

Education

Controlling Injuries Due to Drinking and Driving: The Context and Functions of Education

Bruce G. Simons-Morton, Ed.D., M.P.H.
University of Texas Medical Branch, Galveston, Texas

Denise G. Simons-Morton, M.D., M.P.H.
*Center for Health Promotion Research and Development
University of Texas Health Science Center, Houston, Texas*

The importance of education in motor vehicle crash (MVC) injury control has been the subject of intense debate. Some view education as a failure and a distraction from the more serious business of environmental control of injuries (Robertson et al. 1974; Robertson 1986), while others view education as a necessary element of the dynamic process of altering social norms (Wallack 1984), gaining public support for environmental controls (Moore and Gerstein 1981; Malfetti 1985), and implementing effective injury control interventions (Simons-Morton et al. 1989a). Changing behavior and creating a protective environment are two essential and complementary approaches to the prevention and control of MVC injuries, each of which can be approached through education (Bergman 1982; Moore and Gerstein 1981).

In this chapter we present a conceptualization of the role of education in preventing injuries due to drinking and driving, describe the health problem context necessary for understanding the role of education, discuss the societal context for educational approaches, provide examples of the utility of education in MVC injury control, discuss major issues regarding public education for injury control, and provide recommendations for research. From our perspective, education is the major component of health promotion and an important intervention approach in public health.

The Role of Education

There appears to be a controversy over whether injuries due to drinking and driving should be addressed through changing personal health behavior or through environmental protection (Robertson 1986). In fact, they can and must be addressed through both (Moore and Gerstein 1981). Personal behavior determines whether individuals drink and drive; social and physical environmental factors influence whether individuals drink or drink and drive; and environmental conditions can help decrease injury in those

individuals who suffer MVCs due to drinking and driving. Education has an important role in influencing each of these factors.

Figure 1 shows how education can influence four types of related outcomes: (1) personal alcohol and safety behaviors of at-risk individuals and their proximal others, (2) social norms regarding alcohol and safety behaviors and environmental constraints, (3) environmental factors that influence personal behaviors, and (4) protective environmental factors.

The essential differences between the four avenues for education are who is being influenced (at-risk individuals, the general public, or decisionmakers in organizations, communities, or governments) and what are the objectives (changes in personal health behaviors, societal norms, or environmental conditions). In each case, the ultimate outcome of education is behavior change, either personal health behavior or decision-maker actions, to reduce risk of injury. Behavior change is mediated by knowledge, attitudes, skills, experience, and reinforcement, and is greatly influenced by the larger sociophysical environment.

