected whose public image fits the underlying strategy of the campaign, not just because he or she is available. Data on the celebrity's popularity among different demographic groups should be examined, and formative research should be undertaken to test the target audience's perceptions of the celebrity's credibility, trustworthiness and attractiveness. Most important, people who know the celebrity, and whose judgment can be trusted, should be consulted for their advice whenever possible.

Select a mix of media channels

A tenet of commercial marketing and advertising is to use a variety of media channels to provide a clear and consistent message (DeJong and Winsten, 1998). They should be selected according to the target audience's media preferences, the objectives of the campaign and cost. Audience rating systems and formative research can be used to help identify which specific stations, programs, print venues, websites or other media are the best vehicles for reaching the target audience at the lowest cost per contact.

It is sometimes assumed that a campaign must use television to be effective, but that is mistaken. In general, television is excellent for providing short, uncomplicated messages, evoking emotional reactions, establishing evi-

dence of new social norms, and modeling behaviors that can be easily taught. Radio shares many of television's advantages and is much less expensive, both in terms of production costs and advertising rates; this allows greater repetition of the messages. Moreover, the variety of radio stations on the air facilitates the targeting of messages to very narrowly defined groups.

The print media are less able to command attention than the broadcast media, but they can be used to reach narrowly defined target groups, especially policy-makers and community opinion leaders. In addition, because print advertisements, brochures and feature articles can be reread and invite reflection, they are better suited for presenting rational arguments or detailed information. For college students, campus newspapers can be an ideal medium for campaign materials.

The Internet and the web are becoming another consequential medium for public service campaigns, especially for college students. While the private sector, including alcohol and tobacco companies, have aggressively developed home pages on the web (Williams et al., 1997), public service groups have only recently begun to explore the medium's possibilities. Those organizations that have made the greatest progress in developing this resource have had extensive government or foundation support (e.g., the National Clearinghouse for Alcohol and Other Drug Information). Recently, it has become feasible to use websites to make video and audio materials widely available to the public, which opens up a whole new world of possibilities for public health advocates.

Maximize media exposure

What constitutes adequate exposure has not been extensively studied in public service campaigns because, historically, those campaigns have relied on public service time or have had small budgets. Two broad generalizations can be provided for guidance (DeJong and Winsten, 1998). First, repetition helps draw attention to the message, facilitates learning and increases liking for the message. However, repetition can be counterproductive if it is excessive. Second, airing spots in high-frequency bursts (or "flights") is superior to having the same number of messages drawn out over a longer period. Precise recommendations cannot be made, however, because the right amount of exposure depends on multiple variables, including the nature of the target group, the precise objective, the complexity and entertainment value of the message, the nature and extent of competing messages and the context in which the campaign is conducted.

Conduct formative research

Formative research with the target audience is essential at each step of the campaign development process: defin-

ing the campaign's goals and objectives, selecting the most promising audience segment, identifying appropriate media channels for delivering messages, designing educational materials, tracking audience exposure and reaction, and refining the campaign (DeJong and Winsten, 1998). In essence, creating an effective campaign requires entering into a dialogue with the audience (Garcia, 1990).

It is surprising how often campaigns are developed without careful formative research. Funding is usually not the issue, as pretesting expenses can be kept relatively modest. More often, not enough time has been allowed to do the research. At a minimum, focus groups should be conducted to test preliminary executions, such as scripts, storyboards, and mock-ups of print advertisements. Tests of finished products are generally less critical, although in some isolated cases, this type of testing is absolutely essential (Wallack and Barrows, 1982-1983).

Representatives of the target audience are an excellent source of information at this stage, but not everything they say should be accepted at face value. For example, focus groups almost always endorse fear messages; but, as discussed above, research suggests that fear-based messages work under only extremely limited circumstances (Job, 1988). Therefore, it is essential that formative research include consultation with experts who can provide an experience-based and analytical perspective.

Conduct process and outcome evaluations

Few public service campaigns have been rigorously evaluated. Campaigns involving academic researchers tend to be low-budget, short-term and localized efforts. Full-scale national campaigns are rarely evaluated due to both expense and the difficulty of setting up a research design that permits meaningful inferences about a campaign's impact. The common failure to evaluate these campaigns prevents planners from assessing the need for making midcourse corrections and impedes progress in learning what types of campaign strategies work best. Hence, whenever possible, early program planning should incorporate both process and outcome evaluation activities to monitor progress and demonstrate project impact.

There are three types of evaluation strategies that have been used to assess the impact of mass media campaigns: (1) community studies, which assess the impact of local or regional campaigns by comparing "treatment" and "control" (no campaign) communities; (2) exposure studies, which compare the knowledge, attitudes and behaviors of people who have been exposed to the campaign versus those who have not; and (3) time-series studies, which involve the examination of data for an extended period of time, both before and after the introduction of the media campaign.

Most campaign evaluations have failed to capture the diversity and complexity of mass media effects. Measure-

ment systems should be designed to capture the full range of expected effects. For example, if a campaign's objective is to move an issue to the top of the public agenda, the project's success can be established by tracking the number of news stories before and during the campaign, the number of legislative proposals submitted and passed, the growth of grassroots advocacy groups and so forth (Roberts and Maccoby, 1985).

Conclusion

Learning from both the successes and failures of past mass communication campaigns, public service groups are working now with a renewed enthusiasm for using the mass media to promote their causes. Studies have demonstrated that when long-term mass communication campaigns are designed and executed according to sound principles, they can play a meaningful role in changing behavior, either directly or by helping bring about environmental change at the institutional, community or policy level. Many failed campaigns are understood to have been seriously flawed in design and execution due to poor planning and inadequate formative research.

An Outline for Future Mass Media Campaigns

To date, most mass media campaigns focused on college drinking have used a basic information approach. These campaigns have been driven by the widely shared conviction that the techniques of commercial advertising can be successfully applied to this problem. These campaigns are developed with the implicit conviction that people will naturally take steps to protect themselves if planners can find just the right messages to inform them about the problem and to motivate them (Wallack and DeJong, 1995). Like commercial advertising, this approach seeks to change individual behavior directly by providing information.

This approach is not congruent with the general thrust of work in public health, which has focused on identifying and controlling environmental factors that contribute to disease and other health-related problems. This environmental work (e.g., draining the swamps, providing clean water, building sanitation facilities) has been credited for the great gains in life expectancy seen in developed countries. Over time, attention shifted to public health problems that seem rooted in poor behavioral choices. To address these, public health specialists turned away from the tradition of environmental management and instead turned to health education, with its focus on altering individual behavior through changes in knowledge and attitude.

The health education approach is valuable, of course, if not essential. However, it is also limited in what it can accomplish. In recent years, public health experts have argued that a paradigm that addresses the physical, social,

legal and economic environment that encourages and sustains high-risk behavior is the most effective way to reduce behavioral health problems. Accordingly, public health media campaigns can make their greatest contribution by creating a climate of support for changing this environment (Wallack and DeJong, 1995).

The environmental management framework outlined by the Higher Education Center for Alcohol and Other Drug Prevention brings attention to the vital role of policy change at the institutional, community, state and federal level in preventing alcohol-related problems on campus (DeJong et al., 1998). Research has already shown that community-based coalitions can affect policy change to reduce alcohol consumption (Holder et al., 1997; Perry et al., 1996), and it is recommended that this general strategy be adapted to reduce alcohol-related problems in higher education (DeJong and Langford, this supplement). The following discussion addresses how the mass media can be used to create a climate of support for environmental change.

Policy change as a participatory process

A participatory process that includes all major sectors of the campus and community is key to developing and implementing new policies (DeJong et al., 1998). College presidents and other top administrators on many campuses have grappled with the problem of how to involve students as real partners in this process. Which student leaders should be involved? How should they be selected? What is a meaningful role for them to play? These are difficult questions. What is evident, however, is that the participation of any group of student leaders in this process will not be accepted by the student body at large in the absence of broad student support for policy change. The paramount question, then, is how such support can be generated through a mass media campaign.

It is important to remember that policy reforms cannot go too far beyond perceived social norms without provoking resistance or even open defiance. It follows that support for policy change will be less forthcoming if people have an exaggerated view of student norms regarding alcohol consumption. A critical step in building support for policy change, then, is to conduct a social norms marketing campaign that will correct that misperception. Once people realize that the majority of students are already practicing safe, moderate behaviors, college administrators can more easily enlist the support they need to advance a policy agenda that reinforces those positive trends. In short, another way to think about social norms marketing campaigns is that they put the college community in touch with the positive social norms that exist on campus.

Another type of information that can be used to build the case for policy change concerns the secondary effects of high-risk drinking—that is, the negative consequences

that students experience due to other students' misuse of alcohol. Various college alcohol surveys have found that a majority of students experience these consequences, which include interrupted study and sleep; having to take care of a drunken student; being insulted or humiliated; having a serious argument or quarrel; having property damaged; experiencing unwanted sexual advances; being pushed, hit or assaulted; and being a victim of sexual assault or date rape (Wechsler et al., 1996). The realization that secondhand smoke puts nonsmokers at risk gave new momentum to the antitobacco movement. Similarly, an increased awareness that high-risk drinking hurts students who are not at high risk themselves can increase support for campus alcohol control policies. Media can play a pivotal role in developing this new awareness.

Mass media campaigns can also be used to provide evidence of substantial support for new policies that are consonant with the actual values and norms shared on campus. The 1997 Harvard survey revealed that there is widespread support nationally for various measures to reduce high-risk drinking, including strict enforcement of the rules (65%), prohibiting kegs on campus (60%), "cracking down" on Greek organizations (60%) and banning on-campus advertisements from local outlets (52%) (Wechsler et al., 2000). Support for policies is also subject to misperception. Evidence from a study conducted on one Northeast campus showed that, just as students overestimate how much alcohol is being consumed on campus, they underestimate how much student support exists for reasonable policy reform (DeJong and Langford, this supplement). For example, 54.3% of students supported using stricter disciplinary sanctions for repeated violations of campus alcohol policies, but only 25.7% thought that other students supported this policy. Clearly, not all policy proposals will receive majority support, and the level of actual support for any particular policy will vary from campus to campus.

Campaign planners using this approach should determine where student support exists, correct misperceptions about this support and then move forward with a policy agenda that most students will endorse. This does not mean that presidents and other top administrators should never implement policies that are opposed by a majority of students, but that, whenever they can, they should find and build on student support. Over time, changes in policy, if enforced, hold the promise of further reducing high-risk drinking, which in turn can further alter the community's perceptions of its values and behavioral norms and thus set the stage for additional changes in policy.

Key steps in building support for policy change

This broad campaign outline suggests a sequence of specific steps that campus-based task forces can take to build

student support for environmentally focused policy changes using the mass media.

First, the task force should define the problem in a way that motivates behavior change. This means focusing on the secondary effects of high-risk drinking rather than the incidence of negative consequences experienced by the drinkers themselves. When describing the problem in this way, the task force should take care to avoid inadvertently reinforcing misperceptions of student drinking norms (DeJong and Linkenbach, 1999).

Second, the task force should collect and report survey data that will correct misperceptions of student drinking norms. This can have a positive effect on behavior, both directly and by helping build support for policy changes that reflect the health-protective values and behavioral norms of the majority.

Third, the task force should publicize positive trends to help reinforce further changes in behavioral norms. There are positive changes underway on many campuses, but a narrow focus on the severity of student alcohol-related problems can obscure them. Letting students know about "good news" can help strengthen the resolve of abstainers and moderate drinkers to stay that course, while also motivating other students to moderate their alcohol consumption.

Fourth, the task force should collect information on student opinions about various policy options. This information will be especially useful in efforts to give students a meaningful role in reviewing, developing and implementing campus policies. If a majority of students favor certain alcohol control measures, that fact should be publicized, providing an opportunity to correct misperceptions about the level of community support.

Fifth, when feasible, the task force should consider implementing a program of environmental change by starting with those policies that enjoy majority support and then moving on from there. When students know that new policies are consonant with the values and behavioral norms of the community, protests from opponents will be fewer and more easily contained.

At some schools, however, basing policies solely on the preferences of students would result in slow, evolutionary changes in student behavior and would not satisfy key constituencies, including administrators, faculty, parents, private donors and legislators. To build pressure for change, college presidents and other task force members must continue to voice their concerns about student alcohol consumption and its threat to their institution's capacity to achieve its educational mission (Presidents Leadership Group, 1997). At the same time, the task force should foster a campus environment where the large numbers of students who want reasonable policy reform and stricter enforcement of the rules are emboldened to speak out and can be heard.

Sixth, once new policies or programs are in place, students, faculty and others on campus must be informed. The mass media provide a superb vehicle for publicizing these changes, not just through news coverage, but also through special advertising and promotions. Research in drunk-driving prevention has shown, for example, that widespread publicity of "sobriety checkpoints" and other law enforcement measures is essential to their general effectiveness. In the absence of publicity, such policy changes have little or no discernible impact (Ross, 1992).

Conclusion

The strategy recommended here represents a structured integration of the three kinds of mass media campaigns that have been attempted to reduce student drinking: information, social norms marketing, and advocacy. The result is a sequenced and participatory campaign that would build the case for and otherwise support the type of environmentally focused prevention efforts now being implemented on many college and university campuses (DeJong and Langford, this supplement). Ultimately, this and other campaign ideas need to be tested experimentally to learn what will work best to reduce alcohol-related problems on campus.

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References

- BANDURA, A. *Social Foundations of Thought and Action: A Social Cognitive Theory*, Upper Saddle River, NJ: Prentice Hall, 1986.
- DEARING, J.W. AND ROGERS, E.M. *Agenda-Setting*, Thousand Oaks, CA: Sage, 1996.
- DEJONG, W. Relapse prevention: An emerging technology for promoting long-term drug abstinence. *Int. J. Addict.* **29**: 681-705, 1994.
- DEJONG, W. AND ATKIN, C.K. A review of national television PSA campaigns for preventing alcohol-impaired driving, 1987-1992. *J. Publ. Hlth Policy* **16**: 59-80, 1995.
- DEJONG, W. AND LINKENBACH, J. Telling it like it is: Using social norms marketing campaigns to reduce student drinking. *Amer. Assoc. Higher Educ. Bull.* **52** (4): 11-13, 16, 1999.
- DEJONG, W. AND RUSSELL, A. MADD's position on alcohol advertising: A response to Marshall and Oleson. *J. Publ. Hlth Policy* **16**: 231-238, 1995.
- DEJONG, W., VINCE-WHITMAN, C., COLTHURST, T., CRETILLA, M., GILBREATH, M., ROSATI, M. AND ZWEIG, K. *Environmental Management: A Comprehensive Strategy for Reducing Alcohol and Other Drug Use on College Campuses*, Newton, MA: Higher Education Center for Alcohol and Other Drug Prevention, Department of Education, 1998.
- DEJONG, W. AND WINSTEN, J.A. *The Media and the Message: Lessons Learned from Past Public Service Campaigns*, Washington, DC: The National Campaign to Prevent Teen Pregnancy, 1998.
- DEJONG, W. AND ZWEIG, K.L. Checking out colleges: Questions to ask school officials about alcohol and other drug prevention. *Driven* **1** (2): 18-19, 1998.
- DEVINE, L. AND DEJONG, W. What parents should say to college freshmen about alcohol. *Coll. Parent Advoc.* **Spring**: 1, 7, 1998.
- GARCIA, S.O. Creating culturally sensitive materials. In: MATIELLA, A.C. (Ed.) *Getting the Word Out: A Practical Guide to AIDS Materials Development*, Santa Cruz, CA: ETR Associates, 1990, pp. 49-61.
- HAINES, M.P. A case study of the social norms approach. In: PERKINS, H.W. (Ed.) *The Social Norms Approach to Prevention*, submitted for publication.
- 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**: 134-140, 1996.
- HAMMOND, S.L., FREIMUTH, V.S. AND MORRISON, W. The gatekeeping funnel: Tracking a major PSA campaign from distribution through gatekeepers to target audience. *Hlth Educ. Q.* **14**: 153-166, 1987.
- HARVARD BUSINESS SCHOOL. *Anti-Drug Marketing Study for the Mayor's Policy Office of the City of Boston*, Cambridge, MA: Harvard Business School, 1987.
- HOLDER, H.D., SALTZ, R.F., GRUBE, J.W., TRENO, A.J., REYNOLDS, R.I., VOAS, R.B. AND GRUENEWALD, P.J. Summing up: Lessons from a comprehensive community prevention trial. *Addiction* **92** (Suppl. No. 2): S293-S301, 1997.
- JOB, R.F.S. Effective and ineffective use of fear in health promotion campaigns. *Amer. J. Publ. Hlth* **78**: 163-167, 1988.
- LEFEBVRE, R.C. AND FLORA, J.A. Social marketing and public health intervention. *Hlth Educ. Q.* **15**: 299-315, 1988.
- LERNER, J.J. *The Belief in a Just World: A Fundamental Delusion*, New York: Plenum Press, 1980.
- LINKENBACH, J. AND PERKINS, H.W. Misperceptions of peer alcohol norms in a statewide survey of young adults. In: PERKINS, H.W. (Ed.) *The Social Norms Approach to Prevention*, submitted for publication.
- MONTGOMERY, K.C. *Target: Prime Time: Advocacy Groups and the Struggle over Entertainment Television*, New York: Oxford Univ. Press, 1989.
- PERKINS, H.W. College student misperceptions of alcohol and other drug norms among peers: Exploring causes, consequences, and implications for prevention programs. In: *Designing Alcohol and Other Drug Prevention Programs in Higher Education: Bringing Theory into Practice*, Newton, MA: Higher Education Center for Alcohol and Other Drug Prevention, Department of Education, 1997, pp. 177-206.
- PERRY, C.L., WILLIAMS, C.L., VELEN-MORTENSON, S., TOOMEY, T.L., KOMRO, K.A., ANSTINE, P.S., MCGOVERN, P.G., FINNEGAN, J.R., FORSTER, J.L., WAGENAAR, A.C. AND WOLFSON, M. Project Northland: Outcomes of a communitywide alcohol use prevention program during early adolescence. *Amer. J. Publ. Hlth* **86**: 956-965, 1996.
- PRESIDENTS LEADERSHIP GROUP. *Be Vocal, Be Visible, Be Visionary: Recommendations for College and University Presidents on Alcohol and Other Drug Prevention*, Newton, MA: Higher Education Center for Alcohol and Other Drug Prevention, Department of Education, 1997.
- ROBERTS, D. AND MACCOBY, N. Effects of mass communication. In: LINDZEY, G. AND ARONSON, E. (Eds.) *Handbook of Social Psychology*, 3rd Edition, Vol. 2: Special Fields and Applications, New York: Random House (distributed by Lawrence Erlbaum, Mahwah, NJ), 1985, pp. 539-598.
- ROSS, H.L. *Confronting Drunk Driving: Social Policy for Saving Lives*, New Haven, CT: Yale Univ. Press, 1992.
- STOKOLS, D. Translating social ecological theory into guidelines for community health promotion. *Amer. J. Hlth Prom.* **10**: 282-298, 1996.
- WALLACK, L. AND BARROWS, D.C. Evaluating primary prevention: The California "Winners" Alcohol Program. *Int. Q. Commun. Hlth Educ.* **3**: 307-336, 1982-1983.
- WALLACK, L. AND DEJONG, W. Mass media and public health: Moving the focus from the individual to the environment. In: MARTIN, S.E. (Ed.) *The Effects of the Mass Media on the*

- Use and Abuse of Alcohol. NIAAA Research Monograph No. 28, NIH Publication No. 95-3743, Bethesda, MD: Department of Health and Human Services, 1995, pp. 253-268.
- WECHSLER, H., AUSTIN, B. AND DEJONG, W. Secondary effects of binge drinking on college campuses. In: Bulletin Series: Alcohol and Other Drug Prevention, Newton, MA: Higher Education Center for Alcohol and Other Drug Prevention, Department of Education, 1996, pp. 2-3.
- WECHSLER, H., DOWDALL, G.W., MAENNER, G., GLEDHILL-HOYT, J. AND LEE, H. Changes in binge drinking and related problems among American college students between 1993 and 1997: Results of the Harvard School of Public Health College Alcohol Study. *J. Amer. Coll. Hlth* **47**: 57-68, 1998.
- WECHSLER, H., NELSON, T. AND WEITZMAN, E. From knowledge to action: How Harvard's College Alcohol Study can help your campus design a campaign against student alcohol abuse. *Change* **Jan./Feb.**: 38-43, 2000.
- WILLIAMS, W.S., MONTGOMERY, K.C. AND PASNIK, S. Alcohol and Tobacco on the Web: New Threats to Youth, Washington, DC: Center for Media Education, 1997.

Environmental Policies to Reduce College Drinking: Options and Research Findings

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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

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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 co-operating 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. Detering 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.

Effects of Minimum Drinking Age Laws: Review and Analyses of the Literature from 1960 to 2000

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ABSTRACT. *Objective:* The goal of this article is to review critically the extant minimum legal drinking age (MLDA) research literature and summarize the current state of knowledge regarding the effectiveness of this policy. *Method:* Comprehensive searches of four databases were conducted to identify empirical studies of the MLDA published from 1960 to 1999. Three variables were coded for each study regarding methodological quality: (1) sampling design, (2) study design and (3) presence or absence of comparison group. *Results:* We identified 241 empirical analyses of the MLDA. Fifty-six percent of the analyses met our criteria for high methodological quality. Of the 33 higher quality studies of MLDA and alcohol consumption, 11 (33%) found an inverse relationship; only 1 found the opposite. Similarly, of the 79 higher quality

analyses of MLDA and traffic crashes, 46 (58%) found a higher MLDA related to decreased traffic crashes; none found the opposite. Eight of the 23 analyses of other problems found a higher MLDA associated with reduced problems; none found the opposite. Only 6 of the 64 college-specific studies (9%) were of high quality; none found a significant relationship between the MLDA and outcome measures. *Conclusions:* The preponderance of evidence indicates there is an inverse relationship between the MLDA and two outcome measures: alcohol consumption and traffic crashes. The quality of the studies of specific populations such as college students is poor, preventing any conclusions that the effects of MLDA might differ for such special populations. (*J. Stud. Alcohol*, Supplement No. 14: 206-225, 2002)

THE MINIMUM legal drinking age (MLDA) is the most well-studied alcohol control policy in the United States (Wagenaar and Toomey, 2000). The intention of this policy is to lower alcohol use and its associated problems among youth. Following Prohibition, most states established an age-21 MLDA. During the early 1970s, a trend toward lowering the MLDA to age 18, 19 or 20 began in the United States, providing many natural experiments. As a result of research evidence indicating that traffic crashes among youth increased following lowering of the legal age, a citizens' effort began urging states to raise the MLDA back to age 21. In 1984, the federal government enacted the Uniform Drinking Age Act, which provided for the withholding of federal highway funds from states that failed to increase their MLDA (King and Dudar, 1987). By 1988, all states had established an age-21 MLDA. The increase in MLDA across multiple states again provided researchers with many natural experiments to assess effects of these policy changes on alcohol consumption and related problems among youth.