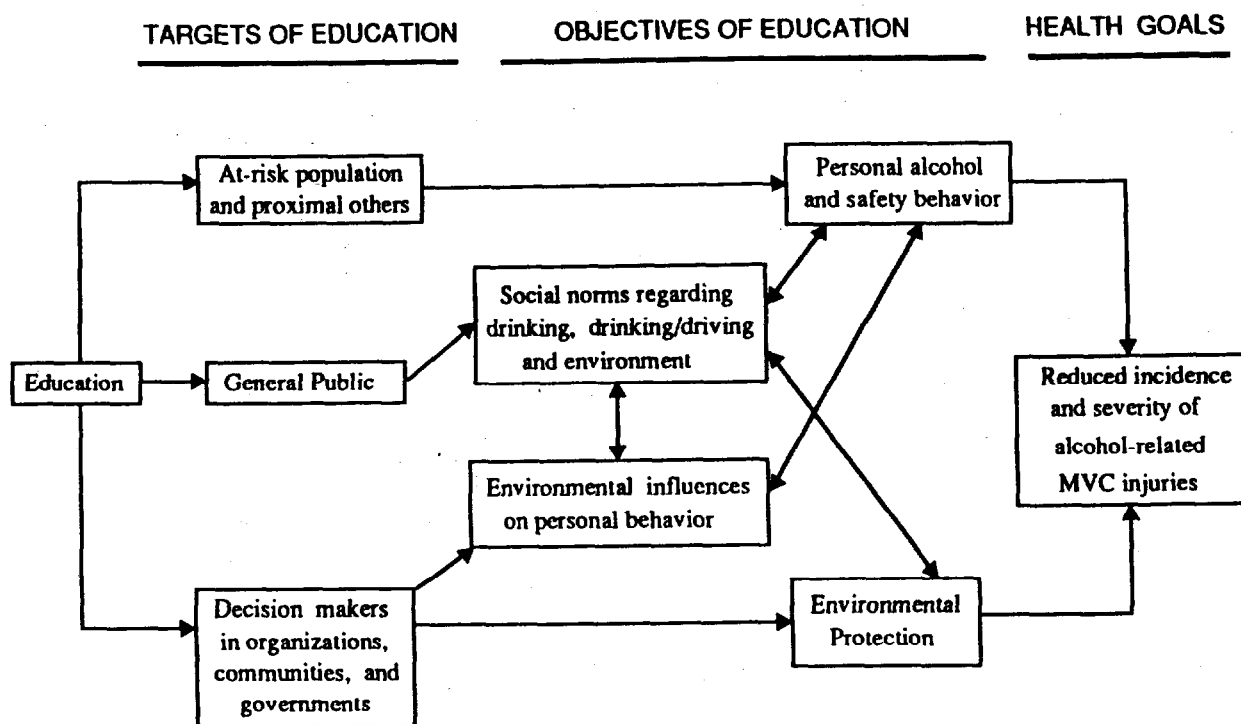


Figure 1. The role of education in reducing motor vehicle crash injury due to drinking and driving.

The Context for Education: Review of the Problem

To understand better the role of education in alcohol-related injury control, it is useful to review briefly the literature on drinking-and-driving injury; drinking and drinking/driving behavior; environmental influences on drinking, drinking/driving, and safety behavior; and environmental protection.

Alcohol and MVC Injury

Injury is the fourth leading cause of death in the United States, and MVCs are the leading cause of injury deaths (Baker 1984). Of the 75,000 U.S. deaths attributable to

alcohol annually, an estimated 32 percent are due to MVCs (Stoudemire et al. 1987). Half of fatal MVCs involve alcohol (NIAAA 1987). Drinking and driving dramatically increases the risk of MVC injury and death (Rubin et al. 1983).

Risk for alcohol-related MVC death is well distributed across population groups (Baker 1984) and affects not only drinking drivers, but also innocent passengers and pedestrians. Adolescents and young adults, however, are at extreme risk. MVC is the leading cause of death for persons age 15-24 years, accounting for 40 percent of all deaths (Malin et al. 1982). Persons age 16-25 years account for about 20 percent of total miles driven but are involved in an estimated 42 percent of all alcohol-related MVC fatalities (Fell 1982). Persons age 18-25 are involved in fatal crashes at a rate four times that of 26- to 35-year-olds (Malin et al. 1982). Males at all ages are at greater risk for alcohol-related MVC deaths, with the disparity in risk between males and females greatest during adolescence and young adulthood (Johnston et al. 1987; Schoenborn 1988).

Substantial evidence shows that impairment of driving ability occurs at blood alcohol concentrations (BAC) below 0.10, and some impairment occurs at less than 0.05 BAC (Moskowitz and Robinson 1988). The relationship between drinking and MVC severity is particularly acute for young (inexperienced) drivers (Malin et al. 1982). Consequently, safe driving may be compromised by the effects of even relatively small amounts of alcohol.

Thus, alcohol-related MVC injury and death are major public health problems affecting all age groups. Adolescents and young adults, especially males, are at particularly high risk and thus are prime targets for educational efforts directed at influencing them and their environments.

Drinking and Drinking/Driving Behavior

Drinking and driving behavior can best be understood in the context of normative patterns of drinking. The percentage of drinkers increases with age from early adolescence into young adulthood. In one study, the percentage who reported ever drinking increased from over 30 percent in eighth grade to over 70 percent by tenth grade and more than 90 percent by twelfth grade (Johnston et al. 1987). About 65 percent of high school seniors and 75 percent of 21- to 22-year-olds had used alcohol in the past 30 days. About 37 percent of high school seniors and 45 percent of 19- to 28-year-olds reported drinking five or more drinks in a row during the prior 2 weeks (Johnston et al. 1987). Hence, despite legal sanctions against drinking, most youths experiment with alcohol, and many underage youths drink regularly. Young males tend to initiate drinking earlier, drink more frequently, and drink greater amounts than females of the same age (Johnston et al. 1987).

In national surveys that asked U.S. adults (18-65 years old) about their drinking during the previous 2 weeks, 20 percent reported abstaining, 40 percent reported drinking fewer than two drinks, 30 percent reported drinking three to four drinks, and 10 percent reported drinking five or more (Thornberry et al. 1986). About 8 percent of adults reported drinking daily, and nearly 25 percent reported drinking five or more drinks in one day at least five times in the past year (Schoenborn 1988). Males at all ages were more likely than females to drink daily, to be heavy drinkers, and to drink and drive (Schoenborn 1988).

Drinking and driving behavior parallels the pattern of alcohol use, placing younger persons at greater risk than older persons. Thirty-four percent of 16-year-old high school students reported having driven after drinking during the last month, and 18 percent of males and 10 percent of females reported doing so weekly (Williams et al. 1986). By age 18, 53 percent of males and 39 percent of females reported having driven after drinking, while 30 percent of males and 11 percent of females reported doing so weekly (Williams et al. 1986).