Despite this long history, the debate over the MLDA continues. Part of this debate is whether the age-21 MLDA is really effective in reducing alcohol-related problems. This debate is particularly relevant to college campuses because the majority of students on many campuses are under age 21. Some college administrators argue that the age-21 law

has caused more problems on college campuses, not less (Lonnstrom, 1985).

To determine the overall effect of the age-21 MLDA on youth, including college-age students, the existing research literature should be critically reviewed. The purpose of this review is to summarize all studies available in the peer-reviewed published literature over the past four decades that evaluated the effects of public policies establishing a legal minimum age for purchase and/or consumption of alcoholic beverages. Most studies assessed effects of the MLDA on consumption and alcohol-related problems among all those under age 21—college students and those not in college. Some MLDA studies specifically assessed effects of MLDA changes on college students alone. Given the current discussions on college campuses, we provide a review of the college studies in addition to a summary of the overall MLDA literature. A second objective of this article is to describe key issues in public debates regarding MLDA policies.

Method

We obtained all identified published studies on the drinking age from 1960 to 1999, a total of 132 documents. Comprehensive searches were conducted of four databases to identify studies of interest: ETOH (1960-1999 [National Institute on Alcohol Abuse and Alcoholism's alcohol and alcohol problems science database]), MEDLINE (1966-

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TABLE 1. Effects of legal minimum drinking age policies on consumption

Study	Jurisdiction	Quality				College specific	Outcome measure	Results	
		Probability sample	Design	Comp. group	Dir. of relation.			Statistically significant	
STUDIES ON LOWERING MINIMUM DRINKING AGE									
Smart and Schmidt, 1975	Toronto:								
	•Grades 7-13	•Yes	•Pre-post	No		•Self-reported proportion of drinkers	↓	Not reported	
	•Jr and sr high administrators	•Census (86%)	•Cross-sectional	No		•Students' consumption (perceived)	↓	Not reported	
Smart, 1977	•Several colleges: First-year students	•No	•Cross-sectional	No	X	•Self-reported consumption		No	
	Ontario	Census	Pre-post	No		•Alcohol sales: off-sale		No	
Bellows, 1980	NE	Not avail.	Time-series	Not avail.		•Alcohol sales: on-sale	↓	Not reported	
Smart and Finley, 1976	Canada: 10 provinces	Census	Pre-post	Yes		•Consumption (source not specified)		No	
Barsby and Marshall, 1977	25 states	Census	Pre-post	Yes		•Beer sales		No	
Smart, 1977	25 states	Census	Longitudinal	Yes		•Spirits sales (relative to legal age population)		No	
Douglas and Millar, 1979	MI	Census	Time-series	No		•Alcohol sales (beer)	↓	Yes	
McFadden and Wechsler, 1979	MA:					•Alcohol sales (draft beer)	↓	Yes	
	•H.S. students in 5 communities	Unclear	Longitudinal	No		•Self-reported consumption		No	
Wagenaar, 1982a	•34 New England colleges	Unclear	Cross-sectional	Yes	X	•Self-reported frequency of consumption	↓	Yes	
	MI	Census	Time-series	No		•Beer and wine sales (draft beer-temp.)	↓	Yes	
Wagenaar, 1982b	ME, NH	Census	Time-series	Yes		•Alcohol sales: ME		No	
Hoadley et al., 1984	48 states	Census	Longitudinal	Yes		•Beer sales (packaged): NH	↓	Yes	
	McCornac and Filante, 1984	50 states and DC	Census	Longitudinal	Yes	•Spirits sales		No	
						•Spirits sales		No	
STUDIES ON RAISING MINIMUM DRINKING AGE									
Vingilis and Smart, 1981	Ontario:								
	•Grades 7-13	•Yes	•Pre-post	Yes		•Self-reported consumption		No	
	•16-19 year olds in 1 city	•Census	•Time-series	No		•Consumption/possession /supply offenses		No	
Wagenaar, 1982a	•H.S. vice-principals	•Census (81%)	•Cross-sectional	No		•Students' consumption (perceived)	↓	Not reported	
	MI	Census	Time-series	No		•Beer and wine sales (packaged beer)	↓	Yes	
Wagenaar, 1982b	ME	Census	Time-series	Yes		•Alcohol sales (beer)	↓	Yes	
Hingson et al., 1983	MA: 16-19 year olds	Yes	Longitudinal	Yes		•Consumption/possession offenses	↑	Yes	
						Self-reported:			
Hoadley et al., 1984	48 states	Census	Longitudinal	Yes		•Consumption		No	
	Smith et al., 1984	MA: 16-17 year olds	Longitudinal	Yes		•Shift to illicit drug use		No	
Bessmer, 1985	Undergraduates	Not avail.	Pre-post	Not avail.	X	•Spirits sales		No	
	Lonnstrom, 1985	NY: Administrators at 4-year colleges	Census (90%)	Cross-sectional	Not avail.	X	Self-reported:		
Hughes and Dodder, 1986	OK: Intro. sociology classes at 1 university	Yes	Longitudinal	No	X	•Consumption		No	
					X	•Shift to marijuana use		No	
Williams and Lillis, 1986	NY: 16-20 year olds in 57 counties	Yes	Pre-post	Yes		•Drinking locations (shift from public to private)		No	
						•Self-reported consumption	↓	Yes	
Lillis et al., 1987	NY: 16-20 year olds in 57 counties	Yes	Pre-post	Yes		•Self-reported beer purchases	↓	Yes	
Wilkinson, 1987	50 states and DC	Census	Longitudinal	Yes		•Consumption (source not specified)	↓	Yes	
Engs and Hanson, 1988	U.S.: Students in health/sociology/ P.E. classes at 56 universities	No	Longitudinal	No	X	•Self-reported proportion of drinkers (all ages)	↓	Yes	

Continued

TABLE 1. *Continued*

Study	Jurisdiction	Quality				College specific	Outcome measure	Results	
		Probability sample	Design	Comp. group	Dir. of relation.			Statistically significant	
Lotterhos et al., 1988	NC: Undergrads in health classes at 1 university	Yes	Cross-sectional	No	X	•Students intending to increase or not change consumption levels (4 mos before raising MDA)	82%	N/A	
Williams and Lillis, 1988	NY: 16-20 year olds in 57 counties	Yes	Longitudinal	Yes		•Self-reported alcohol purchasing	↓	Yes	
Arndt, 1989	FL: 7th, 9th and 12th graders in 5 counties	Not avail.	Longitudinal	Yes		•Self-reported consumption	↓	Yes	
						Self-reported: •Consumption (12th graders)	↓	Yes	
						•Percentage of users (7th and 12th graders)	↓	Yes	
George et al., 1989	NY: Intro. psychol. students	No	Longitudinal	Yes	X	Self-reported: •Drinking locations (shift from public to private [incl. autos])		No	
						•Frequency of consumption	↓	Yes	
						•Quantity of consumption		No	
Gonzalez, 1989	FL: Students in undergraduate courses at 9 universities	Yes	Longitudinal	Yes	X	•Self-reported consumption		No	
Perkins and Berkowitz, 1989	NY: 1 university	Census (86-90%)	Pre-post	Yes	X	•Self-reported consumption		No	
Davis and Reynolds, 1990	NY: Undergraduates at 1 university	Yes	Pre-post	No	X	Self-reported (all ages): •Consumption		No	
						•Drinking locations (shift from public to private)		Not reported	
Gonzalez, 1990a	FL: Students in undergraduate courses at 1 university	Yes	Longitudinal	Yes	X	•Self-reported consumption		No	
Gonzalez, 1990b	FL: Students on spring break	No	Longitudinal	No	X	•Self-reported consumption		No	
O'Malley and Wagenaar, 1991	Nationwide: H.S. seniors (cohort followed)	Yes	Longitudinal	Yes		Self reported: •Consumption	↓	Yes	
						•Duration/degree of intoxication		No	
						•Shift to marijuana		No	
						•Drinking locations		No	
Gordon and Minor, 1992	NC: Students in undergraduate psych. courses at 1 university	No	Repeated cross-sectional	Yes	X	•Self-reported consumption	↑	Yes	
Hughes and Dodder, 1992	OK: Intro. sociol. classes at 1 university	Yes	Longitudinal	No	X	Self-reported: •Consumption		No	
						•Drinking locations (shift from public to private)		No	
Johnson et al., 1992	Canada: All provinces	Unclear	Time-series	Yes		•Consumption (beer and wine) (source not specified)	↓	Yes	
Yu and Shacket, 1998	NY: 10 counties	Yes	Longitudinal	Yes		•Self-reported purchase rates	↓	Not reported	
						•Self-reported consumption	↓	Not reported	
STUDIES THAT COMPARE STATES WITH HIGH AND LOW MINIMUM DRINKING AGE									
Rooney and Schwartz, 1977	5 states: Seniors from 27 high schools	No	Cross-sectional	Yes		•Self-reported consumption	↑	Not reported	
Colon, 1980	50 states and DC	Not avail.	Cross-sectional	Yes		•Consumption (source not specified)		No	
Maisto and Rachal, 1980	29 states: High schools	Yes	Cross-sectional	Yes		Self-reported: •Consumption	↓	Yes	
						•Access to alcohol	↓	Yes	
Schweitzer et al., 1983	35 states	Unclear	Cross-sectional	Yes		•Beer and spirits consumption (source not specified)	↓	Yes	
Ornstein, 1984	50 states and DC	Census	Longitudinal	Yes		•Beer consumption	↓	Yes	
						•Spirits consumption		No	
Coate and Grossman, 1987	Nationwide: 16-21 year olds	Yes	Repeated cross-sectional	Yes		•Self-reported consumption (all ages)	↓	Yes	
Coate and Grossman, 1988	Nationwide: 16-21 year olds	Yes	Cross-sectional	Yes		•Self-reported consumption (beer)	↓	Yes	

Continued

TABLE 1. *Continued*

Study	Jurisdiction	Quality				College specific	Outcome measure	Results	
		Probability sample	Design	Comp. group	Dir. of relation.			Statistically significant	
Mooney et al., 1992	LA and NC: Students in social science courses at 2 universities	No	Cross-sectional	Yes	X	Self-reported (18-22 year olds): •Consumption in controlled locations •Consumption in uncontrolled locations •Overall consumption •Self-reported consumption		No ↑ Yes ↑ Yes ↓ Yes	
Laixuthai and Chaloupka, 1993	Nationwide: H.S. seniors	Yes	Repeated cross-sectional	Yes					
Mooney and Gramling, 1993	LA and NC: Students in social science courses at 2 universities	Yes	Cross-sectional	Yes	X	•Self-reported consumption		No	
Laixuthai, 1994	Nationwide: H.S. seniors	Yes	Repeated cross-sectional	Yes		•Self-reported consumption	↓	Not reported	
Grossman et al., 1995	Nationwide: 16-21 year olds and H.S. seniors	Yes	Cross-sectional	Yes		•Self-reported consumption	↓	Yes	
Dee, 1999	Nationwide: H.S. seniors in 44 states	Yes	Longitudinal	Yes		•Self-reported consumption	↓	Yes	

Notes: Comp. group = comparison group. Dir. of relation. = direction of relationship. Outcome measure and Results pertain specifically to the age group affected by law unless otherwise specified. ↓ Inverse relationship between drinking age and outcome (i.e., drinking age higher, outcome measure lower). ↑ Positive relationship between drinking age and outcome (i.e., drinking age higher, outcome measure higher). Census (X%) = full census attempted but X% participated. Not avail. = dissertation abstracts reviewed only.

1999), Current Contents (1994-1999) and Social Science Abstracts (1983-1999). The entire record for each document was included in the search; thus, any record with any search term in the title, keywords, subject headings, descriptors or abstract fields was identified. Search terms used for each database were as follows (where * is the truncation indicator to include all forms of the root word):

- ETOH: (minimum age OR drinking age OR purchase age OR legal age OR MDA OR MLDA) OR ([teen* OR adolescen* OR young OR college* OR youth* OR student* OR underage* OR minor*] AND [sale* OR enforce* OR deterrence* OR avail* OR access* OR crackdown OR ID OR identification OR compliance])
- MEDLINE and Current Contents: (minimum age OR drinking age OR purchase age OR legal age OR MLDA) OR ([teen* OR adolescen* OR young OR college* OR youth OR student* OR underage* OR minor*] AND [sale* OR enforce* OR deterrence* OR avail* OR access* OR crackdown OR ID OR identification OR compliance])
- Social Science Abstracts: (minimum age OR drinking age OR purchase age OR legal age OR MDA OR MLDA)

In addition, two previous literature reviews were used to identify relevant studies (Wagenaar, 1983a, 1993).

We obtained and reviewed the original document for each study and coded eight key variables for each study. These variables include the jurisdiction studied (i.e., state or province), specific outcome measures analyzed (e.g., self-reported drinking, car crash fatalities) and whether the study was specific to college student populations. In addition, three key indicators of methodological quality were coded for each study. The first is sampling design, distinguishing lower

quality nonprobability sampling versus higher quality probability sampling or census data. The second quality indicator is the research or study design, with lower quality studies consisting of cross-sectional (one time-point) observations only versus higher quality studies that used pre-post (one observation before a policy change and one after), longitudinal (more than 2 but fewer than 20 repeated observations) or time-series (20 or more repeated observations over time) designs. The third quality indicator is whether some form of comparison group was used; studies with no comparison groups are of low quality. Finally, we coded whether the findings were statistically significant. If the results were significant, we coded the direction of the relationship between legal age for drinking and a specific outcome measure.

Effects of drinking age on alcohol consumption

We located 48 published studies that assessed the effects of changes in the legal minimum drinking age on indicators of alcohol consumption (Table 1). In the 48 studies, a total of 78 alcohol consumption outcome measures were analyzed (e.g., sales figures, self-reported drinking). Of the 78 analyses, 27 (35%) found a statistically significant inverse relationship between the legal drinking age and alcohol consumption; that is, as the legal age was lowered, drinking increased, and as the legal age was raised, drinking decreased. An additional 8 analyses that found an inverse relationship did not report significance levels. Of the 78 analyses, only 5 found a positive relationship between the legal drinking age and consumption. In short,

TABLE 2. Effects of legal minimum drinking age policies on traffic crashes

Study	Jurisdiction	Quality			College specific	Outcome measure	Results	
		Probability sample	Design	Comp. group			Dir. of relation.	Statistically significant
STUDIES ON LOWERING MINIMUM DRINKING AGE								
Williams et al., 1975	MI, WI, Ontario	Census	Longitudinal	Yes		Drivers involved in: •All types of fatal crashes •SV fatal crashes •Nighttime fatal crashes	No ↓ ↓	No Yes Yes
Naor and Nashold, 1975	WI	Census	Longitudinal	Yes		•Fatalities among drivers w/BAC > .05	↓	No
Whitehead et al., 1975	London, Ontario	Census	Longitudinal	Yes		Male drivers: •Alcohol-related crashes •Nighttime crashes	↓ ↓	Not reported Not reported
Bellows, 1980	NE	Not avail.	Time-series	Yes		•Total crashes •Alcohol-related fatal crashes •Non-alcohol-related fatal crashes (ages not specified)	↓ ↓ ↓	Not reported No No
Bako et al., 1976	Alberta	Census	Longitudinal	Yes		•Drivers with BAC > .08 responsible for fatal crashes (ages 15-19)	↓	Not reported
Ferreira and Sicherman, 1976	MA	Census	Time-series	Yes		•Alcohol-related fatalities (all ages) •Driver fatalities •Fatal crashes (drivers 18-20)	↓ ↓ ↓	Yes Yes Yes
Douglass and Millar, 1979	MI	Yes	Time-series	Yes		Fatal and nonfatal: •SVN crashes: male drivers •Total crashes (drivers 18-20) •HBD crashes (drivers 18-20)	↓ ↓ ↓	Not reported Not reported Not reported
Brown and Maghsoodloo, 1981	AL	Census	Longitudinal	Yes		•Alcohol-related SV crashes	↓	Yes
Cook and Tauchen, 1984	48 states	Census	Longitudinal	Yes		•Fatalities	↓	Yes
Smith and Burvill, 1986	Australia: 3 states	Census	Pre-post	Yes		•Injuries (males) •Fatalities •DUI offenses (males)	↓ ↓ ↓	Yes No Yes
STUDIES ON RAISING MINIMUM DRINKING AGE								
Wagenaar, 1981	MI	Yes	Time-series	Yes		•HBD crashes •SVN male driver crashes	↓ ↓	Yes Yes
Vingilis and Smart, 1981	Ontario	Census	Time-series	Yes		•Drinking-driving convictions •Driver fatalities: alcohol-related •Driver fatalities: total	↓ ↓ ↓	No No No
Williams et al., 1983	9 states	Census	Pre-post	Yes		Drivers involved in: •Nighttime fatal crashes •SVN fatal crashes	↓ ↓	Yes Yes
Hingson et al., 1983	MA: 16-19 year olds	Census	Pre-post	Yes		•All types of fatal crashes •SVN fatal crashes •Total fatal crashes •Drinking-driving arrests	↓ ↓ ↓ ↓	No Yes No No
		Yes	Longitudinal	Yes		Self-reported: •Nonfatal crashes •Frequency of drinking-driving •Proportion reporting drinking-driving	↓ ↓ ↓	No Yes No
Wagenaar, 1983b	ME	Census	Time-series	Yes		Drivers involved in: •Alcohol-related property damage crashes	↓	Yes
Smith et al., 1984	MA: 16-17 year old drivers	Census	Longitudinal	Yes		•Injury and fatal crashes •SVN fatal crashes •Total fatal crashes	↓ ↓ ↓	No No No
	MA: 16-17 year olds	Yes	Longitudinal	Yes		•Self-reported drinking-driving •Self-reported crashes	↓ ↓	Yes Yes
Thiel, 1985	TX	Census	Pre-post	Yes		•Alcohol-related injury/fatality crashes •Total injury/fatality crashes	↓ ↓	No Yes
Hoskin et al., 1986	10 states	Census	Pre-post	Yes		•SVN driver fatalities	↓	Yes
Males, 1986	14 states	Census	Longitudinal	Yes		•Nighttime fatal crashes •All fatal crashes	↓ ↓	No No

Continued

TABLE 2. *Continued*

Study	Jurisdiction	Quality				College specific	Outcome measure	Results	
		Probability sample	Design	Comp. group	Dir. of relation.			Statistically significant	
Hughes and Dodder, 1986	OK: Soc. classes at 1 university	Yes	Longitudinal	No	X	•Self-reported drinking-driving		No	
MacKinnon and Woodward, 1986	MI, MA, IL	Census	Time-series	Yes		•Driver fatalities (MI, IL)	↓	Yes	
Wagenaar, 1986	MI	Census	Time-series	Yes		•SVN injury crashes •HBD injury crashes	↓ ↓	Yes Yes	
Wagenaar and Maybee, 1986	TX	Census	Time-series	Yes		•SVN crashes (drivers age 18)	↓	Yes	
Coate and Grossman, 1987	Nationwide	Census	Longitudinal	Yes		•Fatalities	↓	Yes	
DuMouchel et al., 1987	26 states	Census	Longitudinal	Yes		•Nighttime driver fatal crashes	↓	Yes	
Lillis et al., 1987	NY	Census	Pre-post	Yes		•Alcohol-related fatal crashes •Alcohol-related injury crashes •DWI arrests	↓ ↓ ↓	Yes Yes Yes	
Saffer and Grossman, 1987a,b	NY: 16-20 year olds 48 states	Yes Census	Pre-post Longitudinal	Yes Yes		•Self-reported drinking-driving •Fatalities	↓ ↓	Yes Yes	
Weinstein, 1987	48 states	Census	Longitudinal	Yes		•Crash fatalities	↓	Not reported	
Wilkinson, 1987	50 states and DC	Census	Longitudinal	Yes		•Fatalities (ages >15)	↓	Not reported	
Decker et al., 1988	TN	Census	Time-series	Yes		•SVN driver fatalities •Mean BAC levels of fatally injured drivers	↓ ↓	Yes Yes	
Engs and Hanson, 1988	U.S.: Students in health/sociology/ P.E. classes at 56 universities	No	Longitudinal	No	X	•Self-reported drinking-driving (all ages)	↓	Yes	
Williford, 1988	NY	Not avail.	Pre-post	Yes		•Self-reported drinking-driving	↓	Not reported	
Asch and Levy, 1990	47 states	Census	Longitudinal	Yes		•SV driver fatalities •SVN driver fatalities	↓ ↓	Yes No	
Davis and Reynolds, 1990	NY: Undergraduates at 1 university	Yes	Pre-post	No	X	Self-reported (all ages): •Drinking-driving	↑	Not reported	
Legge, 1990	NY	Census	Time-series	Yes		•SVN fatal crashes: male drivers •All fatal crashes		No No	
O'Malley and Wagenaar, 1991	13 states	Census	Time-series	Yes		•SVN fatal crashes among drivers < 21 (corresponded w/decrease in self-reported consumption)	↓	Yes	
Hughes and Dodder, 1992	OK: Intro. sociol. classes at 1 university	Yes	Longitudinal	No	X	•Self-reported drinking-driving		No	
Jones et al., 1992	50 states and DC	Census	Longitudinal	Yes		•Driver fatalities •Pedestrian fatalities		No No	
Chaloupka et al., 1993	48 states	Census	Longitudinal	Yes		•All fatalities •Nighttime driver fatalities •Fatalities among drivers with BAC >.05	↓ ↓ ↓	Yes Yes Yes	
Durant and Legge, 1993	MI	Census	Time-series	Yes		•SV fatalities (drivers <21) •All fatalities (drivers <21)	↓ ↓	Yes Yes	
Joksich and Jones, 1993	31 states	Census	Longitudinal	Yes		•Driver fatalities (BAC >0)	↓	Yes	
Park, 1994	Multiple states	Not avail.	Cross-sectional	Not avail.		•Drunk-driving (source not specified)	↓	Yes	
Figlio, 1995	WI	Census	Time-series	Yes		•Alcohol-related crashes (teens)	↓	Yes	
Yu, 1995	NY: Drinking-driving offenders	Yes	Longitudinal	Yes		•Drinking-driving convictions	↓	Not reported	
Klepp et al., 1996b	MN: 7th graders in 4 school districts (8 years later)	Census (94%)	Repeated cross-sectional	Yes		•Self-reported drinking-driving	↓	Yes	
Ruhm, 1996	48 states	Census	Longitudinal	Yes		•Nighttime fatalities (all ages) •Fatalities	↓	No Yes	
Chung, 1997	Not avail.	Not avail.	Time-series	Not avail.		•Interstate and noninterstate drunk-driving fatalities		No	
Yu and Shackel, 1998	NY: 16-24 year olds in 10 counties	Yes	Longitudinal	No		•Self-reported drinking-driving rates	↓	Not reported	

Continued

TABLE 2. *Continued*

Study	Jurisdiction	Quality			College specific	Outcome measure	Results	
		Probability sample	Design	Comp. group			Dir. of relation.	Statistically significant
STUDIES THAT COMPARE STATES WITH HIGH AND LOW MINIMUM DRINKING AGE								
Maisto and Rachal, 1980	29 states: High schools	Yes	Cross-sectional	Yes		•Self-reported drinking-driving	↓	Yes
Colon and Cutter, 1983	50 states and DC	Census	Cross-sectional	Yes		•Fatalities (all ages) •Fatal crashes (all ages)		No No
Colon, 1984	50 states and DC	Census	Cross-sectional	Yes		•SV fatalities	↑	Yes
Engs and Hanson, 1986	U.S.: Students in health/sociology/P.E. classes at 72 colleges	No	Cross-sectional	Yes	X	•Self-reported drinking while driving •Self-reported driving after drinking	↓	Yes No
Asch and Levy, 1987	50 states	Census	Cross-sectional	Yes		•All fatalities •SV fatalities •SVN fatalities		No No No
Loeb, 1987	46 states and DC: All ages	Census	Cross-sectional	Yes		•Fatalities (all ages)		No
Kenkel, 1993b	Nationwide	Yes	Cross-sectional	Yes		•Self-reported drinking-driving	↓	Yes
Laixuthai, 1994	Nationwide H.S. seniors	Yes	Repeated cross-sectional	Yes		•Self-reported nonfatal crashes		No
Dee, 1999	48 states	Census	Longitudinal	Yes		•Total fatalities •Driver fatalities •Nighttime fatalities	↓ ↓ ↓	Yes Yes Yes

Notes: Comp. group = comparison group. Dir. of relation. = direction of relationship. SV= single vehicle. SVN = single vehicle nighttime. HBD = had been drinking. Outcome measure and Results pertain specifically to the age group affected by law unless otherwise specified. ↓ Inverse relationship between drinking age and outcome (i.e., drinking age higher, outcome measure lower). ↑ Positive relationship between drinking age and outcome (i.e., drinking age higher, outcome measure higher). Census (X%) = full census attempted but X% participated. Not avail. = dissertation abstracts reviewed only.

45% of all analyses found that a higher legal drinking age is associated with reduced alcohol consumption.

Of the 78 analyses of alcohol consumption, 21 were the weaker cross-sectional designs, and 57 were pre-post, longitudinal or time-series designs. Of the 21 cross-sectional analyses, 8 (38%) found a significant inverse relationship between legal drinking age and alcohol consumption, whereas only 3 found a significant positive relationship. An additional 4 analyses found an inverse relationship, and 1 found a positive relationship; however, significance levels were not reported. Of the 57 longitudinal analyses (i.e., which we define as any analyses that included repeated measures over time), 19 (33%) found a significant inverse relationship; only 1 longitudinal study found a significant positive relationship. An additional 4 longitudinal analyses found an inverse relationship but did not report significance levels.

Of the 78 analyses of alcohol consumption, 55 (71%) included a comparison group of some kind. For 3 analyses, it was not clear whether a comparison group was used (not avail.). Of the 55 analyses including comparison groups, 23 (42%) found a significant inverse relationship; only 4 found a significant positive relationship. An additional 3 analyses found an inverse relationship, and 1 analysis found a positive relationship but no significance levels were reported. Of the 20 analyses that did not include comparison

groups, 4 found a significant inverse relationship between the legal age and alcohol consumption, and none found a positive relationship. An additional 4 analyses without comparison groups found an inverse relationship but did not report significance levels.

Of the 78 analyses of alcohol consumption, 58 (74%) included probability samples or a complete census of the relevant population, and 11 analyses clearly did not use a probability sample or census. For an additional 9 analyses, it was unclear whether a probability sample or census was used. Of the 58 with a probability sample or census, 20 (34%) found a significant inverse relationship between the legal age and alcohol consumption; only 1 study found a significant positive relationship. An additional 8 studies found an inverse relationship but did not report significance levels, and 26 analyses found no significant relationship. Of the 11 analyses without a probability sample or census, 2 found a significant inverse relationship, and 3 found a significant positive relationship. One additional study found a positive relationship but did not report significance. Of the 9 analyses for which it was unclear whether a probability sample or census was used, 5 found a significant inverse relationship between the legal age and alcohol consumption; none found a significant positive relationship.

Finally, of the 78 analyses of alcohol consumption, only 24 were specific to college student populations. Of the 24

college-specific analyses, 3 (13%) found a significant inverse relationship between the legal age and alcohol consumption, 3 found a significant positive relationship, and 15 found no significant relationship. One additional study found an inverse relationship with no report on significance levels. Of the 54 analyses that were not college specific, 24 (44%) found a significant inverse relationship between the legal age and alcohol consumption. Only 1 found a significant positive relationship. An additional 7 analyses found an inverse relationship, and 1 found a positive relationship but did not report significance levels.

In conclusion, the preponderance of evidence suggests that higher legal drinking ages reduce alcohol consumption. Of all analyses that reported significant effects, 87% found higher drinking ages associated with lower alcohol consumption. Only 13% found the opposite. The evidence is not entirely consistent: Almost half (46%) of the analyses found no association between the legal age and indicators of alcohol consumption. However, focusing on the 33 of the 78 studies of high methodological quality (i.e., those that include a longitudinal design, comparison groups and probability sampling or use of a census) reveals that 11 (33%) of the 33 higher quality studies found a significant inverse relationship between the legal age and alcohol consumption. Only 1 (3%) found a significant positive relationship. Only 3 of these studies of higher quality were college specific, and results were not significant in all 3 studies.

Effects of drinking age on driving after drinking and traffic crashes

We located 57 published studies that assessed the effects of changes in the legal minimum drinking age on indicators of driving after drinking and traffic crashes (Table 2). In the 57 studies, a total of 102 crash outcome measures were analyzed (e.g., fatal crashes, drink-driving crashes, self-reported driving after drinking). Of the 102 analyses, 52 (51%) found a statistically significant inverse relationship between the legal drinking age and crashes; that is, as the legal age was lowered, the number of crashes increased, and as the legal age was raised, the number of crashes decreased. (From here on, we use the term *crashes* to include all traffic-related outcome measures.) An additional 12 analyses that found an inverse relationship did not report significance levels. Of the 102 analyses, only 2 found a positive relationship between the legal drinking age and traffic crashes. In short, more than half of all analyses found that a higher legal drinking age is associated with decreased rates of traffic crashes.

Of the 102 analyses of traffic crashes, 14 were the weaker cross-sectional designs, and 88 were longitudinal designs. Of the 14 cross-sectional analyses, 5 (36%) found a significant inverse relationship between legal drinking age and

crashes, whereas only 1 found a significant positive relationship. Of the 88 longitudinal analyses, 47 (53%) found a significant inverse relationship; none found a significant positive relationship. An additional 12 found an inverse relationship, and 1 found a positive relationship but did not report significance levels.

Of the 102 analyses of traffic crashes, 95 (93%) included a comparison group of some kind (for 2 analyses it was not clear whether a comparison group was used). Of the 95 analyses including comparison groups, 50 (53%) found a significant inverse relationship; only 1 found a significant positive relationship. An additional 11 analyses found an inverse relationship but no significance levels were reported. Of the 5 analyses that did not include comparison groups, 1 found a significant inverse relationship between the legal age and traffic crashes. One additional analysis without comparison groups found an inverse relationship, and 1 found a positive relationship but did not report significance levels.

Of the 102 analyses of traffic crashes, 94 (92%) included probability samples or a complete census of the relevant population, and 3 analyses clearly did not use a probability sample or census. For an additional 5 analyses it was unclear whether a probability sample or census was used. Of the 94 with a probability sample or census, 49 (52%) found a significant inverse relationship between the legal age and traffic crashes; only 1 study found a significant positive relationship. An additional 11 studies found an inverse relationship, and 1 study found a positive relationship but did not report significance levels; 34 analyses found no significant relationship. Of the 3 analyses without a probability sample or census, 2 found a significant inverse relationship, and none found a significant positive relationship. Of the 5 analyses for which it was unclear whether a probability sample or census was used, 1 found a significant inverse relationship between the legal age and traffic crashes; none found a significant positive relationship.

Finally, of the 102 analyses of traffic crashes, only 6 were specific to college student populations. Of the 6 college-specific analyses, 2 (33%) found a significant inverse relationship between the legal age and traffic crashes, 1 found a positive relationship but significance was not reported, and 3 found no significant relationship. Of the 96 analyses that were not college specific, 50 (52%) found a significant inverse relationship between the legal age and traffic crashes; only 1 found a significant positive relationship. An additional 12 analyses found an inverse relationship but did not report significance levels.

In conclusion, the preponderance of evidence indicates that higher legal drinking ages reduce rates of traffic crashes. Of all analyses that reported significant effects, 98% found higher drinking ages associated with lower rates of traffic crashes. Only 2% found the opposite. The evidence, however, is not entirely consistent: 35% of the analyses found no association between the legal age and indicators of traf-

TABLE 3. Effects of legal minimum drinking age policies on other health and social problem outcomes

Study	Jurisdiction	Quality				Outcome measure	Results	
		Probability sample	Design	Comp. group	College specific		Dir. of relation.	Statistically significant
STUDIES ON LOWERING MINIMUM DRINKING AGE								
Smith, 1986	Australia: 2 states	Census	Pre-post	Yes		•Nontraffic emergency hospital admissions	↓	Yes
Smith and Burvill, 1986	Australia: 3 states	Census	Pre-post	Yes		•Juvenile crime (male)	↓	Yes
Howland et al., 1998	48 states	Census	Time-series	Yes		•Drownings		No
Birckmayer and Hemenway, 1999	48 states	Census	Time-series	Yes		•Suicides	↓	Yes
STUDIES ON RAISING MINIMUM DRINKING AGE								
Bessmer, 1985	Undergraduates	Not avail.	Pre-post	Not avail.	X	•Self-reported drinking-related problems		No
Hingson et al., 1985	MA	Census	Pre-post	Yes		•Nontraffic accidental fatalities •Suicide fatalities •Homicides		No No No
Lonnstrom, 1985	NY: Administrators at 4-year colleges	Census (90%)	Cross-sectional	Not avail.	X	Perception of students' alcohol-related problems: •Vandalism •Academic problems •Social life	↓ ↓	Not reported Not reported No
Hughes and Dodder, 1986	OK: Intro. sociology classes at 1 university	Yes	Longitudinal	No	X	Self-reported alcohol-related problems: •Social problems •Legal problems •Damaging property •Fighting		No No No No
Engs and Hanson, 1988	U.S.: Students in health/sociology/P.E classes at 56 universities	No	Longitudinal	No	X	Self-reported alcohol-related problems (all ages): •Academic problems •Damaging property •Fighting •Job problems •Social problems •Legal problems	↑	No No Yes No No No
Gonzalez, 1989	FL: Students in undergraduate courses at 9 colleges	Yes	Longitudinal	Yes	X	•Self-reported negative drinking consequences		No
Perkins and Berkowitz, 1989	NY: 1 university	Census (86-90%)	Pre-post	Yes	X	•Self-reported negative drinking consequences		No
Davis and Reynolds, 1990	NY: Undergraduates at 1 university	Yes	Pre-post	No	X	Self-reported alcohol-related problems (all ages): •Academic problems •Damaging property •Fighting •Legal problems •Injuries •Social problems	↓ ↑ ↑	No No Yes No Yes Yes
Gonzalez, 1990a	FL: Students in undergraduate courses at 1 university	Yes	Longitudinal	Yes	X	•Alcohol-related negative consequences		No
Hughes and Dodder, 1992	OK: Sociology classes at 1 university	Yes	Longitudinal	No	X	Self-reported alcohol-related problems: •Academic problems •Damaging property •Fighting •Social problems •Legal problems		No No No No No
Jones et al., 1992	50 states and DC	Census	Longitudinal	Yes		•Pedestrian fatalities •Other injury (excl. m.v.) fatalities •Suicide fatalities •Homicides	↓	No No Yes No
Joksch and Jones, 1993	31 states	Census	Longitudinal	Yes		•Homicides •Aggravated assaults		No No

Continued

TABLE 3. *Continued*

Study	Jurisdiction	Quality				College specific	Outcome measure	Results	
		Probability sample	Design	Comp. group	Dir. of relation.			Statistically significant	
Parker, 1995	50 states and DC	Census	Time-series	Yes		•Other assaults •Disorderly conduct •Vandalism •Acquaintance homicides (21-24 yr olds)	↓ ↓ ↓	No Yes Yes Yes	
Howland et al., 1998	48 states	Census	Time-series	Yes		•Drownings		No	
Yu, 1998	NY: 16-24 year olds in 10 counties	Yes	Longitudinal	Yes		•Perceived parental approval of underage drinking	Remained low		
Birckmayer and Hemenway, 1999	48 states	Census	Time-series	Yes		•Suicides	↓	Yes	
STUDIES THAT COMPARE STATES WITH HIGH AND LOW MINIMUM DRINKING AGE									
Rooney and Schwartz, 1977	5 states: Seniors from 27 high schools	No	Cross-sectional	Yes		•Self-reported drinking-related problems	↑	Not reported	
Colon, 1980	50 states and DC	Not avail.	Cross-sectional	Yes		•Alcoholism (source not specified)		No	
Maisto and Rachal, 1980	29 states: High schools	Yes	Cross-sectional	Yes		Self-reported alcohol-related problems: •Academic problems •Social problems •Legal problems		No No No	
Schweitzer et al., 1983	35 states	Census	Cross-sectional	Yes		•Alcoholism (cirrhosis deaths) •Alcohol-related mortality (source not specified)		No No	
Engs and Hanson, 1986	U.S.: Students in health/sociology/P.E. classes at 72 colleges	No	Cross-sectional	Yes	X	Self-reported alcohol-related problems: •Academic problems •Damaging property •Fighting •Job problems •Social problems	↓	Yes No No No No	
Breed et al., 1990	50 college newspapers	Yes	Cross-sectional	Yes	X	•Amount of alcohol advertising		No	

Notes: Comp. group = comparison group. Dir. of relation. = direction of relationship. Outcome measure and Results pertain specifically to the age group affected by law unless otherwise specified. ↓ Inverse relationship between drinking age and outcome (i.e., drinking age higher, outcome measure lower). ↑ Positive relationship between drinking age and outcome (i.e., drinking age higher, outcome measure higher). Census (X%) = full census attempted but X% participated. Not avail. = dissertation abstracts reviewed only.

fic crashes. However, focusing on the 79 studies of higher methodological quality (i.e., those that include a longitudinal design, comparison groups and probability sampling or use of a census) reveals that 46 (58%) of these 79 higher quality studies found a significant inverse relationship between the legal age and traffic crashes; none found a significant positive relationship. None of these studies of higher quality were college specific.

Effects of drinking age on other health and social problem outcomes

We identified 24 published studies that assessed the effects of changes in the legal minimum drinking age on indicators of other health and social problem outcomes (other than traffic crashes), such as suicide, homicide or vandalism (Table 3). In the 24 studies, 61 outcome measures were analyzed. Of the 61 analyses, 10 (16%) found a statistically significant inverse relationship between the legal drinking age and other outcomes; that is, as the legal

age was lowered, the number of problems increased, and as the legal age was raised, the number of problems decreased. Of the 61 analyses, 4 found a positive relationship between the legal drinking age and other outcomes; an additional 2 analyses that found an inverse relationship and 1 that found a positive relationship did not report significance levels.

Of the 61 analyses of other health and social problems, 16 were the weaker cross-sectional designs, and 45 were longitudinal designs. Of the 16 cross-sectional analyses, 1 (6%) found a significant inverse relationship between legal drinking age and other problems; none found a significant positive relationship. Of the 45 longitudinal analyses, 9 (20%) found a significant inverse relationship; 3 found a significant positive relationship.

Of the 61 analyses of other health and social problems, 36 (59%) included a comparison group of some kind (for 4 analyses it was not clear whether a comparison group was used). Of the 36 analyses including comparison groups, 9 (25%) found a significant inverse relationship; none found

TABLE 4. Studies of mediating factors related to minimum drinking age

Study	Jurisdiction	Quality		College specific	Results
		Probability sample	Design		
McFadden and Wechsler, 1979	MA: H.S. students	?	Cross-sectional		<ul style="list-style-type: none"> •80% reported easy access to alcohol •Most common source of alcohol was friends/relatives or other buyers
Hingson et al., 1985	MA: 16-19 year olds	Yes	Cross-sectional		<ul style="list-style-type: none"> •40% reported purchase attempts •1/3 reported that there was no request for ID •Enforcement efforts varied widely
Smart and Adlaf, 1987	Ontario: Grades 7-13	Yes	Cross-sectional		<ul style="list-style-type: none"> •4.6% used unauthorized age of majority cards •Positive relationship between alcohol use and unauthorized use of age of majority cards
Goldsmith, 1988	MD: 1 county	No	Cross-sectional	X	<ul style="list-style-type: none"> •Most common source of alcohol for underage H.S. students was older persons; for underage college students most common source was self-purchase •8% of underage college students and 10% of underage H.S. students reported use of false ID •21% of students reported use of false ID
Lotterhos et al., 1988	NC: Undergraduates in health classes at 1 university	Yes	Cross-sectional	X	<ul style="list-style-type: none"> •21% of students reported use of false ID
Rubington, 1990	1 university: RAs in 2 dorms	No	Cross-sectional	X	<ul style="list-style-type: none"> •Low levels of enforcement of drinking rules
Preusser and Williams, 1992	NY (3 counties) and DC: Licensed outlets	Yes	Cross-sectional		<ul style="list-style-type: none"> •44-97% of underage purchase attempts were successful
McCall, 1993	Psych. students at 1 college and store clerks	No	Cross-sectional	X	<ul style="list-style-type: none"> •Age estimates of underage persons were influenced by prior stimuli
Wagenaar et al., 1993	MN and WI: 18 and 19 year old college students in 15 communities	No	Cross-sectional	X	<ul style="list-style-type: none"> •Most common source of alcohol during high school was parties, older siblings and friends
O'Leary et al., 1994	NJ: Licensed est. in 16 cities	Yes	Cross-sectional		<ul style="list-style-type: none"> •59% of purchase attempts by minors were successful
Schofield et al., 1994	Australia: Licensed est. in 2 cities in S. Wales	?	Cross-sectional		<ul style="list-style-type: none"> •76% of purchase attempts by pseudo-underage required no proof of age
Forster et al., 1994	MN: Off-sale licensed est. in 28 communities	Census	Cross-sectional		<ul style="list-style-type: none"> •47% of purchase attempts by pseudo-underage were successful
Preusser et al., 1994	CO: Licensed est. in Denver	Yes	Longitudinal		<ul style="list-style-type: none"> •Successful purchase rates by underage reduced from 59% to 28% following enforcement intervention
Wagenaar and Wolfson, 1994	50 states	Census	Cross-sectional		<ul style="list-style-type: none"> •Low rates of arrests and penalties for violations of MDA •Rates varied widely among states
Forster et al., 1995	MN and WI: Licensed est. in 24 communities:		Cross-sectional		
	•Off-sale	•Census			<ul style="list-style-type: none"> •50% of purchase attempts by pseudo-underage at on-sale and 52% at off-sale were successful
	•On-sale	•Yes			
Vaucher et al., 1995	Switzerland: Licensed est. in 1 canton	Yes	Cross-sectional		<ul style="list-style-type: none"> •81% of underage boys were served alcohol •17% of owners/managers knew correct MDA
Wagenaar and Wolfson, 1995	KY, MI, MT and OR	No	Cross-sectional		<ul style="list-style-type: none"> •Low rates of arrests and enforcement for MDA violations, especially against outlets
Wolfson et al., 1995	KY, MI, MT and OR: Law enforcement officials at 15 agencies	No	Cross-sectional		<ul style="list-style-type: none"> •Law enforcement officials perceived a lack of support from community to enforce MDA
Durkin et al., 1996	1 university: Undergraduate sociology courses	No	Cross-sectional	X	<ul style="list-style-type: none"> •46% of students reported use of false ID •Positive relationship between use of false ID and frequency of consumption
Klepp et al., 1996	Norway: 7th graders in 1 county (cohort followed)	Yes	Repeated cross-sectional		<ul style="list-style-type: none"> •Older friends or home were most common sources of alcohol for youth •Perceived access to alcohol at 13 was predictive of frequency of alcohol use at 15
Lewis et al., 1996	KS: 100 stores in Wichita	No	Pre-post		<ul style="list-style-type: none"> •Sales to minors reduced from 83% to 33% following enforcement intervention (ns)

Continued

TABLE 4. *Continued*

Study	Jurisdiction	Quality		College specific	Results
		Probability sample	Design		
Smart et al., 1996	Ontario: Grades 7-13	Yes	Cross-sectional		<ul style="list-style-type: none"> •66% reported easy access to alcohol •Most common sources were home or older buyers
Wagenaar et al., 1996	MN and WI: 15 communities •18-20 year olds •9th and 12th graders	<ul style="list-style-type: none"> •Yes •Census (89-93%) 	Cross-sectional		<ul style="list-style-type: none"> •Adults > 21 were most common sources of alcohol •Majority reported easy access to alcohol
Wolfson et al., 1996a	MN: Licensed off-sale est. in 28 communities	Census (93%)	Cross-sectional		<ul style="list-style-type: none"> •46% of purchase attempts by pseudo-underage were successful •Bars less likely than other types of outlets to sell to pseudo-underage
Wolfson et al., 1996b	MN and WI: Licensed est. in 15 communities •Off-sale •On-sale	<ul style="list-style-type: none"> •Census •Yes 	Cross-sectional		<ul style="list-style-type: none"> •< 50% had policies to reduce underage sales •Off-sale reported more aggressive age identification policies
Casswell and Zhang, 1997	New Zealand: 1 city (cohort followed ages 15-21)	?	Longitudinal		<ul style="list-style-type: none"> •Ease of access to alcohol at 15 positively associated with quantity of consumption and alcohol-related problems at 18
Grube, 1997	CA and SC: Off-sale outlets	Yes	Pre-post		<ul style="list-style-type: none"> •Sales to pseudo-underage were significantly reduced following increased enforcement efforts
Jones-Webb et al., 1997a	MN and WI: H.S. students in 2 communities	No	Cross-sectional		<ul style="list-style-type: none"> •Friends, siblings and co-workers >21 were most common sources of alcohol
Jones-Webb et al., 1997b	MN and WI: H.S. seniors in 15 communities	Census (93%)	Cross-sectional		<ul style="list-style-type: none"> •Perceived alcohol availability was positively related to consumption but not to drinking consequences among males
McCall, 1997	NY: Bartenders in 4 cities	No	Cross-sectional		<ul style="list-style-type: none"> •Increased attractiveness associated with less likelihood of request for proof of age
Mayer et al., 1998	MN and WI: 9th and 12th graders in 15 communities	Census (89-93%)	Cross-sectional		<ul style="list-style-type: none"> •Most common setting for drinking was someone else's home •Friends most common drinking partners
Schwartz et al., 1998	NY, VA, FL and GA: 16-19 year olds	No	Cross-sectional	X	<ul style="list-style-type: none"> •7-14% reported using false identification (14% of college students) •39% reported purchase attempts (44% of college students)
McCall, 1999	Undergraduates	No	Cross-sectional	X	<ul style="list-style-type: none"> •Increased attractiveness of customer and positive mood of server associated with less likelihood of request for proof of age
Fletcher et al., 2000	MN and WI: 15 communities •18-20 year olds •12th graders •Off-sale outlets	<ul style="list-style-type: none"> •Yes •Census (83.5%) •Census (96%) 	Cross-sectional		<ul style="list-style-type: none"> •7% reported using home delivery •10% reported using home delivery •17% reported making home deliveries

Notes: Census (X%) = full census attempted but X% participated. ? = information not clear from article.

a significant positive relationship. One additional analysis found a positive relationship but no significance levels were reported. Of the 25 analyses that did not include comparison groups, 1 found a significant inverse relationship between the legal age and other problems, and 3 found a positive relationship.

Of the 61 analyses of other problems, 47 (77%) included probability samples or a complete census of the relevant population, 12 analyses clearly did not use a probability sample or census, and for an additional 2 analyses it was

unclear whether a probability sample or census was used. Of the 47 with a probability sample or census, 9 (19%) found a significant inverse relationship between the legal age and other problems; only 2 studies found a significant positive relationship. An additional 2 studies found an inverse relationship but did not report significance levels, and 33 analyses found no significant relationship. Of the 12 analyses without a probability sample or census, 1 found a significant inverse relationship, and 1 found a significant positive relationship. Of the 2 analyses for which it was

unclear whether a probability sample or census was used, neither found significant inverse or positive relationships between the legal age and other problems.

Finally, of the 61 analyses of other health and social problems, 34 were specific to college student populations. Of the 34 college-specific analyses, 2 (6%) found a significant inverse relationship between the legal age and other health and social problems, and 3 found a significant positive relationship. Two additional studies found an inverse relationship with no report on significance levels. Of the 27 analyses that were not college specific, 8 (30%) found a significant inverse relationship between the legal age and other problems; none found a significant positive relationship. One additional analysis found a positive relationship but did not report significance levels.

In conclusion, although there is clearly some evidence that higher legal drinking ages reduce rates of other health and social problems, results are not as consistent as they are for traffic crash outcome indicators. Of all analyses that reported significant effects, 75% found higher drinking ages associated with lower rates of problems. Only 25% found the opposite. The evidence, however, is not entirely consistent: 72% of the analyses found no association between the legal age and indicators of other problems. However, focusing on the 23 studies of higher methodological quality (i.e., those that include a longitudinal design, comparison groups and probability sampling or use of a census) reveals that 8 (35%) of the 23 higher quality studies found a significant inverse relationship between the legal age and other problems; none found a significant positive relationship. Two of those studies of higher quality were college specific; however, results of both were not significant.

Given the diverse types of outcomes included in this section, we also stratified the analyses of the higher methodological studies into four groups that were more homogeneous. Of the 16 analyses of nontraffic injuries (fatal and nonfatal), 4 found a significant inverse relationship between the legal drinking age and injuries; none found a positive relationship. Of the 10 analyses of "other crime" (e.g., vandalism, disorderly conduct), 3 found a significant inverse relationship between the legal drinking age and crime; none found a positive relationship. Only 1 study that analyzed the relationship between social, academic and employment problems was of higher methodological quality, and it did not find any statistically significant results. Similarly, only 3 studies that analyzed "other problems" (e.g., alcoholism, cirrhosis, general alcohol-related problems) were of higher quality, and none found significant results.

Mediating Factors

In addition to studies specifically evaluating the effects of minimum drinking age policies, there is a growing scientific literature on several closely related factors that can

be deemed to mediate the relationship between drinking age law and outcomes of interest. Such factors include self-reported ease of access to alcohol and sources of alcohol, purchase success rates by underage-appearing buyers at bars and liquor stores, use of false age-identification documents, patterns of enforcement of the drinking age, effects of enforcement "crackdowns" and use of home delivery as a source of alcohol for youth. We identified 34 published articles on these factors; findings are summarized in Table 4.

Results show that more than half to more than three-quarters of teens surveyed report that alcohol is easy to obtain. Moreover, explicit tests of the propensity of alcohol retailers to sell to underage youth in purchase-attempt studies found 44-97% of outlets tested sold to underage youth with no request for age identification. Such studies show that the beneficial effects of the age-21 policy to date in terms of reduced drinking and reduced traffic crashes among youth have largely been achieved with minimal implementation of the law.

Most studies reveal that use of false age identification documents is only a modest problem. Estimates range from 5% to 21% of teens report using false age identification to obtain alcohol. One study was an outlier, finding 46% of undergraduate sociology students on one campus report use of false age identification (Durkin et al., 1996). Most studies on use of false age identification to date have not specifically focused on college students. It is possible that the accessibility and use of false identification documents is higher in college environments, but we do not know whether this is the case based on currently available data.

The limited degree to which age-21 policies have been implemented is also shown in several enforcement studies. Such studies have consistently found very low levels of enforcement of the age-21 policy. Enforcement actions against those selling or providing alcohol to minors are particularly rare (Wagenaar and Wolfson, 1994).

Studies of the effects of increased enforcement show it to be a highly effective means to reduce alcohol sales to minors. Increased enforcement, specifically compliance checks on retail alcohol outlets, typically cuts rates of sales to minors by at least half (Grube, 1997; Lewis et al., 1996; Preusser et al., 1994).

Finally, a recent study reports that 10% of high school seniors and 7% of 18- to 20-year olds use the home delivery services of alcohol retailers to obtain alcoholic beverages (Fletcher et al., 2000).

In summary, research on mediating factors between the establishment of a legal age for purchase and consumption of alcohol and actual effects on teen drinking and alcohol-related problems indicates clear means of further increasing the effectiveness of this policy. Such means include, most notably, increased rates of enforcement to prevent alcohol sales to minors. Other means to improve implementation of the age-21 policy, such as efforts to reduce use of

false age identification and tighter restrictions on home delivery of alcohol, may also help enhance effectiveness of this law.

Conclusion

Compared with a wide range of other programs and efforts to reduce drinking among teenagers, increasing the legal age for purchase and consumption of alcohol to 21 appears to have been the most successful effort to date (compare studies summarized in Table 1 with studies cited in reviews of other prevention efforts such as Moskowitz [1989] and Gorman and Speer [1996]). The magnitude of effects of the age-21 policy may appear small, particularly in studies using weak research designs and having low levels of statistical power. However, even modest effects applied to the entire population of youth result in very large societal benefits. For example, the National Highway Traffic Safety Administration, using an average estimated reduction in traffic fatalities due to the legal drinking age of 13%, calculates that the age-21 policy prevented 846 deaths in 1997 and prevented a total of 17,359 deaths since 1975 (National Highway Traffic Safety Administration, 1998).

A large proportion of studies of the MLDA found a statistically significant, *inverse* relationship between the MLDA and alcohol consumption and alcohol-related problems (48% of the higher quality studies). Only a small number of studies found a statistically significant, *positive* relationship between the MLDA and various outcomes (1% of the higher quality studies). A large number of studies found no statistically significant relationship. In addition to differences in quality of research design and analyses, several other factors may account for variability in results across studies, including size of sample and extent of change in policy. The power to detect a statistically significant effect is directly influenced by the size of the sample. In some states, the MLDA was raised only 1 year, from age 20 to age 21; in other states it was raised from age 18 to 21. Studies of policy changes that affect smaller segments of the population may be less likely to detect effects simply because of reduced statistical power when analyzing fewer data. Given potential design and analysis limitations in any single study, the large proportion of MLDA studies that found a significant inverse relationship with various outcomes gives strong support for the effectiveness of the MLDA.

It is difficult to estimate accurately the effects of the drinking age specifically on college students. Unfortunately, most studies focusing on college students have been based on weaker cross-sectional designs or limited nonprobability samples. Only 9% of the college-specific studies (6 of 64) used a higher quality research design. Of these higher quality studies, none found a statistically significant inverse relationship between the MLDA and consumption or

alcohol-related problems. In addition, of these 6 analyses, 4 included a sample of students at only one university. Although it is possible that the age-21 policy has been less effective on college campuses than among the general youth population, existing research clearly does not suggest that the age-21 MLDA has increased problems among college students. However, more studies that use robust research designs would be needed to assess accurately the effect of the MLDA specifically on college campuses. In addition, studies of potential mediating factors on campuses are also needed. For example, how well are MLDA laws enforced on college campuses? How easily can underage students obtain alcohol on and around campus? If one assumes that the MLDA is less effective on college campuses, perhaps it is due to lax enforcement and particularly easy access to alcohol by underage youth in such settings.

Finally, despite progress in recent decades, most youth continue to have access to alcohol, most drink at least occasionally, and a substantial fraction regularly become intoxicated. The social costs from injuries, deaths and damage associated with underage drinking remain high. The benefits of the legal drinking age of 21 have occurred with little or no active enforcement in most areas. Simply by increasing enforcement levels and deterring adults from selling or providing alcohol to minors, even more injuries and deaths related to alcohol use among youth are likely to be prevented each year.

Policy Issues Related to the Minimum Legal Drinking Age

Despite an abundance of research demonstrating the effectiveness of the age-21 MLDA in reducing youth drinking and alcohol-related problems, three decades after states first began lowering minimum drinking ages, and two decades after states were in the midst of raising their legal drinking ages, a few states are again considering lowering their legal age limits for drinking. Many issues and arguments heard decades ago are again occasionally heard (Fell, 1985; Toomey et al., 1996). One difference this time around is that we have the benefit of hundreds of research studies summarized in the body of this article. Here we summarize 13 similar issues that are still often raised in policy debates by those opposed to a legal drinking age of 21 and provide up-to-date responses that may be useful to college administrators, public health practitioners and others.

Issue 1

Issue. "Establishing a legal drinking age of 21 is unconstitutional age discrimination."

Response. This question has been treated in detail in two court cases. The first case challenged, in federal court, the constitutionality of Michigan's increase in the drinking

age, one of the early states to raise the legal age back to 21 (Guy, 1978). The court ruled, on the basis of scientific evidence that linked lower drinking ages to increased traffic crash involvement among youth, that the drinking-age discrimination was reasonably related to the state objective of reducing highway crashes. Thus the higher drinking age withstood the constitutional challenge on three key legal issues: (1) drinking alcohol is not a "fundamental" right guaranteed by the Constitution, (2) age is not inherently a "suspect" criteria for discrimination (in contrast to race or ethnicity, for example) and (3) using the drinking age to prevent highway crashes has a "rational basis" in available scientific evidence. The court mentioned additional reasons that a higher drinking age is not unconstitutional. The higher drinking age does not cause a permanent disability, but is only a temporary postponement of a specific behavior for the young person's own protection. Furthermore, states have broad powers to regulate the distribution and use of beverage alcohol under the Twenty-first Amendment, which ended Prohibition. Therefore, the drinking age, like other alcohol-control regulations, has a "strong presumption of validity," according to the court.

More recently, the state of Louisiana's age-21 MLDA was challenged in court on the premise that it violated the state's constitutional law regarding age discrimination. Louisiana's State Supreme Court concluded, however, that "statutes establishing the minimum drinking age at a level higher than the age of majority are not arbitrary because they substantially further the appropriate governmental purpose of improving highway safety, and thus are constitutional" (Manuel vs State of Louisiana, 1996). In other words, because the age-21 MLDA was based on empirical evidence that the law saved lives, the court decided that it was not an arbitrary law and thus did not violate Louisiana's constitution.

Issue 2

Issue. "The federal government is exerting too much power over the states. The federal law encouraging states to set the legal drinking age at 21, by withholding highway funds from states that do not do so, is just one example of this."

Response. Citizens groups in a number of states began the initial movement to raise the drinking age to 21. Numerous statewide and national surveys show overwhelming public support for the drinking age of 21, both in the late 1970s and early 1980s when states were raising the age (Wagenaar, 1993), and today. The most recent national survey shows 84% of the U.S. population age 18 and over oppose lowering the age from 21 to 19 (Wagenaar et al., 2000). As several states increased the drinking age to 21, significant reductions in multiple types of injuries (including deaths related to car crashes) were observed (Jones et

al., 1992; Wagenaar, 1993). However, as some states raised their drinking age while neighboring states did not, some young people drove across state lines to get alcohol, increasing the chance of traffic crashes. Recognizing that having a uniform drinking age achieves safety, the federal government strongly encouraged, but did not mandate, the remaining states to increase their drinking ages to age 21.

Issue 3

Issue. "Europeans teens are allowed to drink from an early age, yet those countries don't have the alcohol-related problems we do. What we need are fewer restrictions, not more."

Response. The idea that Europeans do not have alcohol-related problems is a myth. European youth may be at less risk of traffic crashes because youth drive less frequently in Europe than in the United States. Compared with the United States, Europeans have higher legal driving ages, more expensive automobiles and greater access to public transportation. Looking beyond traffic crashes, however, European countries have similar or higher rates of other alcohol-related problems compared with the United States. For example, in 1990, France and Italy had higher per capita alcohol consumption and higher rates of cirrhosis deaths than did the United States. Per capita consumption in France and Italy was 12.7 and 8.7 liters of alcohol, respectively, compared with 7.5 in the United States. Cirrhosis death rates in France and Italy were 26.8 and 17.0 per 100,000, respectively, whereas the U.S. rate was 11.6 (Edwards et al., 1994). European countries are now looking to the United States for research and experience regarding the age-21 policy. Europeans are initiating the debate on the most appropriate age for legal access to alcohol.

Issue 4

Issue. "If I'm old enough to go to war, I should be old enough to drink."

Response. Many rights have different ages of initiation. A person can obtain a hunting license at age 12, driver's license at age 16, vote and serve in the military at 18, serve in the U.S. House of Representatives at age 25 and in the U.S. Senate at age 30 and run for President at age 35. Other rights we regulate include the sale and use of tobacco and legal consent for sexual intercourse and marriage. The minimum age of initiation is based on the specific behavior involved and must take into account the dangers and benefits of that behavior at a given age (Fell, 1985). The age-21 policy for alcohol takes into account the fact that underage drinking is related to numerous serious problems, including injuries and deaths resulting from car crashes, suicide, homicide, assault, drowning and recreational injuries. In fact, the leading cause of death among

teens is car crashes (National Center for Health Statistics, 1994), and alcohol is involved in approximately one-third of these deaths (National Highway Traffic Safety Administration, 1998).

Issue 5

Issue. “Nineteen- and twenty-year-olds are drinking anyway. If we legalize it, at least they’ll be drinking in a controlled supervised settings, such as a bar or nightclub, rather than in cars or at unsupervised parties.”

Response. Data show bars and nightclubs are not safe, controlled locations. Studies have repeatedly shown a majority of alcohol outlets regularly break the law, for example, by selling alcohol to minors (Forster et al., 1994, 1995; Preusser and Williams, 1992) or selling to intoxicated patrons (Toomey et al., 1999). When the legal age is lower than 21, teens purchase the majority of their alcohol at liquor stores because it is cheaper than getting it at bars. They then consume this alcohol in homes, cars or parks. These areas are very difficult to control (Fell, 1985).

There is also some “trickle-down” effect in that when youth get alcohol they often give it to even younger teens (Jones-Webb et al., 1997a). When the legal age is 21, 19- and 20-year olds can often obtain alcohol from their friends. When the drinking age was 18 and 19, 17- and even 16-year olds were often able to get alcohol from their friends. If the drinking age is lower, more alcohol will be available to younger high school students and perhaps even middle school students. There will always be some people who violate laws, but this does not mean we should condone the illegal behavior by modifying the law. The age-21 policy has resulted in a reduction in the amount of alcohol consumed and a substantial decrease in the number of car crashes involving underage drinkers. These results have occurred despite the fact that the law is often not strictly enforced (Wagenaar and Wolfson, 1994, 1995).

Issue 6

Issue. “Lower rates of alcohol-related crashes among 19- to 20-year olds aren’t related to the age-21 policy, but rather they’re related to increased drinking-driving education efforts, tougher enforcement and tougher drunk-driving penalties.”

Response. After the age-21 MLDA was implemented, alcohol-involved highway crashes declined immediately (i.e., starting the next month) among the 18- to 20-year-old population. Careful research has shown declines are not due to enforcement of and tougher penalties for driving while intoxicated, but are directly a result of the legal drinking age. Studies have also shown that education alone is not effective at reducing youth drinking (Clayton et al., 1996; Ellickson et al., 1993). To achieve long-term reductions in

youth drinking problems, we have to change the environment by making alcohol less accessible to teens.

Issue 7

Issue. “Making it illegal to drink until 21 just increases the desire for the ‘forbidden fruit.’ Then, when teens turn 21, they’ll drink even more.”

Response. Actually, the opposite is true. Early legal access to alcohol is associated with higher rates of drinking as an adult. When the drinking age is 21, those under 21 drink less and continue to drink less through their early twenties. The lower rates of drinking and the reductions in injury and death before age 21 are not compensated for after reaching 21 with rates higher than they would have been (O’Malley and Wagenaar, 1991).

Issue 8

Issue. “Who will pay for enforcement of these laws? The age-21 law is too expensive.”

Response. We already pay large portions of our tax dollars for problems resulting from alcohol. For example, in Minnesota, cities use approximately one-third of their police budgets to deal with alcohol-related problems (Cities Bulletin, 1989); in the United States, we pay more than \$10 billion annually just for the costs associated with drunk driving (Kenkel, 1993a). Moreover, drinkers clearly do not pay their own way. They end up generating costs (in health care costs, legal fees and lost wages) of more than a dollar for every drink sold—costs we all pay in increased taxes, higher health and auto insurance premiums and higher costs for goods and services (Miller and Blincoe, 1994). The higher drinking age saves money by resulting in fewer alcohol-related health problems, fewer alcohol-related injuries and less vandalism.

Issue 9

Issue. “We have other more important problems to deal with. The truth is, underage drinking is just not a big problem.”

Response. Underage drinking is a serious problem. In 1998, 52% of high school seniors in the United States drank alcohol in the last month, and more than 30% were intoxicated at least once in the last 2 weeks (Johnston et al., 1998). And these are the lower numbers under the age-21 policy. Teens would be drinking even more if the legal age were lowered. A recent national survey indicates that 96% of the public remains concerned about teen drinking (Wagenaar et al., 2000). The age-21 law clearly does not eliminate youth drinking, but it is one important component of a multifaceted effort to minimize youth drinking problems.

Issue 10

Issue. "Here come the Prohibitionists."

Response. Those supporting the age-21 policy are not Prohibitionists. They are not interested in outlawing all alcohol consumption for adults and are not interested in putting the alcohol industry out of business. They are interested in protecting youth and the safety of all citizens in our communities by supporting implementation and enforcement of the law that states that it is illegal to sell alcohol to those under the age of 21. They are interested in protecting property and reducing the costs spent on health care and crime. These are goals shared by most of the public, and research shows that if we can reduce youth access to alcohol, we can help achieve these goals.

Issue 11

Issue. "We need to punish those teens who are drinking and creating problems, not enact policies that will affect the whole community."

Response. This problem requires shared responsibility. It is adults who create the environments within communities that provide youth with easy access to alcohol. Adults own and operate the businesses that sell alcohol to underage youth. Adults permit advertising and marketing of alcohol in ways that appeal to teens. Thus it is not appropriate to blame just the teens for drinking. Surely, teens have a responsibility not to attempt to purchase or consume alcohol. But arresting after the fact and labeling as criminals teens who drink is not the most effective approach. A modest civil penalty for the teenager caught with alcohol is appropriate.

More effective in the long term are efforts to reduce the supply of alcohol to teens to prevent youth drinking and the resulting tragedies before they happen. This requires active enforcement of statutes and regulations on those who sell or provide alcohol to teens, with appropriate penalties for violations.

Issue 12

Issue. "We drank when we were young and we grew out of it. It's just a phase that all teens go through."

Response. Unfortunately, many teens will not "grow out of it." Studies indicate that youth who start drinking before they are 21 are more likely to drink heavier later in life, whereas those who do not drink until they are 21 tend to drink less as adults (Grant and Dawson, 1997). Teens who drink are also more likely to try other illegal drugs and to become victims of crime (Kandel et al., 1992). If we accept that teen drinking is just a normal phase that teens go through, youth will continue to experience car crashes, other injuries, early unprotected sex and other common problems associated with drinking.

Issue 13

Issue. "If teens can't get alcohol, they'll just switch to other, perhaps even more dangerous, drugs."

Response. Research shows that the opposite is true; teens who drink and/or smoke are more likely also to use other drugs (Fell, 1985; Kandel et al., 1992). If we can keep youth from using alcohol and tobacco, we can actually reduce the chance that they will try other illegal drugs. Moreover, when the drinking age was raised to 21, and teen drinking declined, there was no evidence of a compensatory increase in other drug use (O'Malley and Wagenaar, 1991).

References

- ARNDT, S.K. Adolescent Alcohol Consumption and a Changing Legal Drinking Age. *Dissertation Abstracts Int.* **50** (4-B): 1308, 1989.
- ASCH, P. AND LEVY, D.T. Does the minimum drinking age affect traffic fatalities? *J. Policy Anal. Manage.* **6**: 180-192, 1987.
- ASCH, P. AND LEVY, D.T. Young driver fatalities: The roles of drinking age and drinking experience. *So. Econ. J.* **57**: 512-520, 1990.
- BAKO, G., MACKENZIE, W. AND SMITH, E.S. Effect of legislated lowering of the drinking age on fatal highway accidents among young drivers in Alberta, 1970-1972. *Can. J. Publ. Hlth* **67**: 161-163, 1976.
- BARSBY, S.L. AND MARSHALL, G.L. Short-term consumption effects of a lower minimum alcohol-purchasing age. *J. Stud. Alcohol* **38**: 1665-1679, 1977.
- BELLOWS, D.C. The Effects of Lowering the Drinking Age in Nebraska: A Quasi-Experimental Time-Series Analysis, Ph.D. dissertation, Lincoln, NE: University of Nebraska-Lincoln, 1980.
- BESSMER, M.A. Relationship of Self-Reported Problems and Drinking Among College Students. *Dissertation Abstracts Int.* **45** (9-B): 3061, 1985.
- BIRCKMAYER, J. AND HEMENWAY, D. Minimum-age drinking laws and youth suicide, 1970-1990. *Amer. J. Publ. Hlth* **89**: 1365-1368, 1999.
- BREED, W., WALLACK, L. AND GRUBE, J.W. Alcohol advertising in college newspapers: A 7-year follow-up. *J. Amer. Coll. Hlth* **38**: 255-262, 1990.
- BROWN, D.B. AND MAGHSOODLOO, S. Study of alcohol involvement in young driver accidents with the lowering of the legal age of drinking in Alabama. *Accid. Anal. Prev.* **13**: 319-322, 1981.
- CASSWELL, S. AND ZHANG, J.F. Access to alcohol from licensed premises during adolescence: A longitudinal study. *Addiction* **92**: 737-745, 1997.
- CHALOUKKA, F.J., SAFFER, H. AND GROSSMAN, M. Alcohol-control policies and motor-vehicle fatalities. *J. Legal Stud.* **22**: 161-186, 1993.
- CHUNG, H.B. Drunk Driving and Social Control Policies: Econometric Analysis of Policy Effectiveness. *Dissertation Abstracts Int.* **57** (12A): 5291, 1997.
- CITIES BULLETIN (newsletter). St. Paul, MN: League of Minnesota Cities, Vol. 30, November 9, 1989.
- CLAYTON, R.R., CATTARELLO, A.M. AND JOHNSTON, B.M. The effectiveness of drug abuse resistance education (Project DARE): 5-year follow-up results. *Prev. Med.* **25**: 307-318, 1996.
- COATE, D. AND GROSSMAN, M. Change in alcoholic beverage prices and legal drinking ages: Effects on youth alcohol use and motor vehicle mortality. *Alcohol Hlth Res. World* **12**: 22-25, 1987.
- 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.

- COLON, I. Alcohol Control Policies and Their Relation to Alcohol Consumption and Alcoholism, Ph.D. dissertation, Waltham, MA: F. Heller Graduate School, Brandeis University, 1980.
- COLON, I. Alcohol beverage purchase age and single-vehicle highway fatalities. *J. Safety Res.* **15**: 159-162, 1984.
- COLON, I. AND CUTTER, H.S. Relationship of beer consumption and state alcohol and motor vehicle policies to fatal accidents. *J. Safety Res.* **14**: 83-89, 1983.
- COOK, P.J. AND TAUCHEN, G. The effect of minimum drinking age legislation on youthful auto fatalities, 1970-1977. *J. Legal Stud.* **13**: 169-190, 1984.
- DAVIS, J.E. AND REYNOLDS, N.C. Alcohol use among college students: Responses to raising the purchase age. *J. Amer. Coll. Hlth* **38**: 263-269, 1990.
- DECKER, M.D., GRAITCER, P.L. AND SCHAFFNER, W. Reduction in motor vehicle fatalities associated with an increase in the minimum drinking age. *JAMA* **260**: 3604-3610, 1988.
- DEE, T.S. State alcohol policies, teen drinking and traffic fatalities. *J. Publ. Econ.* **72**: 289-315, 1999.
- DOUGLAS, R.L. AND MILLAR, C.W. Alcohol availability and alcohol-related casualties in Michigan 1968-1976. In: GALANTER, M. (Ed.) *Currents in Alcoholism, Vol. 6: Treatment and Rehabilitation and Epidemiology*, New York: Grune & Stratton, 1979, pp. 303-317.
- DU MOUCHEL, W., WILLIAMS, A.F. AND ZADOR, P. Raising the alcohol purchase age: Its effects on fatal motor vehicle crashes in twenty-six states. *J. Legal Stud.* **16**: 249-266, 1987.
- DURANT, R.F. AND LEGGE, J.S. Policy design, social regulation, and theory building: Lessons from the traffic safety policy arena. *Polit. Res. Q.* **46**: 641-656, 1993.
- 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**: 92-104, 1996.
- EDWARDS, G., ANDERSON, P., BABOR, T.F., CASSWELL, S., FERRENCE, R., GIESBRECHT, N., GODFREY, C., HOLDER, H.D., HEMMENS, P., MÄKELÄ, K., MIDANIK, L.T., NORSTRÖM, T., ÖSTERBERG, E., ROMELSIÖ, A., ROOM, R., SIMPURA, J. AND SKOG, O.-J. *Alcohol Policy and the Public Good*, New York: Oxford Univ. Press, 1994.
- ELLICKSON, P.L., BELL, R.M. AND HARRISON, E.R. Changing adolescent propensities to use drugs: Results from project ALERT. *Hlth Educ. Q.* **20**: 227-242, 1993.
- ENGS, R.C. AND HANSON, D.J. Age-specific alcohol prohibition and college students' drinking problems. *Psychol. Rep.* **59** (2, Pt 2): 979-984, 1986.
- ENGS, R.C. AND HANSON, D.J. University students' drinking patterns and problems: Examining the effects of raising the purchase age. *Publ. Hlth Rep.* **103**: 667-673, 1988.
- FELL, J.C. Drinking age 21: Facts, myths and fictions. *Amer. Assoc. Auto. Med. Q.* **7**: 21-26, 1985.
- FERREIRA, J. AND SICHERMAN, A. Impact of Massachusetts' reduced drinking age on auto accidents. *Accid. Anal. Prev.* **8**: 229-239, 1976.
- FIGLIO, D.N. The effect of drinking age laws and alcohol-related crashes: Time-series evidence from Wisconsin. *J. Policy Anal. Manage.* **14**: 555-566, 1995.
- 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.
- GEORGE, W.H., CROWE, L.C., ABWENDER, D. AND SKINNER, J.B. Effects of raising the drinking age to 21 years in New York State on self-reported consumption by college students. *J. Appl. Social Psychol.* **19** (8, Pt 1): 623-635, 1989.
- GOLDSMITH, H. Illicit alcohol procurement by underage persons: Prevention implications and strategies for melioration. *J. Offend. Counsel. Serv. Rehab.* **13**: 133-162, 1988.
- GONZALEZ, G.M. Effects of raising the drinking age among college students in Florida. *Coll. Student J.* **23**: 67-75, 1989.
- GONZALEZ, G.M. Effects of raising the drinking age and related campus initiatives on student alcohol consumption and alcohol-related problems. *J. Coll. Student Devel.* **31**: 181-183, 1990a.
- GONZALEZ, G.M. Effects of drinking age on reduced consumption of alcohol reported by college students: 1981-1986. *J. Drug Issues* **20**: 67-73, 1990b.
- GORDON, R.A. AND MINOR, S.W. Attitudes toward a change in the legal drinking age: Reactance versus compliance. *J. Coll. Student Devel.* **33**: 171-176, 1992.
- GORMAN, D.M. AND SPEER, P.W. Preventing alcohol abuse and alcohol-related problems through community intervention: A review of evaluation studies. *Psychol. Hlth* **11**: 95-131, 1996.
- GRANT, B.F. AND DAWSON, D.A. Age at onset of alcohol use and its association with DSM-IV alcohol abuse and dependence: Results from the National Longitudinal Alcohol Epidemiologic Survey. *J. Subst. Abuse* **9**: 103-110, 1997.
- GROSSMAN, M., CHALOUKPA, F.J., SAFFER, H. AND LAIXUTHAI, A. Effects of alcohol price policy on youth: A summary of economic research. In: BOYD, G.M., HOWARD, J. AND ZUCKER, R.A. (Eds.) *Alcohol Problems Among Adolescents: Current Directions in Prevention Research*, Mahwah, NJ: Lawrence Erlbaum, 1995, pp. 225-242.
- GRUBE, J.W. Preventing sales of alcohol to minors: Results from a community trial. *Addiction* **92** (Suppl. 2): S251-S260, 1997.
- GUY, R. Opinion. Ref. Civil No. 8-73015 and Civil No. 8-73159. U.S. District Court, Eastern District of Michigan, Southern Division, Detroit, MI, December 22, 1978.
- HINGSON, R., MERRIGAN, D. AND HEEREN, T. Effects of Massachusetts raising its legal drinking age from 18 to 20 on deaths from teenage homicide, suicide, and nontraffic accidents. *Pediatr. Clin. No. Amer.* **32**: 221-232, 1985.
- HINGSON, R.W., SCOTCH, N., MANGIONE, T., MEYERS, A., GLANTZ, L., HEEREN, T., LIN, N., MUCATEL, M. AND PIERCE, G. Impact of legislation raising the legal drinking age in Massachusetts from 18 to 20. *Amer. J. Publ. Hlth* **73**: 163-170, 1983.
- HOADLEY, J.F., FUCHS, B.C. AND HOLDER, H.D. Effect of alcohol beverage restrictions on consumption: A 25-year longitudinal analysis. *Amer. J. Drug Alcohol Abuse* **10**: 375-401, 1984.
- HOSKIN, A.F., YALUNG-MATHEWS, D. AND CARRARO, B.A. Effect of raising the legal minimum drinking age on fatal crashes in 10 states. *J. Safety Res.* **17**: 117-121, 1986.
- HOWLAND, J., BIRCKMAYER, J., HEMENWAY, D. AND COTE, J. Did changes in minimum age drinking laws affect adolescent drowning (1970-90)? *Injury Prev.* **4**: 288-291, 1998.
- HUGHES, S.P. AND DODDER, R.A. Raising the legal minimum drinking age: Short-term effects with college student samples. *J. Drug Issues* **16**: 609-620, 1986.
- HUGHES, S.P. AND DODDER, R.A. Changing the legal minimum drinking age: Results of a longitudinal study. *J. Stud. Alcohol* **53**: 568-575, 1992.
- JOHNSON, J.A., OKSANEN, E.H., VEALL, M.R. AND FRETZ, D. Short-run and long-run elasticities for Canadian consumption of alcoholic beverages: An error-correction mechanism/cointegration approach. *Rev. Econ. Stat.* **74**: 64-74, 1992.
- JOHNSTON, L.D., O'MALLEY, P.M. AND BACHMAN, J.G. *National Survey Results on Drug Use from the Monitoring the Future Study, 1975-1997. Vol. 1 (NIH Publication No. 98-4345) and Vol. 2 (NIH Publication No. 98-4346)*, Washington: Government Printing Office, 1998.

- JOKSCH, H.C. AND JONES, R.K. Changes in the drinking age and crime. *J. Crim. Justice* **21**: 209-221, 1993.
- JONES, N.E., PIEPER, C.F. AND ROBERTSON, L.S. 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: A pilot study. *Subst. Use Misuse* **32**: 219-228, 1997a.
- JONES-WEBB, R., TOOMEY, T.L., SHORT, B., MURRAY, D.M., WAGENAAR, A. AND WOLFSON, M. Relationships among alcohol availability, drinking location, alcohol consumption, and drinking problems in adolescents. *Subst. Use Misuse* **32**: 1261-1285, 1997b.
- KANDEL, D.B., YAMAGUCHI, K. AND CHEN, K. Stages of progression in drug involvement from adolescence to adulthood: Further evidence for the gateway theory. *J. Stud. Alcohol* **53**: 447-457, 1992.
- KENKEL, D.S. Do drunk drivers pay their way? A note on optimal penalties for drunk driving. *J. Hlth Econ.* **12**: 136-149, 1993a.
- KENKEL, D.S. Drinking, driving, and deterrence: The effectiveness and social costs of alternative policies. *J. Law Econ.* **36**: 877-913, 1993b.
- KING, R.F. AND DUDAR, D. M. The politics of denial: The use of funding penalties as an implementation device for social policy. *Policy Sci.* **20**: 307-337, 1987.
- KLEPP, K.I., AAS, H.N. AND WAHLBERG, R.B. Perceived access to alcohol among lower secondary school students. A longitudinal study (Norwegian). *Tidsskr. Nor. Laegeforen.* **116**: 3132-3135, 1996a.
- KLEPP, K.I., SCHMID, L.A. AND MURRAY, D.M. Effects of the increased minimum drinking age law on drinking and driving behavior among adolescents. *Addict. Res.* **4**: 237-244, 1996b.
- LAIKUTHAI, A. Youth, Alcohol Use and Abuse: An Examination of Public Policy and Laws on Alcohol, Marijuana, and Drunk Driving, Ph.D. dissertation, Chicago, IL: Health Sciences Center, University of Illinois at Chicago, 1994.
- LAIKUTHAI, A. AND CHALOUKPA, F.J. Youth alcohol use and public policy. *Contemp. Policy Issues* **11**: 70-81, 1993.
- LEGGE, J.S., JR. Reforming highway safety in New York State: An evaluation of alternative policy interventions. *Social Sci. Q.* **71**: 373-382, 1990.
- LEWIS, R.K., PAINE-ANDREWS, A., FAWCETT, S.B., FRANCISCO, V.T., RICHTER, K.P., COPPLE, B. AND COPPLE, J.E. Evaluating the effects of a community coalition's efforts to reduce illegal sales of alcohol and tobacco products to minors. *J. Commun. Hlth* **21**: 429-436, 1996.
- LILLIS, R.P., WILLIAMS, T.P. AND WILLIFORD, W.R. Impact of the 19-year-old drinking age in New York. In: HOLDER, H.D. (Ed.) *Advances in Substance Abuse: Behavioral and Biological Research, Supplement 1: Control Issues in Alcohol Abuse Prevention: Strategies for States and Communities*, Greenwich, CT: JAI Press, 1987, pp. 133-146.
- LOEB, P.D. The determination of automobile fatalities. *J. Transport. Econ. Policy* **21**: 279-287, 1987.
- LONNSTROM, D.A. Impact of Changes in the New York State Minimum Drinking Age Law upon the College Campus. *Dissertation Abstracts Int.* **45** (8-A): 2670, 1985.
- LOTTERHOS, J.F., GLOVER, E.D., HOLBERT, D. AND BARNES, R.C. Intentionality of college students regarding North Carolina's 21-year drinking age law. *Int. J. Addict.* **23**: 629-647, 1988.
- MCCALL, M. Accuracy in detecting potential underage drinkers: The role of contextual effects in proofing. *J. Appl. Social Psychol.* **23**: 875-890, 1993.
- MCCALL, M. The effects of physical attractiveness on gaining access to alcohol: When social policy meets social decision making. *Addiction* **92**: 597-600, 1997.
- MCCALL, M. Physical attractiveness, mood, and the decision to card for the purchase of alcohol: Evidence for a mood-management hypothesis. *J. Appl. Social Psychol.* **29**: 1172-1190, 1999.
- MCCORNAC, D.C. AND FILANTE, R.W. Demand for distilled spirits: An empirical investigation. *J. Stud. Alcohol* **45**: 176-178, 1984.
- McFADDEN, M. AND WECHSLER, H. Minimum drinking age laws and teenage drinking. *Psychiat. Opin.* **16** (3): 26-28, 1979.
- MACKINNON, D.P. AND WOODWARD, J.A. The impact of raising the minimum drinking age on driver fatalities. *Int. J. Addict.* **21**: 1331-1338, 1986.
- MAISTO, S.A. AND RACHAL, J.V. Indications of the relationship among adolescent drinking practices, related behavior, and drinking-age laws. In: WECHSLER, H. (Ed.) *Minimum-Drinking-Age Laws: An Evaluation*, Lexington, MA: Lexington Books, 1980, pp. 155-176.
- MALES, M.A. Minimum purchase age for alcohol and young-driver fatal crashes: A long-term view. *J. Legal Stud.* **15**: 181-211, 1986.
- MANUEL VS STATE OF LOUISIANA, 692 So. 2d 320 (La. 1996).
- MAYER, R.R., FORSTER, J.L., MURRAY, D.M. AND WAGENAAR, A.C. Social settings and situations of underage drinking. *J. Stud. Alcohol* **59**: 207-215, 1998.
- MILLER, T.R. AND BLINCOE, L.J. Incidence and cost of alcohol-involved crashes in the United States. *Accid. Anal. Prev.* **26**: 583-591, 1994.
- MOONEY, L.A. AND GRAMLING, R. The differential effects of the minimum drinking age law. *Sociol. Inquiry* **63**: 330-338, 1993.
- MOONEY, L.A., GRAMLING, R. AND FORSYTH, C. Legal drinking age and alcohol consumption. *Deviant Behav.* **13**: 59-71, 1992.
- MOSKOWITZ, J.M. The primary prevention of alcohol problems: A critical review of the research literature. *J. Stud. Alcohol* **50**: 54-88, 1989.
- NAOR, E.M. AND NASHOLD, R.D. Teenage driver fatalities following reduction in the legal drinking age. *J. Safety Res.* **7**: 74-79, 1975.
- NATIONAL CENTER FOR HEALTH STATISTICS. *Health, United States, 1993*, DHHS Publication No. (PHS) 94-1232, Washington: Government Printing Office, 1994.
- NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION. *Traffic Safety Facts 1997: Alcohol*, Report No. DOT HS 808 806, Washington: Department of Transportation, 1998.
- O'LEARY, D., GORMAN, D.M. AND SPEER, P.W. The sale of alcoholic beverages to minors. *Publ. Hlth Rep.* **109**: 816-818, 1994.
- O'MALLEY, P.M. AND WAGENAAR, A.C. Effects of minimum drinking age laws on alcohol use, related behaviors, and traffic crash involvement among American youth: 1976-1987. *J. Stud. Alcohol* **52**: 478-491, 1991.
- ORNSTEIN, S.I. A survey of findings on the economic and regulatory determinants of the demand for alcoholic beverages. *Subst. Alcohol Actions/Misuse* **5**: 39-44, 1984.
- PARK, J. Solving the Problem of Alcohol-Impaired Driving: An Evaluation of Alcohol-Related Legal Policies in the States. *Dissertation Abstracts Int.* **54** (9-A): 3589, 1994.
- PARKER, R.N. *Alcohol and Homicide: A Deadly Combination of Two American Traditions*, Albany, NY: State Univ. of New York Press, 1995.
- PERKINS, H.W. AND BERKOWITZ, A.D. Stability and contradiction in college students' drinking following a drinking-age law change. *J. Alcohol Drug Educ.* **35** (1): 60-77, 1989.
- PREUSSER, D.F. AND WILLIAMS, A.F. Sales of alcohol to underage purchasers in three New York counties and Washington, D.C. *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.
- ROONEY, J.F. AND SCHWARTZ, S.M. The effect of minimum drinking age laws upon adolescent alcohol use and problems. *Contemp. Drug Probl.* **6**: 569-583, 1977.
- RUBINGTON, E. Drinking in the dorms: A study of the etiquette of RA-resident relations. *J. Drug Issues* **20**: 451-461, 1990.
- RUHM, C.J. Alcohol policies and highway vehicle fatalities. *J. Hlth Econ.* **15**: 435-454, 1996.
- SAFFER, H. AND GROSSMAN, M. Beer taxes, the legal drinking age, and youth motor vehicle fatalities. *J. Legal Stud.* **16**: 351-374, 1987a.
- SAFFER, H. AND GROSSMAN, M. Drinking age laws and highway mortality rates: Cause and effect. *Econ. Inquiry* **25**: 403-417, 1987b.

- SCHOFFIELD, M.J., WEEKS, C. AND SANSON-FISHER, R. Alcohol sales to minors: A surrogate study. *Prev. Med.* **23**: 827-831, 1994.
- SCHWARTZ, R.H., FARROW, J.A., BANKS, B. AND GIESEL, A.E. Use of false ID cards and other deceptive methods to purchase alcoholic beverages during high school. *J. Addict. Dis.* **17** (3): 25-33, 1998.
- SCHWEITZER, S.O., INTRILIGATOR, M.D. AND SALEHI, H. Alcoholism: An econometric model of its causes, its effects and its control. In: GRANT, M., PLANT, M. AND WILLIAMS, A. (Eds.) *Economics and Alcohol: Consumption and Controls*, New York: Gardner Press, 1983, pp. 107-127.
- SMART, R.G. Changes in alcoholic beverage sales after reductions in the legal drinking age. *Amer. J. Drug Alcohol Abuse* **4**: 101-108, 1977.
- SMART, R.G. AND ADLAF, E.M. Age of majority cards and drinking among young people. *J. Alcohol Drug Educ.* **32** (3): 60-64, 1987.
- SMART, R.G., ADLAF, E.M. AND WALSH, G.W. Procurement of alcohol and underage drinking among adolescents in Ontario. *J. Stud. Alcohol* **57**: 419-424, 1996.
- SMART, R.G. AND FINLEY, J. Changes in drinking age and per capita beer consumption in ten Canadian provinces. *Addict. Dis.* **2**: 393-402, 1976.
- SMART, R.G. AND SCHMIDT, W. Drinking and problems from drinking after a reduction in the minimum drinking age. *Brit. J. Addict.* **70**: 347-358, 1975.
- SMITH, D.I. Effect on non-traffic accident hospital admissions of lowering the drinking age in two Australian states. *Contemp. Drug Probl.* **13**: 621-639, 1986.
- SMITH, D.I. AND BURVILL, P.W. Effect on traffic safety of lowering the drinking age in three Australian states. *J. Drug Issues* **16**: 183-198, 1986.
- SMITH, R.A., HINGSON, R.W., MORELOCK, S., HEEREN, T., MUCATEL, M., MANGIONE, T. AND SCOTCH, N. Legislation raising the legal drinking age in Massachusetts from 18 to 20: Effect on 16 and 17 year-olds. *J. Stud. Alcohol* **45**: 534-539, 1984.
- THIEL, R.R. The Impact of the Raised Drinking Age in Texas on Alcohol-Related Traffic Accidents and Fatalities. *Dissertation Abstracts Int.* **46** (5-A): 1419, 1985.
- 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., WAGENAAR, A.C., KILIAN, G., FITCH, O., ROTHSTEIN, C. AND FLETCHER, L. Alcohol sales to pseudo-intoxicated bar patrons. *Publ. Hlth Rep.* **114**: 337-342, 1999.
- VAUCHER, S., REHM, J., BENVENUTI, J. AND MULLER, R. Young teenagers and access to alcohol in a Swiss canton: Evidence from observational testing and from a telephone survey. *Addiction* **90**: 1619-1625, 1995.
- VINGLIS, E. AND SMART, R.G. Effects of raising the legal drinking age in Ontario. *Brit. J. Addict.* **76**: 415-424, 1981.
- WAGENAAR, A.C. The Minimum Legal Drinking Age: A Time-Series Impact Evaluation. *Dissertation Abstracts Int.* **41** (8B): 2984, 1981.
- WAGENAAR, A.C. Aggregate beer and wine consumption: Effects of changes in the minimum legal drinking age and a mandatory beverage container deposit law in Michigan. *J. Stud. Alcohol* **43**: 469-487, 1982a.
- WAGENAAR, A.C. Public policy effects on alcohol consumption in Maine and New Hampshire: 1970-1980. *Contemp. Drug Probl.* **11**: 3-20, 1982b.
- WAGENAAR, A.C. *Alcohol, Young Drivers, and Traffic Accidents: Effects of Minimum-Age Laws*, Lexington, MA: Lexington Books, 1983a.
- WAGENAAR, A.C. Raising the legal drinking age in Maine: Impact on traffic accidents among young drivers. *Int. J. Addict.* **18**: 365-377, 1983b.
- WAGENAAR, A.C. Preventing highway crashes by raising the legal minimum age for drinking: The Michigan experience 6 years later. *J. Safety Res.* **17**: 101-109, 1986.
- 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., WILLIAMS, C.L. AND PERRY, C.L. Where and how adolescents obtain alcoholic beverages. *Publ. Hlth Rep.* **108**: 459-464, 1993.
- WAGENAAR, A.C., HARWOOD, E.H., TOOMEY, T.L., DENK, C.E. AND ZANDER, K.M. Public opinion on alcohol policies in the United States: Results from a national survey. *J. Publ. Hlth Policy* **21**: 303-327, 2000.
- WAGENAAR, A.C. AND MAYBEE, R.G. The legal minimum drinking age in Texas: Effects of an increase from 18 to 19. *J. Safety Res.* **17**: 165-178, 1986.
- 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. Detering sales and provision of alcohol to minors: A study of enforcement in 295 counties in four states. *Publ. Hlth Rep.* **110**: 419-427, 1995.
- WEINSTEIN, B.G. Costs and benefits of establishing a national purchasing age of 21. In: HOLDER, H.D. (Ed.) *Advances in Substance Abuse: Behavioral and Biological Research*, Supplement 1: Control Issues in Alcohol Abuse Prevention: Strategies for States and Communities, Greenwich, CT: JAI Press, 1987, pp. 105-118.
- WHITEHEAD, P.C., CRAIG, J., LANGFORD, N., MACARTHUR, C., STANTON, B. AND FERRENCE, R.G. Collision behavior of young drivers: Impact of the change in the age of majority. *J. Stud. Alcohol* **36**: 1208-1223, 1975.
- WILKINSON, J.T. Reducing drunken driving: Which policies are most effective? *So. Econ. J.* **54**: 322-334, 1987.
- WILLIAMS, A.F., RICH, R.F., ZADOR, P.L. AND ROBERTSON, L.S. The legal minimum drinking age and fatal motor vehicle crashes. *J. Legal Stud.* **4**: 219-239, 1975.
- WILLIAMS, A.F., ZADOR, P.L., HARRIS, S.S. AND KARPFF, R.S. The effect of raising the legal minimum drinking age on involvement in fatal crashes. *J. Legal Stud.* **12**: 169-179, 1983.
- WILLIAMS, T.P. AND LILLIS, R.P. Changes in alcohol consumption by 18-year-olds following an increase in New York State's purchase age to 19. *J. Stud. Alcohol* **47**: 290-296, 1986.
- WILLIAMS, T.P. AND LILLIS, R.P. Long-term changes in reported alcohol purchasing and consumption following an increase in New York State's purchase age to 19. *Brit. J. Addict.* **83**: 209-217, 1988.
- WILLIFORD, W.R. Effect of the Nineteen Alcohol Purchase Age on an Eighteen-Year-Old High-Risk Behavior Group. *Dissertation Abstracts Int.* **48** (A): 2746, 1988.
- WOLFSON, M., TOOMEY, T.L., FORSTER, J.L., WAGENAAR, A.C., MCGOVERN, P.G. AND PERRY, C.L. Characteristics, policies and practices of alcohol outlets and sales to underage persons. *J. Stud. Alcohol* **57**: 670-674, 1996a.
- 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, 1996b.
- WOLFSON, M., WAGENAAR, A.C. AND HORNSETH, G.W. Law officers' views on enforcement of the minimum drinking age: A four-state study. *Publ. Hlth Rep.* **110**: 428-438, 1995.
- YU, J. Alcohol purchase age laws and the serial beginning drinker in New York. *Int. J. Addict.* **30**: 1289-1301, 1995.
- YU, J. Perceived parental/peer attitudes and alcohol-related behaviors: An analysis of the impact of the drinking age law. *Subst. Use Misuse* **33**: 2687-2702, 1998.
- YU, J. AND SHACKET, R.W. Long-term change in underage drinking and impaired driving after the establishment of drinking age laws in New York State. *Alcsm Clin. Exp. Res.* **22**: 1443-1449, 1998.

Comprehensive Community Interventions to Promote Health: Implications for College-Age Drinking Problems

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ABSTRACT. *Objective:* This article reviews comprehensive community interventions that sought to reduce (1) cardiovascular disease risks; (2) smoking; (3) alcohol use disorders, alcohol-related injury and illicit drug use; or (4) sexual risk taking that could lead to HIV infection, sexually transmitted disease and pregnancy. *Method:* Comprehensive community programs typically involve multiple city government agencies as well as private citizens and organizations and use multiple intervention strategies such as school-based and public education programs, media advocacy, community organizing, environmental policy changes and heightened enforcement of existing policies. This review focused on English-language papers published over the past several decades. *Results:* Some programs in each of the four problem areas achieved their behavioral and health goals. The most consistent benefits were found in programs targeting behaviors with immediate health consequences such as alcohol misuse or sexual risk taking. Results were less consis-

tent when consequences of targeted behaviors were more distant in time such as cardiovascular risks and smoking. Also, programs that targeted youth to prevent them from starting new health-compromising behaviors tended to be more successful than programs aimed at modifying preexisting habits among adults. Programs that combined environmental and institutional policy change with theory-based education programs were the most likely to be successful. Finally, programs tailored to local conditions by the communities themselves tended to achieve more behavior change than programs imported from the outside. *Conclusions:* Comprehensive community intervention approaches may have considerable potential to reduce college-age drinking problems, especially given the success of these programs in reducing alcohol-related problems and in preventing health-compromising behaviors among youth. (*J. Stud. Alcohol*, Supplement No. 14: 226-240, 2002)

CITING THE SUCCESS of comprehensive multifactorial community interventions with other public health problems, the National Academy of Sciences has recommended this approach for reducing alcohol-related health problems (Institute of Medicine, 1989). This approach was initially used to reduce heart disease and cardiovascular risks. More recently, it has targeted underage drinking, traffic and other unintended injuries caused by alcohol use as well as unplanned pregnancy, infections with HIV and other sexually transmitted diseases.

Traditional public health strategies attempt to identify and intervene with specific subpopulations at high risk for a targeted health problem. In contrast, comprehensive multistrategy community programs attempt to involve the total community and its constituent organizations, institutions and individuals across demographic and risk spectrums. Comprehensive community programs addressing problems associated with alcohol have involved multiple agencies in city government as well as private citizens and private organizations. Such programs seek to stimulate behavior change by influencing the normative environment in which high-risk individuals live.

Comprehensive community interventions are also distinguished by the use of multiple intervention strategies for

changing health-related behaviors. Although programs differ with respect to content and behavioral targets, they typically include some combination of: school-based education, public information programs, medical screening and treatment, media advocacy, organizing and mobilizing of different community groups and populations, promotion of environmental changes that can influence the price and availability of products like alcohol and tobacco that affect health and programs to publicize and enhance enforcement of existing laws pertaining to the use of alcohol, tobacco or other drugs. Programs can also provide social and entertainment activities that are alcohol, drug or tobacco free or that promote healthy lifestyles such as exercise and good nutrition.

Although comprehensive community interventions share the common features of multiple participants and interventions, they have varied on a number of dimensions, including the primary target population, the geographic or organizational setting, who initiated the program and the location of the director. Primary target populations can include all members of a community, youth, adults, elderly, certain minorities or racial subgroups or groups with distinct behaviors. Geographic and organizational settings can range from cities to neighborhoods or counties and may or may not reflect geopolitical units. Initiators of such programs have varied from university researchers to members of city government or private organizations within a community.

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TABLE 1. Cardiovascular risk reduction programs

Name of study	Behavioral targets	Intervention	Theoretical model	Research design	Results
North Karelia Project (Puska et al., 1981)	Reduce cardiovascular risks: • Smoking • Diet • Hypertension	<ul style="list-style-type: none"> Organized work groups on health education, stroke registration hypertension Community analyses survey and mortality data, insurance Health education meetings Radio station given information Leaflets and posters prepared on cardiovascular risks News articles, health reports, editorials and interview Training provided to health care professionals about cardiovascular risk factors, hypertension, smoking cessation, nutrition, heart disease diagnosis and treatment No smoking policies in schools, health centers, restaurants, offices Smoking cessation, nutrition and weight reduction courses 	Information and health belief	Quasi-experimental Comparison N. Karelia with Kuopio Province in Finland • Surveys '72, '77, '82, '87, '92 • Blood pressure taken • Blood samples drawn	<ul style="list-style-type: none"> Serum cholesterol declined 16% in N. Karelia vs 12% control 1972-92 Diastolic BP declined 8-10% both areas Smoking declined 52% to 37% N. Karelia vs 49% to 37% comparison
North Karelia School Smoking Prevention (Vartiainen et al., 1998)	• Smoking	<ul style="list-style-type: none"> 2-year school program Students taught about pressures to smoke Role playing to increase resistance skills Short- and long-term hazards of smoking discussions Peer-led education 	Social influence	Quasi-experimental	<ul style="list-style-type: none"> Mean cigarette 22% lower in program schools vs controls; 30% prevalence of smokers vs 41% among controls
Pawtucket Heart Health Program (Carleton et al., 1995)	Reduce: • Elevated blood pressure • Cigarette smoking • Physical inactivity	<ul style="list-style-type: none"> Self-help course Small group classes Risk factor measurement and counseling Involved 500 community organizations 27 schools, all supermarkets, many government departments Labeling of low fat food in stores Restaurant menus highlighted low fat meals Heart health curriculum elementary through high schools 	Behavior change Development of social supports	Quasi-experimental Pawtucket compared with a southern New England city Repeat cross-sectional survey every 2 years	<ul style="list-style-type: none"> Smoking down both cities No significant difference Body mass indices increased in both cities, up more in comparison Largest decreases in projected heart disease rates in Pawtucket: 15% but the difference declined to 8% after the program ended and latter was not significant
Stanford 5 City Project (Farquhar et al., 1990; Winkleby et al., 1996)	• Reduce cardiovascular morbidity and risk factors, mortality	<ul style="list-style-type: none"> Mass media and interpersonal education program for both the public and health professionals undertaken to create social and institutional support to sustain the initiative 	Social learning theory Persuasive theory Marketing theory Community change theory	2 intervention communities were compared with 3 matched control communities	<ul style="list-style-type: none"> 6 yr improvement in CHD knowledge (this dissipated) Blood pressure reduction by Year 9 after the program) significantly greater in intervention communities at Year 9 No greater smoking reduction at Year 9 Significantly greater mortality risk for women but not men No body mass differences for women; male controls did better than men in intervention cities Treatment cities had a significantly better mortality risk for women but not men

Continued

To date, few comprehensive community interventions have explicitly included colleges and universities in developing and implementing interventions, and fewer still have specifically evaluated program impact on college students. Further, not all of these comprehensive community interventions have produced the desired public health objectives. This review of comprehensive community programs was conducted to assess what program components or char-

acteristics might be useful to implement to reduce alcohol misuse and related health and social problems among college students.

Cardiovascular Risk Reduction Projects

Several comprehensive community intervention initiatives to reduce cardiovascular risks have been reported in

TABLE 1. *Continued*

Name of study	Behavioral targets	Intervention	Theoretical model	Research design	Results
Minnesota Heart Health Program (Luepker et al., 1994)	<ul style="list-style-type: none"> • Reduce heart disease in 3 north central communities • Lower blood cholesterol • Lower blood pressure • Smoking reduction • Increase physical activity 	<ul style="list-style-type: none"> • Risk factor screening and follow up • Community analysis and organization • Direct adult education • Environmental changes • Risk factor screening and education with 60% of adults • Face to face interventions with 30% of adults • Health professional education • Youth education • School-based education 	<ul style="list-style-type: none"> • Social learning theory • Persuasive communication theory 	3 communities vs 3 matched control communities compared through cohort survey over a 6-7 yr period	<ul style="list-style-type: none"> • No significant group differences seen on: <ul style="list-style-type: none"> • Blood cholesterol • Smoking • Blood pressure • Body mass index or overall heart disease risk • Slightly beneficial effects for smoking among women and exercise in final wave of the study
Class of 1989 Study (Perry et al., 1992)	<ul style="list-style-type: none"> • Reduce adolescent smoking • Program offered to 8th graders 	<ul style="list-style-type: none"> • Students learn short-term consequences of smoking • Group sessions • Teach students it is not normative • Students learn to resist peer pressure and advertiser pressures to smoke • Students make public commitment not to smoke 	<ul style="list-style-type: none"> • Problem behavior • Social learning theory • Persuasive communication theory 	Quasi-experimental	<ul style="list-style-type: none"> • Students in intervention communities 40% less likely to smoke
Physical Activity Program (Kelder et al., 1993)	<ul style="list-style-type: none"> • Encourage regular aerobic physical activity 	<ul style="list-style-type: none"> • Instruction monitoring heart rate • Peer-led 10-lesson curriculum to promote physical activity and healthy eating • Create school, family, peer support • 4-week community wide competition 	<ul style="list-style-type: none"> • Social learning theory 	Quasi-experimental intervention vs control community annual surveys	<ul style="list-style-type: none"> • Males reported more exercise in intervention community in 7th- and 11th-grade surveys • Females reported more exercise in all but the 11th-grade survey

the scientific literature. In the United States, these efforts have focused much more on individual change than on the political, regulatory or enforcement environments (Table 1).

The *North Karelia Project* (Puska et al., 1981; Vartiainen et al., 1994, 1998), the first community demonstration program to reduce cardiovascular disease risks, began in an eastern province of Finland in 1972, which at that time had the highest coronary mortality rate in the world. A steering committee and working groups on health education, stroke registration and hypertension control were organized. Community analyses were undertaken using baseline survey, insurance, health systems and mortality data. Education on smoking, diet and hypertension was conducted through voluntary organizations, health and social service organizations, radio and television. Leaflets and posters on smoking, diet, hypertension, physical exercise and advice to heart disease patients were distributed at clinics, schools, voluntary organizations, banks, pharmacies and other stores. Training was offered to health center personnel, doctors, public health nurses, teachers and social workers regarding the measurement and management of cardiovascular risk factors, smoking cessation, nutrition, hypertension and coronary disease. The program promoted "no smoking" policies in health centers, schools, restaurants and offices; the growing of vegetables; and production of lower fat foods. Hypertension, stroke and heart disease registries were started.

To evaluate the efficacy of these programs, North Karelia was compared with the Kuopio Province in Finland. Sur-

veys of both areas were completed in 1972, 1977, 1982, 1987 and 1992. Blood pressure measurements and blood samples were collected.

Serum cholesterol declined 16% in North Karelia and 12% in Kuopio from 1972 to 1992. Systolic blood pressure declined 4% in Kuopio from 1972 to 1992. Declines in diastolic blood pressure were similar in both areas: 8-10% from 1972 to 1992. Smoking declined from 52% to 32% among men in North Karelia, significantly more than among men in Kuopio (from 49% to 37%). The greatest declines occurred during the first 5 years of the program and helped to stimulate interest in comprehensive community interventions for coronary disease prevention in the United States.

Beginning in 1978, a school-based component of the North Karelia program exposed seventh grade students to a 2-year five-session smoking prevention program using a social influence approach (Vartiainen et al., 1998). Students were taught about pressures to smoke exerted by peers, adults and mass media and were trained to deal with these pressures. Short- and long-term hazards of smoking were discussed.

In 1993, mean lifetime cigarette consumption was 22% lower among program participants than among students in comparison schools. The mean prevalence of smoking was 30% among program participants and 41% in control subjects. Investigators concluded that long-term smoking prevention effects could be achieved if a school-based program using a social influence model were combined with community and mass media interventions (Vartiainen et al., 1998).

Comprehensive community interventions to reduce cardiovascular risks among U.S. adults have not been as successful as the North Karelia study, but school-based components have achieved some desired behavior changes.

The *Pawtucket Heart Health Program* (Carleton et al., 1995) sought to reduce elevated blood pressure, cigarette smoking and physical inactivity. Phases of behavior change, awareness and agenda setting were promoted, and training was provided in behavioral skills and development of social supports. A community activation component encouraged individuals to participate in self-help courses, direct risk-factor measurement and counseling. More than 500 community organizations and more than 3,500 volunteers were involved, including public and private schools, supermarkets, grocery stores, religious and social organizations, larger work sites, restaurants and most departments of city government. The program introduced grocery store labeling of low fat food; a nutrition education program at the public library; restaurant menus highlighting health foods; and a heart health curriculum in elementary, middle and high schools. At least 42,000 individuals participated in one or more program.

In a quasi-experimental evaluation design, Pawtucket was compared with a southern New England city with similar sociodemographic characteristics. Large-scale cross-sectional surveys were conducted in each community at 2-year intervals.

Smoking declined 6.6% in the intervention group and 8% in the comparison city. There was no significant difference between cities in changes in mean blood pressure or blood cholesterol. Body mass indices increased in both cities but significantly more so in the comparison city. The projected cardiovascular disease rates were significantly less—15% in Pawtucket during the intervention program—but the difference declined to 8% after the program ended, a difference that was no longer statistically significant. The Pawtucket Heart Health evaluators concluded that they found very limited evidence that cardiovascular risk factor behaviors and disease risk changed through a process of community activation at the individual, group, organization and community levels.

The *Stanford 5 City Project* (Farquhar et al., 1990; Winkleby et al., 1996) sought to reduce cardiovascular risk factors, morbidity and mortality. The program used both mass media and interpersonal education programs. Messages were developed using social learning theory, social marketing theory, persuasion theories and community development strategies. Community organizing was undertaken to create social and institutional support to sustain the program's initiatives.

In both intervention and comparison cities, there were improvements over time in cardiovascular disease knowledge, cholesterol and smoking, making between-city group differences more difficult to observe. Six years after the start of the program, there were significant improvements

in the two program communities relative to three matched comparison communities in knowledge about coronary heart disease etiology and risk factors. These differences dissipated by the 9-year follow-up. There were no significant reductions in blood pressure at 6 years, but by the 9-year follow-up the intervention cities had significantly greater declines in blood pressure than comparison areas. No significant differences in smoking rates were seen between intervention and comparison areas at 6- or 9-year follow-ups. There were no significant differences in body mass indices for women. However, for men, the control cities actually had more favorable scores at the 9-year follow-up. Nine years after the start of the program, the treatment cities had a significantly better mortality risk for women but not men.

The *Minnesota Heart Health Program* (Luepker et al., 1994) involved nearly 400,000 people in six communities. Initiated in 1980, it sought to reduce cardiovascular morbidity and mortality by 15% by reducing sedentary behaviors, cigarette smoking, blood cholesterol levels and blood pressure levels. The intervention operated at the individual, group and community levels and embraced a wide range of strategies and theories, including social learning theory and persuasive communications theory. The program alerted people to health issues and provided incentives to adopt effective health promoting behavioral alternatives. Community leaders were encouraged to foster environmental change to support risk reduction. Mass media established awareness of the program, disseminated risk factor messages and enhanced the salience of healthy lifestyles. Community health professionals were involved through their local organizations and preventive practice advisory committees. More than 60% of all adult residents received onsite risk-factor screening, education and counseling. The adult education component provided multiple-contact programs of intensive personal counseling on cardiovascular risk reduction. School-based education discouraged health-compromising behaviors in youth and their parents.

Three pairs of communities, matched on size and type, were compared through cohort surveys over a 6- to 7-year period. Against a backdrop of strong secular trends of increasing health promotion and declining risk factors, the overall program effects were modest in size and duration and generally within chance levels. No significance between group differences were seen in blood cholesterol, smoking among men, blood pressure, body mass index or overall coronary heart disease risk. Slight beneficial treatment effects were seen for smoking among women and exercise in the final wave of the study.

Two school-based educational components of the Minnesota Heart Health Program, however, achieved more marked behavioral changes. First, the *Class of 1989 Study* (Perry et al., 1992), an intensive intervention to reduce or prevent adolescent smoking, was offered to seventh grade

TABLE 2. Community programs to reduce smoking

Name of study	Behavioral targets	Intervention	Theoretical model	Research design	Results
Tobacco Policy Options for Prevention Project (Forster et al., 1998)	• Youth tobacco use	• Change local ordinances to restrict youth tobacco access, and retailer and adult practices that provide youth access to tobacco • Community organizing • Tobacco purchase attempts tried by youth	Community mobilization Deterrence	Random assignment of 14 communities to intervention and control groups	• Little effect on perceived tobacco availability through commercial sources • Reduced perceived access through commercial services • Purchase attempts declined significantly but not significantly more so than in control communities • Smoking by adolescents increased less in intervention than in control communities
Massachusetts Youth Tobacco Enforcement (Rigotti et al., 1997)	Reduce sales of tobacco to youth and youth tobacco use	• Quarterly compliance checks of sales to youth • Fines for noncompliance	Deterrence	Quasi-experimental: 3 intervention matched to 3 comparison communities	• Reduction of 68% to 11% of vendors selling to youth vs 68% to 55% in control communities, but no reported change in adolescent tobacco use
Erie County Youth Tobacco Enforcement (Cummings et al., 1998)	• Reduce sales of tobacco to youth	• Compliance checks of sales preceded by warning letters	Deterrence	Quasi-experimental: 6 intervention communities compared with 6 matched controls	• Vendors in both experimental and control communities knew about the program and compliance increase in both • No significant difference between communities
Central Harlem (Gemson et al., 1998)	• Reduce sales of tobacco to youth	Education vs enforcement of tobacco sales laws, with compliance checks and fines for violation	Deterrence	Quasi-experimental	• Decline from baseline: 70% sales at baseline, 16% decline in control stores, 34% decline in education stores, 56% decline in enforcement stores
Community Intervention Trial for Smoking Cessation (COMMIT Research Group, 1995a,b)	• Reduce heavy smoking	• Bring diverse organizations and institutions together to conduct smoking cessation • Education through media and community wide evaluations • Health care providers • Work sites create demand for cessation services \$220,000/yr per community • Cessation Resources Guide		Randomly assigned communities; 11 matched pairs of communities, 10 in U.S., 1 in Canada Self-reported smoking	• No difference in quit rates for heavy smokers • 3% greater quit rate among light to moderate smokers ($p = .004$) • Changes in overall community smoking • Percentage difference in smoking reduction between intervention and control communities was not significant
Neighbors for a Smoke Free North Side (Fisher et al., 1998)	• Reduce smoking all ages	• Community organizing, emphasizing involvement of local organizations in promoting nonsmoking • Wellness council in each neighborhood • Citywide advisory board • Smoking cessation classes • Billboards • Gospel fest • Door-to-door education		Quasi-experimental: 3 predominantly low income neighborhoods compared with 3 in Kansas City 600 miles away	• 7% decline in smoking prevalence vs only 1% change in comparison

students in the fall of 1984. It addressed social and psychological factors that encourage smoking. Students identified the short-term consequences of smoking, such as smelling like smoke or having bad breath. Their expectations of how many of their peers smoke were compared with actual data on smoking prevalence. Reasons people smoke were studied, and positive alternatives were offered. Finally, students learned skills to resist advertising, peer and adult pressures to smoke. Participants created anti-tobacco advertisements, skits and role-playing scenarios. Sixth grade students made public commitments not to smoke.

Annual surveys from 1983 to 1989 compared one of the intervention communities to its matched pair. Although smoking rates among students in the two communities were comparable at baseline, the proportion of adolescents smoking at the end of high school was significantly lower in the intervention community, with 14.6% of students smoking at least weekly in the intervention group compared with 24.1% in the control community. The authors concluded that the study results permit optimism about the benefits to youth of long-term school-based community-wide programs for delaying onset of smoking.

Second, a peer-led physical activity program designed for eighth grade students using social learning theory encouraged regular aerobic physical activity through a 4-week community-wide competition (Kelder et al., 1993). Students in the intervention community were challenged to exercise outside of school the equivalent of bicycling 250 miles. They received instruction on monitoring heart rates and choosing aerobic activities. In tenth grade, a 10-lesson peer-led curriculum to promote healthy eating and regular aerobic activity was introduced. The program used environmental-level strategies by having same-age peers provide new opportunities for healthier eating, physical activity and reducing barriers to aerobic activity at school and by creating peer, family and school personnel support. Based on annual surveys in the intervention and matched-pair community, females in the intervention community reported at follow-up greater hours of exercise in all but the eleventh grade. Males in the intervention community reported significantly more exercise in the seventh and eleventh grade surveys. Overall, the most pronounced differences were among females.

Community Interventions to Reduce Smoking

Comprehensive community programs have also attempted with mixed effectiveness to reduce tobacco use among youth and adult populations (Table 2).

The *Tobacco Policy Options for Prevention Project* (Forster et al., 1998), a 32-month intervention, sought to reduce youth access to tobacco by community mobilization to change local ordinances, retailer and other adult practices regarding provision of tobacco to youth and increased enforcement of age of sales laws. Fourteen Minnesota communities were randomly assigned to intervention or comparison conditions. Tobacco purchase attempts by youth were tried at all tobacco outlets in June 1993 and June 1996.

School surveys in 1993 and 1996 with more than 6,000 students indicated smoking by adolescents increased in both sets of cities, but less in the intervention communities. The intervention had little effect on perceptions of tobacco availability through social sources, but it reduced perceived access through commercial sources. Purchase attempts declined significantly in the intervention communities. In all communities, there was a sharp decrease in youth purchase attempts that resulted in sales. This decline, however, was not significantly greater in the intervention cities.

Rigotti et al. (1997) compared three Massachusetts communities that increased enforcement of youth tobacco laws with three matched comparison communities. Health departments in the intervention communities began quarterly compliance checks with underage purchase attempts. At baseline, 68% of vendors sold to minors, with no statistical difference between intervention and control community. Two years later, only 18% of the vendors in the interven-

tion communities compared with 55% in the comparison communities sold to minors. However, three annual surveys with more than 17,600 respondents revealed only a small drop in the ability of adolescents under age 18 to purchase tobacco and no decline in its use.

Cummings et al. (1998) reported on a similar enforcement program in Erie County, New York. Six pairs of communities were matched on sociodemographic characteristics, population and number of tobacco outlets. Underage purchase compliance checks directed by local police were conducted in 366 stores at baseline and 319 at follow-up. All tobacco vendors were sent a letter about tobacco laws pertaining to minors and a warning that compliance checks were planned. There was a dramatic increase in compliance with the law in both enforcement and nonenforcement communities. However, compliance rates between the two groups of communities did not vary because most vendors in both areas knew about the enforcement program and the perceived enforcement as more vigilant.

Gemson et al. (1998) reported results from a randomized trial of 15 tobacco vendors in Central Harlem. Stores were randomly allocated to control, education or enforcement conditions. Surveys of underage tobacco purchase compliance were conducted in October 1993 and in April 1994. During both surveys, violators in the enforcement group of stores were fined in accordance with the state law.

At baseline, 70% of stores sold loose cigarettes, and 98% sold either singles or packs of cigarettes. At the 6-month follow-up, sales declined 16% among control stores, 34% among education stores and 56% among enforcement stores.

The *Community Intervention Trial for Smoking Cessation* (COMMIT) (COMMIT Research Group, 1995a,b) was designed to help smokers, especially heavy smokers, achieve and maintain cessation. Within each of 11 matched community pairs, one community was randomly assigned to receive the intervention from January 1989 to December 1992. COMMIT was a partnership with National Cancer Institute staff, 11 participating research institutions and their corresponding local communities. Each community formed a community board. COMMIT fostered demand for cessation services, using public education through media and community-wide events, health care providers, work sites and other organization and cessation resources. The protocol mandated 58 activities to be carried out by local staff or agencies.

Based on a longitudinal survey, the investigators found no significant changes at follow-up among heavy smokers across the experimental groups. Quit rates for light/moderate smokers at baseline were .306 in intervention communities versus .275 in comparison communities, a significant between-group difference. Random digit dial cross-sectional surveys of approximately 2,800 subjects per city were conducted at baseline and follow-up. Overall, smoking preva-

lence decreased 3.5% in the program communities versus 3.2% in the comparison communities, a nonsignificant difference.

Neighbors for a Smoke Free North Side (Fisher et al., 1998) emphasized neighborhood-based governance and resident involvement around the goal of nonsmoking. Wellness councils including neighborhood volunteers and paid staff members ran the program for 24 months. The program included smoking cessation classes, billboards, door-to-door campaigns and a gospel fest. Three predominately low-income black neighborhoods in St. Louis received the intervention and were compared with similar neighborhoods in Kansas City. Random digit dial telephone surveys in 1990 and 1992 indicated smoking prevalence declined 7% in St. Louis, significantly more than in Kansas City, where it declined 1%.

The evaluators of the Smoke Free North Side intervention suggest this program had greater success than COMMIT because COMMIT was centrally developed at the national level. COMMIT was delivered to communities rather than developed by the communities.

Comprehensive Community Programs Addressing Alcohol-Related Problems

Several comprehensive community intervention programs have addressed alcohol use or related problems with positive results (Table 3). Two sought to reduce alcohol and other substance use among elementary and middle school students (Chou et al., 1998; Pentz et al., 1989; Perry et al., 1996). One focused on reducing access to alcohol and drinking among underage adolescents (Wagenaar et al., 2000a,b). Two others targeted entire community populations, including adolescents and young adults (Hingson et al., 1996; Holder, 1997; Holder et al., 2000). Although none specifically measured college drinking and related problems, these studies nonetheless have the most direct implications for those planning comprehensive community college interventions to address alcohol-related health problems.

The *Midwestern Prevention Project* (Pentz et al., 1989) attempted to prevent substance abuse among adolescents ages 10-14 in Kansas City, Missouri, and Indianapolis, Indiana. A quasi-experimental design in Kansas City and a randomized experimental design in Indianapolis evaluated the program. In Kansas City, from September 1984 to January 1986, students received a 10-session youth training program on skills for resisting alcohol, tobacco and illicit drug use; homework involving active interviews; and role plays with parents and family. Most students interviewed parents and family members about family rules regarding the use of these substances and regarding successful techniques to avoid their use and counteract media and community influences. Mass media coverage focused on psychosocial consequences of substance abuse; correction of perceptions about the prevalence of peer drug use; recognition of adult media and community influences on substance use; peer

and environmental pressure resistance; and statements of public commitments to avoid alcohol, tobacco and other drug use. Modeling and role playing of resistance skills, feedback with peer reinforcement, peer leader facilitation and discussion of homework results were part of the program.

Of the 42 schools that participated, 4 were randomly assigned to the program condition and 4 to the control condition. The remaining 34 were assigned on the basis of schools' willingness to accept the program; 20 were willing, and 14 were not. This willingness may have reflected higher salience of substance abuse in those schools. The 20 willing schools were assigned to the program, raising the total number of intervention schools to 24; there were 18 control schools.

Although cigarette, alcohol and marijuana use increased in both groups, increases for all substances were significantly lower in the intervention group 2 years after the program. When students in the 24 intervention schools were compared at 1-year follow-up with students in comparison schools, prevalence of use of all three drugs was lower in the intervention schools: 11% versus 16% for alcohol use, 17% versus 24% for cigarette use and 7% versus 16% for marijuana use.

In a study by Chou et al. (1998), investigators tracked 1,904 students exposed to the program in Indianapolis. They were compared with 1,508 students in the control group. Schools were randomly assigned to groups, and students were followed at 6 months, 1.5 years, 2.5 years and 3.5 years after baseline. After analytically controlling for ethnicity, gender, socioeconomic status, father's occupation and school type and grade, the researchers found that, among subjects using alcohol, tobacco or other drugs at baseline, secondary prevention effects reducing alcohol use were found at the 6-month and 1.5-year follow-up and for tobacco use at 6-month follow-up. Results for marijuana use were inconsistent over time.

Project Northland (Perry et al., 1996) in Minnesota was designed to reduce alcohol use among young adolescents. Sixth, seventh and eighth graders were exposed to a 3-year behavioral curriculum, with peer leadership, parental involvement and community task force activities. Students learned how to resist peer influence and normative expectations about alcohol and methods to bring about community social, political and institutional change in alcohol-related programs and policies. Students interviewed parents, local government officials, law enforcement personnel, retail alcohol merchants, schoolteachers and administrators about their beliefs and activities concerning adolescent alcohol use. A "town meeting" conducted by students made recommendations for community action for alcohol use prevention.

Community task forces including government officials, law enforcement personnel, school representatives, health professionals, youth workers, parents, concerned citizens

TABLE 3. Comprehensive community projects to address alcohol problems

Name of study	Behavioral targets	Intervention	Theoretical model	Research design	Results
Midwestern Prevention Project (Pentz et al., 1989)	<ul style="list-style-type: none"> • 6th-7th graders: the level of cigarette, alcohol and marijuana use can be reduced even among those using at baseline 	<ul style="list-style-type: none"> • 10 session youth education program • 10 homework role plays and interview with parents • Peer-led education • Parental and community organization of media • Consequences and corresponding beliefs about correct prevalence of use • Recognize and resist media, peer and environmental pressures to use substances 	Social influence model	Quasi-experimental design in Kansas City Experimental randomized design in Indianapolis	<p>Kansas City</p> <ul style="list-style-type: none"> • Increases in alcohol, tobacco and marijuana were less in the intervention schools <p>Indianapolis</p> <ul style="list-style-type: none"> • Reduced alcohol consumption 6+18 months • No diff. in marijuana use • Cigarette use reduction at 6 months + 2.5 years
Project Northland (Perry et al., 1996)	<ul style="list-style-type: none"> • Reduce adolescent alcohol use and related problems • 6th, 7th, 8th grader: reduce demand for and supply of alcohol to minors 	<ul style="list-style-type: none"> • School-based curricula: audiotape cassettes, class games, problem solving, role plays, resistance skills, group discussions, peer leaders • Parental involvement, books mailed to parents • Community-wide task force including passage of alcohol-related ordinances • Town meetings 	Social learning theory	Quasi-experimental longitudinal surveys	<ul style="list-style-type: none"> • Significant reductions in drinking among students in intervention communities • Decrease past week use; 30% reduction in cigarette and marijuana use, particularly among those who had not used it by the start of the program
Communities Mobilizing for Change (Wagenaar et al., 2000a)	<ul style="list-style-type: none"> • Reduce availability of alcoholic beverages to underage youth and reduce alcohol outlets selling to minors • Peers, siblings, parent organization through city, schools, enforcement agencies, alcohol business associations and media 	<ul style="list-style-type: none"> • Community organizing • Meetings with community leaders and citizens • Compliance check surveys of alcohol sales to minors 	Community organizing deterrence	Randomized 15 community trials	<ul style="list-style-type: none"> • 17% increase in outlets checking IDs • 24% reduction in sales to minors • 25% reduction in the proportion of teens who tried to buy alcohol • 17% reduction in proportion of 16-20 year olds who supplied alcohol to younger teens • 7% decrease in alcohol consumption

Continued

and adolescents stimulated passage ordinances to prevent alcohol sales to minors and intoxicated patrons. Businesses provided discounts to students who pledged to be alcohol and drug free.

At baseline, 2,351 students were surveyed. Two-year follow-up rates greater than 80% were achieved in intervention and comparison groups. A higher percentage of students in the intervention group were alcohol users at baseline, whereas at follow-up the percentages that used alcohol in the past week and past month were lower in the intervention group. Differences were greatest and significant among those who did not use alcohol at baseline. No significant follow-up differences between groups were found on measures of cigarette smoking or marijuana use.

In the *Communities Mobilizing for Change* project (Wagenaar et al., 2000a), 15 communities were randomly allocated to intervention or comparison groups. A commu-

nity organizing intervention sought to reduce the number of alcohol outlets selling to youth under the legal drinking age and the availability of alcohol to youth from noncommercial sources such as parents, siblings and older peers. Action was encouraged through city councils, school and enforcement agencies, alcohol merchants, business associations and the media. A leadership strategy team changed numerous policies, procedures and practices in the *Communities Mobilizing for Change* group. In 1992 and 1995, approximately 4,500 twelfth graders were surveyed. A telephone survey of 3,095 18- to 20-year olds was conducted in 1992 and repeated in 1995. Response rates were greater than 90%. Compliance check surveys of sales to study confederates who appeared underage were conducted at more than 25 off-sale outlets in 1992 and 1995.

Relative to the comparison communities, the intervention communities achieved a 17% increase in checking age

TABLE 3. *Continued*

Name of study	Behavioral targets	Intervention	Theoretical model	Research design	Results
Community Prevention Trial Program (Holder, 1997; Holder et al., 2000)	<ul style="list-style-type: none"> • Community mobilization • Prevent underage sales to minors 	<ul style="list-style-type: none"> • Media advocacy, community organizing • Enforce underage sales laws • Responsible beverage service training 	Alter the environment of social and structural context of alcohol use	Quasi-experimental, pre- and posttest	<ul style="list-style-type: none"> • Significant reduction in buy attempts resulting in sales in intervention relative to control communities
(Saltz and Stanghetta, 1997)	<ul style="list-style-type: none"> • Illegal sales of alcohol to intoxicated bar and restaurant patrons 	<ul style="list-style-type: none"> • Monitor customer consumption of alcohol • Prevent intoxicated patrons from driving 	Deterrence		<ul style="list-style-type: none"> • No significant impact on serving intoxicated patrons
(Voas, 1997)	<ul style="list-style-type: none"> • Reduce drunk driving 	<ul style="list-style-type: none"> • Intensified DWI enforcement • Media advocacy • Officer training, greater use of breath tests, more checkpoints 	Deterrence		<ul style="list-style-type: none"> • Increased public perception of risk of arrest • Less drinking and driving • Reduction in alcohol-involved traffic crashes (impact in CA not SC)
(Reynolds et al., 1997)	<ul style="list-style-type: none"> • Reduce the density of alcohol outlets 	<ul style="list-style-type: none"> • Local zoning and land use planning approaches 		Quasi-experimental	<ul style="list-style-type: none"> • Local regulations for alcohol outlets and public sites for drinking were changed in all 3 exp. communities exceeding project goals
Massachusetts Saving Lives Program (Hingson et al., 1996)	<ul style="list-style-type: none"> • Reduce alcohol-related traffic deaths and injuries, all ages 	<ul style="list-style-type: none"> • Community organizing, locally developed interventions (e.g., speedwatch, speed signs, speed days, media advocacy, task forces) • School-based education • Police enforcement: under age purchase laws and drunk-driving laws • Media messages 	General social influence and deterrence	Quasi-experimental Matched intervention and comparison	<ul style="list-style-type: none"> • Significant declines in: <ul style="list-style-type: none"> • Alcohol-related traffic (42%) • Traffic deaths (25%) • Injuries/crash (5%) • Reduction in DUI, speeding • Increase in seat belt use
Center for Substance Abuse Prevention (CSAP) (Kaftarian, 2000; Yin et al., 1997)	<ul style="list-style-type: none"> • Reduce alcohol and illegal drug use 	<ul style="list-style-type: none"> • \$350 grants per year • Executive committee mobilized and trained volunteers • Needs assessment • Medical campaigns; community, school and cultural events • Employment and workplace program • Policy and regulatory changes 	Community mobilization	Quasi-experimental 24/251 communities randomly selected for comparison with matched control community surveys; adults, 8th and 10th graders	<ul style="list-style-type: none"> • CSAP communities had greater declines (3-5%) in: <ul style="list-style-type: none"> • Alcohol and illicit drug use 8th graders • Illegal drug use 10th graders • Adult illicit drug and alcohol use • No change females; 8/24 communities showed change

identification of youthful-appearing alcohol purchasers and a 24% decline in sales to potential underage purchasers by bars and restaurants. There was a 25% decrease in the proportion of 18- to 20-year olds seeking to buy alcohol, a 17% decline in the proportion of older teens who provided alcohol to younger teens and a 7% decrease in the percentage of respondents under age 21 who drank in the last 30 days. Among 18- to 20-year olds, there was also a significant decline in arrests for driving under the influence (Wagenaar et al., 2000b).

The *Community Prevention Trial Program* (Holder, 1997; Holder et al., 2000) was a 5-year initiative designed to reduce alcohol-involved injuries and death in three experimental communities. The program used five reinforcing components to change individual behavior by altering the environmental, social and structural contexts of alcohol use. First, community mobilization stimulated public policy interventions by increasing general awareness and concern about alcohol-related trauma. Program initiatives jointly

planned by project organizers and local residents were implemented by the residents. Media, mobilization and intervention activities had specific behavioral objectives tailored to each site. Second, a "responsible beverage server" component sought to reduce sales to intoxicated patrons and to increase local enforcement of alcohol laws by working with restaurants, bar and hotel associations, beverage wholesalers and the Alcohol Beverage Control Commission. Third, a driving-while-intoxicated (DWI) component sought to increase the number of DWI arrests by a combination of officer training, deployment of passive alcohol sensors and media publicized checkpoints. Fourth, media advocacy focused news attention on underage drinking; enforcement of underage sales laws was increased; and clerks, owners and managers were trained to prevent sales of alcohol to minors. Fifth, local zoning powers regarding alcohol outlet density were used to reduce availability of alcohol.

A quasi-experimental evaluation of intervention and comparison communities documented the effects of each

intervention as well as the overall project effects on alcohol-related injuries. During the study, local regulation of alcohol outlets and public sites for drinking changed in all three experimental communities. Compliance checks at 150 outlets where underage persons attempted to purchase alcohol revealed a significant reduction in alcohol purchase by youth.

The DWI reduction component resulted in an increase in news coverage of DWI, additional police enforcement and greater use of breath analyzer equipment. Telephone surveys revealed a significant increase in perceived likelihood of DWI arrest and a reduction in self-reported frequency of driving after drinking. Roadside surveys also revealed reduction in driving after drinking. Alcohol-related crash involvement as measured by single vehicle night crashes declined 10-11% more in the program group than the comparison communities. Alcohol-related trauma visits to emergency departments declined 43% (Holder et al., 2000).

The *Massachusetts Saving Lives Program* (Hingson et al., 1996) was a 5-year (1988-93) comprehensive community intervention designed to reduce alcohol-impaired driving and related traffic deaths. Six program communities were selected based on a competitive proposal process. These were compared with five matched communities whose applications also satisfied selection criteria but were not funded. The rest of Massachusetts also served as a comparison. Outcome data were collected for the period 5 years before and 5 years after the intervention.

In each program community, a full-time coordinator from the mayor's office organized a task force of concerned private citizens and organizations and officials representing various city departments (e.g., school, health, police and recreation). Each community received approximately \$1 per inhabitant per year in program funds. Half the funds were spent to hire the coordinator and the balance was for increased police enforcement and other program activities and educational materials. Voluntary activity was also encouraged. Active task force membership ranged from 20 to 100 persons in each community. An average of 50 organizations participated in each city.

Most initiatives were developed by the communities. The program sought to reduce drunk driving and related risky behaviors such as speeding, running red lights, failure to yield to pedestrians in crosswalks and failure to wear safety belts. To reduce drunk driving and speeding, communities introduced media campaigns, checkpoints, business information programs, speeding and drunk-driving awareness days, speed watch telephone hotlines, police training, high school peer-led education, Students Against Drunk Driving chapters, college prevention programs, alcohol-free prom nights, beer keg registration and increased liquor outlet surveillance by police to reduce underage alcohol purchase. To increase pedestrian safety and safety belt use, program communities conducted media campaigns and police checkpoints, posted crosswalk signs warning motorists of fines

for failure to yield to pedestrians, added crosswalk guards and offered preschool education programs and training for hospital and prenatal staff. Coordinators engaged in numerous media advocacy activities to explain trends in local traffic safety problems and strategies the communities were implementing to reduce traffic injury and death. The proportion of drivers under age 20 who reported driving after drinking in random digit dial telephone surveys declined from 19% during the first year of the program to 9% in subsequent years. There was little change in comparison areas. The proportion of vehicles observed speeding through use of radar was cut in half; there was also little change in comparison cities. There was a 7% increase in safety belt use, a significantly greater increase than found in the comparison area.

Fatal crashes declined from 178 during the 5 pre-program years to 120 during the 5 program years. This was a 25% greater reduction than in the rest of Massachusetts. Fatal crashes involving alcohol declined 42%, and the number of fatally injured drivers with positive blood alcohol levels declined 47% relative to the rest of Massachusetts (90% of fatally injured drivers in Massachusetts are tested annually for alcohol). Visible injuries per 100 crashes declined 5% more in the program than the rest of the state during the program period. The fatal crash declines were greater in program cities, particularly among younger drivers 15- to 25-years old. All six program cities had greater declines in fatal and alcohol-related fatal crashes than did comparison cities or the rest of the state. Interventions varied somewhat by community. This suggests that organizing the community program and combining environmental policy changes and enforcement with theory-based school education programs was more important than any specific initiative in contributing to program success.

In addition to the programs reviewed above, several large community intervention initiatives addressing alcohol and other drug use have been launched. The *Center for Substance Abuse Prevention* provided 251 cities with 5-year grants from 1990 to 1996 to organize community antidrug coalitions.

Awarded approximately \$350,000 per year, each program developed a steering committee, mobilized and trained volunteers, undertook a needs assessment of prevention services and developed a comprehensive prevention plan. Each also implemented media campaigns, community school and cultural events, alternate youth recreation activities, parent and family programs and employment and workplace programs. Policy and regulatory initiatives varied by community but included drug-free and smoke-free school, workplace and other location policies; heightened penalties for drug use possession; lower legal blood alcohol limits for adult and youth drivers; fines for selling alcohol and tobacco to youth; and an evaluation component to assess program implementation and impact on substance use.

Summary evaluations (Kaftarian, 2000; Yin et al., 1997) randomly selected 24 partnerships from a total of 251 and compared them with 24 nonpartnership communities matched on demographic characteristics. Repeat cross-sectional surveys were conducted with 83,473 randomly selected adults, tenth graders and eighth graders. Adults were surveyed at home, and youth were surveyed at school. Substance use rates were compared over an 18-month interval from 1994/1995 to 1996. In the partnership communities, male substance use rates were 3-5% lower at follow-up on five of six outcome measures of regular alcohol and illicit drug use.

When responses of males and females were combined, only one of six outcomes significantly favored the partnerships. This finding persisted with regressions controlling for age, gender and race. However, of the remaining 11 outcomes, all but the smallest were in the predicted direction favoring the community partnership program. When individual partnership-comparison communities were examined, 8 of 24 partnership communities showed some statistically significant reduction in substance use relative to their comparison communities.

Comprehensive Community Interventions to Reduce Behavioral Sexual Risks (Table 4)

The *Mpowerment Project* (Kegeles et al., 1996) was undertaken to reduce sexual risk taking among young gay men. A core group and a community advisory board ran the program. Young male peer outreach workers diffused safer sex messages developed by other volunteers at bars and community and special events and recruited other men into the project, who in turn conducted program outreach and education.

The teams also tried to create new events that would attract young gay men at which safer sex could be promoted. For example, the Mpowerment center offered weekly small group meetings; video, dance and open house parties; rap groups; drop-in hours; picnics; hikes; and bicycle rides. At least 500 men in the study community of Eugene, Oregon, attended these events. These group sessions were presented as a fun way for young gay men to meet other young gay men. Efforts were made to recruit 75-80% of young gay men in the community into the groups. Publicity included articles and advertisements in the gay newspaper.

TABLE 4. Comprehensive community programs to reduce sexual risk taking

Name of study	Behavioral targets	Intervention	Theoretical model	Research design	Results
Mpowerment Project (Kegeles et al., 1996)	Reduce HIV risk behavior among young gay men	<ul style="list-style-type: none"> • Peer-led outreach-safe sex promotion • Small groups and publicity • Publicity campaign in gay press • Care group and community elders advisory board • Clear up misconceptions, eroticize safe sex 	Community mobilization	Quasi-experimental; Santa Barbara, CA compared with Eugene, OR	<ul style="list-style-type: none"> • Unsafe anal intercourse declines from 41% to 30% • No change in comparison communities • 70% to 11% decline in primary partners • 59% to 45% decline in other partners
CDC AIDS Community Demonstration Projects (CDC AIDS, 1999)	<ul style="list-style-type: none"> • Reduce unprotected sex with main partner or other • Reduce anal sex 	<ul style="list-style-type: none"> • Mobilization of community members to distribute and verbally reinforce prevention messages • Small media material featuring theory-based prevention messages • Increased availability of bleach and condom kits 	Behavioral change theory Theoretical model of change	Quasi-experimental compared randomly allocated intervention comparison areas	<ul style="list-style-type: none"> • Reduction in unprotected sex with main and nonmain partners • No change in bleach use • Increase in condom carrying
School/Community Program for Sexual Risk Reduction among Teens (Vincent et al., 1987)	<ul style="list-style-type: none"> • Reduce unintended teen pregnancy and postpone initial voluntary sexual intercourse among never-married teens and preteens 	<ul style="list-style-type: none"> • Mass media • Education of adults • Graduate courses for teachers on reproduction, family planning • Parent-child interaction • Self-esteem in youth • Sex education K-12 • Clergy and parents • Local newspapers and radio promote the program 	Social learning theory	Quasi-experimental community vs other portion of community and other SC counties	<ul style="list-style-type: none"> • Target areas: sharp reduction in pregnancies • 60/1,000 females to 25/1,000
AIDS Prevention for Pediatric Life Enrichment Project (Santelli et al., 1995)	Prevent HIV infection in women	<ul style="list-style-type: none"> • Select outreach controls and community-targeted small media • Role model stories • Condom distribution 	Social learning theory	Quasi-experimental	<ul style="list-style-type: none"> • Increase 30% to 40% in condom use vs 22% to 27% in comparison communities • No change in asking about a sex partner's STD history

Eugene was compared with Santa Barbara, California. Following the intervention, the proportion of men engaging in any unprotected anal intercourse decreased from 41% to 30%. It decreased from 70% to 11% with nonprimary partners and from 59% to 45% with boyfriends. No significant changes occurred in the comparison community.

The *CDC AIDS Community Demonstration Projects* (CDC AIDS Community Demonstration Projects Research Group, 1999) sought to reduce the risk of infection among active injection drug users, female sex partners of male injection drug users, female commercial sex workers, other women who trade sex for money or drugs, youth in high-risk situations, men who have sex with men and residents of census tracts with high rates of sexually transmitted diseases. All sites used a common intervention based on behavioral theories, study community ethnographic research and interventions in prior community studies. The intervention sought to mobilize community members to distribute and verbally reinforce prevention messages, create small media materials featuring theory-based prevention messages in role-model stories and increase availability of condoms and bleach kits. One thousand persons from targeted at-risk communities, other local residents and area business personnel who had regular contact with the targeted population were recruited and trained to distribute intervention materials from July 1991 to June 1994. A total of 585,000 small media materials were distributed containing authentic stories about people from the community who were changing behaviors. The stories emphasized stages of behavior change based on the transtheoretical model. A quasi-experimental cross-sectional design compared randomly allocated intervention and comparison areas. Anonymous field interviews were conducted in 10 cross-sectional waves from 1991 through 1994. Data from 15,205 interviews were analyzed.

By the end of the intervention, more than half the population had been reached by the intervention at least once in the prior 3 months. Significant increases in the intervention relative to the comparison communities were achieved in condom use with a main partner, in condom use with a nonmain partner and in the carrying of condoms.

The *School/Community Program for Sexual Risk Reduction among Teens* (Vincent et al., 1987) was initiated in the western portion of a South Carolina county in 1982 to reduce unintended pregnancies among never-married teens and preteens. It promoted postponement of initial voluntary sexual intercourse and consistent use of effective contraception. Intervention strategies included increasing decision-making skills; improving interpersonal communication skills; enhancing self-esteem; aligning personal values with those of the family, church and community; and increasing knowledge of human reproductive anatomy, physiology and conception.

Adults in the community were trained initially. Two-thirds of district teachers, administrative staff and special service personnel completed at least one university course related to facets of sex education. The trained teachers assisted the project staff in implementing sex education in all grades (kindergarten-12), beginning in 1983. Teachers integrated units of instruction within their biology science and social studies classes. Clergy, church leaders and parents were recruited to attend five-session minicourses with much the same content as given to teachers. Local newspapers and radio promoted program messages. Messages on alcohol, drug abuse, nutrition and smoking were also integrated into the program.

The intervention county was compared with four other counties with similar demographics. The rate of pregnancies per 1,000 females was recorded among females ages 14-17 in each community. Rates prior to the intervention from 1981-1982 were compared with intervention years 1984-1985. There was a sharp reduction during the program period in pregnancies in the target relative to comparison areas: from 60 in 1,000 females to 25 in 1,000 in 1984-1985.

The *AIDS Prevention for Pediatric Life Enrichment Project* (Santelli et al., 1995) was a community-based program to prevent prenatal HIV infection in women that used street outreach and targeted small media to promote condom use. Based on social learning theory, small media publicized HIV risk-reduction messages (e.g., condom use) in the form of role model stories. Stories drawn from focus groups on experiences of persons in the target audience were put into comic books, newsletters, pamphlets and condom envelopes. Three full-time paid street outreach workers and volunteers contacted community residents on street corners, in local shopping areas and through community agencies. In the quasi-experimental time series design, 500 or more face-to-face interviews using a modified street intercept approach were conducted annually in intervention and comparison communities.

Between October 1990 and May 1992, 26,461 street outreach contacts, 26,020 media materials and 65,217 condoms were distributed. The program's name was known by 40% of the respondents by 1992; 36% had contact with street workers. Condom use increased significantly more (from 30% to 40%) in intervention communities than in the comparison communities (from 22% to 27%). No differences, however, occurred over time with respect to inquiring about a sexual partner's history of sexually transmitted disease, rejecting sex for fear of a disease or avoiding sexual contacts when usual partners were not available.

Conclusions

From this review of comprehensive community interventions, several conclusions can be drawn that may have

relevance for college interventions to reduce alcohol-related problems. First, these studies indicate this approach can be effectively applied to a variety of public health problems. Comprehensive community programs consistently yielded significant reductions in alcohol use or related problems.

Second, these studies indicate that health-related behavioral change can be accomplished among college-age adolescents and young adults. The majority of programs (although not all) targeting youth achieved changes in the desired direction. Programs targeting middle-age adults (e.g., the cardiovascular risk reduction programs) had the least differential success, but were implemented in a context of widespread secular changes on program outcomes as were seen in comparison communities. Indeed, in some respects, young people who are in the process of adopting behaviors and lifestyles may be more receptive to intervention than more habituated adults. Moreover, adolescents and young adults may be more sensitive to shifts in behavioral norms because their primary social units involve friends and acquaintances rather than spouses and children. Those strategies aimed at norm change and diffusion of innovation may be more effective in college settings than in more diverse communities because students at a given campus will share a range of characteristics and attributes. Accordingly, the community intervention approach might be specifically appropriate for college intervention programs.

Third, programs are more likely to succeed if they combine environmental and institutional change with theory-based education interventions designed to change individual behavior. This is particularly pertinent to colleges because the administration has influence over aspects of the campus' physical and social environments and many colleges have researchers who are familiar with theory-based educational strategies to promote behavior change.

Fourth, programs that involve community ownership appear to succeed more often than programs imported into the community from the outside. Community development requires a matrix of local organizations and institutions, both public and private. Although these entities are part of most municipalities, colleges also have extensive networks of campus-based student organizations concerned with student life. Accordingly, college administrators desiring collaboration with students around alcohol interventions should have no problem identifying and tapping into student organizations willing to contribute.

Comprehensive community interventions to reduce college alcohol-related problems have not yet been evaluated. A multicomponent college program, which was implemented in the 1980s, achieved little discernible impact (Kraft, 1988), but that program did not involve surrounding communities, public officials or private citizens (Hingson et al., 1997). Without involvement of the communities that surround colleges, intensive multifaceted efforts by colleges may drive

alcohol use into the community or may be undermined by alcohol availability and promotion in the community.

Many questions remain about how best to implement comprehensive college/community interventions to reduce drinking and alcohol-related problems. For example, it needs to be determined whether the behavioral focus should be on drinking practices only or the multiple problems alcohol-using college students pose for themselves and others. The literature on comprehensive community interventions seems to show the greatest impact when the behavioral targets are more focused rather than multifaceted, as were the cardiovascular risk reduction projects.

The locus of decision making and responsibility can vary from the community to colleges or both, and the implementation of this decision-making locus may influence the success of the program. The balance between governmental versus private organizational control or direction could also influence program success, but this has not been studied.

Identifying optimal strategies to mobilize communities for action warrants research attention. Wagenaar et al. (1999) outlined a specific process to mobilize communities that included (1) assessing community interests, (2) building a core base of support in the community, (3) expanding the base, (4) developing a plan of action, (5) implementing the plan, (6) maintaining the effort and institutionalizing it and (7) evaluating and disseminating results. Whether that plausible sequence is the optimal one to follow can be systematically tested. Similarly, the speed and breadth of recruitment into community task forces can be studied. Potential tradeoffs between smaller but more motivated and cohesive task forces versus larger more broadly representative but perhaps less unified work groups can be explored.

The role of evaluators in identifying program interventions needs to be assessed. Many of the projects reviewed in this article had evaluators who actively engaged in problem identification and feedback to the communities being studied about their progress (or lack thereof) in meeting program objectives. How directive program evaluators should be in the process of selecting or modifying program initiatives warrants study. On the one hand, evaluators may have greater access to scientific evaluations of interventions. On the other hand, evaluators may not have as clear an understanding as community members regarding the feasibility of adoption and implementation of specific interventions. Also community ownership in selecting interventions may yield greater motivation to implement them vigorously.

The role of students in formulating and implementing comprehensive programs also deserves research attention. Peer-led educational interventions have shown consistent success among middle and high school students. For example, in Project Northland, peers who participated in planning alcohol-free social events reported less drinking than

did nonparticipants (Komro et al., 1996). Whether similar results will apply among colleges and universities has yet to be determined.

Some interventions, such as Project Northland, involved youth in policy-setting activities. Whether students will be more supportive and compliant with policies they had a role in defining warrants research attention. Whether they will arrive at different and perhaps more effective policy decisions than would city officials or campus administrators also is unknown.

Legal and environmental interventions that influence access to alcohol and enforce laws governing behavior after drinking such as drunk-driving laws have had an influence on college-age persons. Interventions targeting individual knowledge and behavior change have also produced behavior changes, particularly among youth. Comprehensive community college intervention programs may want to include both types of activities. The best balance has yet to be determined. Whether they will produce additive or interactive effects needs to be studied.

References

- CARLETON, R.A., LASATER, T.M., ASSAF, A.R., FELDMAN, H.A. AND MCKINLAY, S. The Pawtucket Heart Health Program: Community changes in cardiovascular risk factors and projected disease risk. *Amer. J. Publ. Hlth* **85**: 777-785, 1995.
- CDC AIDS COMMUNITY DEMONSTRATION PROJECTS RESEARCH GROUP. Community-level HIV intervention in 5 cities: Final outcome data from the CDC AIDS community demonstration projects. *Amer. J. Publ. Hlth* **89**: 336-345, 1999.
- CHOU, C.P., MONTGOMERY, S., PENTZ, M., ROHRBACH, L.A., JOHNSON, C.A., FLAY, B.R. AND MACKINNON, D.P. Effects of a community-based prevention program on decreasing drug use in high-risk adolescents. *Amer. J. Publ. Hlth* **88**: 944-948, 1998.
- COMMIT RESEARCH GROUP. Community Intervention Trial for Smoking Cessation (COMMIT): I. Cohort results from a four-year community intervention. *Amer. J. Publ. Hlth* **85**: 183-192, 1995a.
- COMMIT RESEARCH GROUP. Community Intervention Trial for Smoking Cessation (COMMIT): II. Changes in adult cigarette smoking prevalence. *Amer. J. Publ. Hlth* **85**: 193-200, 1995b.
- CUMMINGS, K.M., HYLAND, A., SAUNDERS-MARTIN, T., PERLA, J., COPPOLA, P.R. AND PECHACEK, T.F. Evolution of an enforcement program to reduce tobacco sales to minors. *Amer. J. Publ. Hlth* **88**: 932-936, 1998.
- FARQUHAR, J.W., FORTMANN, S.P., FLORA, J.A., TAYLOR, C.B., HASKELL, W.L., WILLIAMS, P.T., MACCOBY, N. AND WOOD, P.D. Effects of communitywide education on cardiovascular disease risk factors: The Stanford Five-City Project. *JAMA* **264**: 359-365, 1990.
- FISHER, E.B., AUSLANDER, W.F., MUNRO, J.F., ARFKEN, C.L., BROWNSON, R.C. AND OWENS, N.W. Neighbors for a smoke-free north side: Evaluation of a community organization approach to promoting smoking cessation among African Americans. *Amer. J. Publ. Hlth* **88**: 1658-1663, 1998.
- FORSTER, J.L., MURRAY, D.M., WOLFSON, M., BLAINE, T.M., WAGENAAR, A.C. AND HENNIKUS, D.J. The effects of community policies to reduce youth access to tobacco. *Amer. J. Publ. Hlth* **88**: 1193-1198, 1998.
- GEMSON, D.H., MOATS, H.L., WATKINS, B.X., GANZ, M.L., ROBINSON, S. AND HEALTON, E. Laying down the law: Reducing illegal tobacco sales to minors in central Harlem. *Amer. J. Publ. Hlth* **88**: 936-939, 1998.
- HINGSON, R., BERSON, J. AND DOWLEY, K. Intervention to reduce college student drinking and related health and social problems. In: PLANT, M. AND SINGLE, E. (Eds.) *Alcohol: Minimising the Harm: What Works?* New York: Free Association Books, 1997, pp. 143-170.
- HINGSON, R., MCGOVERN, T., HOWLAND, J. AND HEREEN, T. Reducing alcohol-impaired driving in Massachusetts: The Saving Lives Program. *Amer. J. Publ. Hlth* **86**: 791-797, 1996.
- HOLDER, H. (Ed.) *A Community Prevention Trial to Reduce Alcohol-Involved Trauma*. *Addiction* **92** (Suppl. No. 2): S155-S301, 1997.
- HOLDER, H.D., GRUENEWALD, P.J., PONICKI, W.R., TRENO, A.J., GRUBE, J.W., SALTZ, R.F., VOAS, R.B., REYNOLDS, R., DAVIS, J., SANCHEZ, L., GAUMONT, G. AND ROEPER, P. Effects of community-based interventions on high-risk driving and alcohol-related injuries. *JAMA* **284**: 2341-2347, 2000.
- INSTITUTE OF MEDICINE. *Prevention and Treatment of Alcohol Problems: Research Opportunities*, Washington, DC, National Academy Press, 1989.
- KAFTARIAN, S. *Prevention Works through Community Partnerships: Findings from SAMHSA/CSAP's National Evaluation*, DHHS Publication No. (SMA) 00-3374, Bethesda, MD: Department of Health and Human Services, 2000.
- KEGELES, S.M., HAYS, R.B. AND COATES, T.J. The Mpowerment Project: A community-level HIV prevention intervention for young gay men. *Amer. J. Publ. Hlth* **86**: 1129-1136, 1996.
- KELDER, S.H., PERRY, C.L. AND KLEPP, K.I. Community-wide youth exercise promotion: Long-term outcomes of the Minnesota Heart Health Program and the Class of 1989 Study. *J. School Hlth* **63**: 218-223, 1993.
- KOMRO, K.A., PERRY, C.L., MURRAY, D.M., VELEN-MORTENSON, S., WILLIAMS, C.L. AND ANSTINE, P.S. Peer-planned social activities for preventing alcohol use among young adolescents. *J. School Hlth* **66**: 328-334, 1996.
- KRAFT, D.P. The prevention and treatment of alcohol problems on a college campus. *J. Alcohol Drug Educ.* **34** (1): 37-51, 1988.
- LUEPKER, R.V., MURRAY, D.M., JACOBS, D.R., JR., MITTELMARK, M., BRACHT, N., CARLAW, R., CROW, R., ELMER, P., FINNEGAN, J. AND FOLSOM, A.R. Community education for cardiovascular disease prevention: Risk factor changes in the Minnesota Heart Health Program. *Amer. J. Publ. Hlth* **84**: 1383-1393, 1994.
- PENTZ, M.A., DWYER, J.H., MACKINNON, D.P., FLAY, B.R., HANSEN, W.B., WANG, E. AND JOHNSON, C.A. Multicommunity trial for primary prevention of adolescent drug abuse. *JAMA* **261**: 3259-3266, 1989.
- PERRY, C.L., KEDLER, S.H., MURRAY, D.M. AND KLEPP, K.I. Communitywide smoking prevention: Long-term outcomes of the Minnesota Heart Health Program and the Class of 1989 Study. *Amer. J. Publ. Hlth* **82**: 1210-1216, 1992.
- PERRY, C.L., WILLIAMS, C.L., VELEN-MORTENSON, S., TOOMEY, T.L., KOMRO, K.A., ANSTINE, P.S., MCGOVERN, P.G., FINNEGAN, J.R., FORSTER, J.L., WAGENAAR, A.C. AND WOLFSON, M. Project Northland: Outcomes of a communitywide alcohol use prevention program during early adolescence. *Amer. J. Publ. Hlth* **86**: 956-965, 1996.
- PUSKA, P., TUMIOKHTO, J., SALONEN, J., NISSIEN, A., VIRTAMO, J., BJORKQUIST, S., KLOSKELA, K., NEITTA NAKI, L., TAKALO, T., KOTTKE, T., MAKI, S., SIPILA, P. AND VARVIKKO, P. *Community Control of Cardiovascular Diseases: The North Karelia Project* National Public Health Laboratory of Finland, Geneva: World Health Organization Regional Office for Europe, 1981.
- REYNOLDS, R.I., HOLDER, H.D. AND GRUENEWALD, P.J. Community prevention and alcohol retail access. *Addiction* **92** (Suppl. No. 2): S261-S272, 1997.
- RIGOTTI, N.A., DIFRANZA, J.R., CHANG, Y., TISDALE, T., KEMP, B. AND SINGER, D.E. The effect of enforcing tobacco-sales laws on adolescents, access to tobacco and smoking behavior. *New Eng. J. Med.* **337**: 1044-1051, 1997.

- SALTZ, R.F. AND STANGHETTA, P. A community-wide responsible beverage service program in three communities: Early findings. *Addiction* **92** (Suppl. No. 2): S237-S249, 1997.
- SANTELLI, J.S., CELENTANO, D.D., ROZSENIK, C., CRUMP, A.D., DAVIS, M.V., POLACSEK, M., AUGUSTYN, M., ROLF, F., MCALISTER, A.L. AND BURWELL, L. Interim outcomes for a community-based program to prevent perinatal HIV transmission. *AIDS Educ. Prev.* **7**: 210-220, 1995.
- VARTAINEN, E., PAAVOLA, M., MCALISTER, A. AND PUSKA, P. Fifteen-year follow-up of smoking prevention effects in the North Karelia Youth Project. *Amer. J. Publ. Hlth* **88**: 81-85, 1998.
- VARTAINEN, E., PUSKA, P., JOUSILAHTI, P., KORHONEN, H., TUOMILEHTO, J. AND NISSINEN, A. Twenty-year trends in coronary risk factors in North Karelia and in other areas of Finland. *Int. J. Epidemiol.* **23**: 495-504, 1994.
- VINCENT, M.L., CLEARIE, A.F. AND SCHLUCHTER, M.D. Reducing adolescent pregnancy through school and community-based education. *JAMA* **257**: 3382-3386, 1987.
- VOAS, R.B. Drinking and driving prevention in the community: Program planning and implementation. *Addiction* **92** (Suppl. No. 2): S201-S219, 1997.
- 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. Comm. Psychol.* **27**: 315-326, 1999.
- WAGENAAR, A.C., MURRAY, D.M., GEHAN, J.P., WOLFSON, M., FORSTER, J., 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, 2000a.
- WAGENAAR, A.C., MURRAY, D.M. AND TOOMEY, T.L. Communities mobilizing for change on alcohol (CMCA): Effects of a randomized trial on arrests and traffic crashes. *Addiction* **95**: 209-217, 2000b.
- WINKLEBY, M.A., TAYLOR, C.B., JATULIS, D. AND FORTMANN, S.P. The long-term effects of a cardiovascular disease prevention trial: The Stanford Five-City Project. *Amer. J. Publ. Hlth* **86**: 1773-1779, 1996.
- YIN, R., KAFTERIAN, S., DING, Y. AND JANSEN, M. Outcomes from CSAP's Community Partnership Program: Findings from the National Cross Site Evaluation. *Eval. Prog. Plan.* **20**: 345-355, 1997.

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