Table 1. Objectives of education for three targets of education

TARGETS OF EDUCATION	At-risk population and proximal others	General public	Decision makers in organizations, communities and governments	Decision makers in organizations, communities and governments
MEDIATING VARIABLES	Knowledge Attitudes Skills	Knowledge Attitudes Skills	Knowledge Attitudes Skills Actions	Knowledge Attitudes Skills Actions
TYPES OF OBJECTIVES	Personal alcohol and safety behaviors	Social norms regarding drinking, drinking/driving and environment	Environmental influences on personal behavior	Environmental protection
SPECIFIC OBJECTIVES	Decrease or abstain from drinking Refrain from driving after or while drinking Refrain from riding with a drinking driver Discourage others from drinking and driving or riding with a drinking driver	Social nonacceptance of drinking and driving Provision of social alternatives to drinking and drinking/driving Support of environmental controls on drinking/driving Support of environmental protection from MVC injuries Obeyance of alcohol and safety laws Performance of motor vehicle safety practices	Responsible alcohol-server practices Provision of transportation alternatives (e.g., taxi service, free rides) Limited alcohol advertising Higher alcohol cost/taxes Alcohol sales restrictions Open-container laws Drunk-driving laws Seatbelt laws Lower speed limits Law publicity and enforcement	Manufacture of safer motor vehicles Installation of occupant protection devices (airbags, passive restraints) Development of safer roads

Older adults reported driving after drinking less frequently than younger adults, and about half the percentage of females as males reported driving after drinking at least once in the past year (NCHS 1988). Among 18- to 29-year-old males, more than 36 percent reported drinking and driving in the past year (NCHS 1988). Among adults, a small percentage of repeat offenders accounted for a disproportionate burden of the drinking and driving problem (Smith and Falk 1987). The great number of people who occasionally drink and then drive, however, appear to account for most MVC deaths.

Drinking and driving can be viewed as the product of twin social phenomena – excessive dependence on automobiles for transportation and social norms favoring routine consumption of alcoholic beverage. Thus, the problem of drinking and driving cannot be separated from the more general problems of transportation safety and alcohol consumption. Total alcohol consumption is positively associated and a host of social and health problems, including risk of injury and legal problems (Gerstein 1981), and presumably is associated with drinking and driving.

One goal in injury control is to reduce the prevalence of drinking and driving, which may require alteration in the normative patterns of alcohol consumption – the frequency and amounts of alcohol drinking that are socially acceptable and the situations in which it is acceptable to drink (Simons-Morton et al. 1989b). According to Rose (1985), in situations in which a large proportion of the population is at some risk, it is desirable to alter the population mean level of risk factors, “to shift the whole distribution of exposure in a favorable direction” (p.37). Such an approach seems eminently suited to the problem of drinking and driving, for which the population goal would be a downward shift in the

frequency and amount of drinking, the mean number of drinking/driving events, and the number of circumstances in which it is socially acceptable to drink.

Adolescents and Young Adults

A variety of factors that can be influenced by education is associated with alcohol consumption and with drinking and driving among adolescents. These factors include knowledge, skills, expectations, and social norms and acceptance.

Many adolescents overestimate the number of drinks that will impair their ability to drive (Williams and Lund 1986). Adolescents with better social skills (Donovan et al. 1983), some religious affiliation (Donovan et al. 1983; Miller and Nirenberg 1984; Coombs et al. 1985), and higher academic achievement (Donovan, et al. 1983; Onei and Jones 1986) are less likely to drink. Expectations of improved cognitive and driving ability (Onei and Jones 1986) may predispose a person to drink and drive. Students who drink and drive tend to be those who drive in a more deviant manner, have greater access to alcohol and to cars, and engage in more social activities outside the home (Williams and Lund 1986). Adolescents who drink and drive are likely to associate with peers who drink and report that their parents are not important in controlling their behavior (Williams and Lund 1986). Many adolescents feel there are few social alternatives to drinking (Glynn 1981).

Environmental Influences on Behavior

Cost and availability of alcohol and the age of legal drinking are some environmental factors that influence drinking and driving. By raising the minimum age at which alcoholic beverages can be purchased to 21, fatal nighttime accidents involving drivers under age 21 were decreased by 28 percent (Smith and Falk 1987) and motor vehicle fatalities in 18- to 21-year-old drivers were reduced 18 percent (Saffer and Grossman 1987). Higher costs for alcoholic beverages, especially beer, can reduce consumption, especially by adolescents (Stoudemire et al. 1987). Saffer and Grossman (1987) estimated that a 100-percent increase in the taxes on beer would reduce highway mortality by 27 percent. Limiting young persons to daytime driving may also reduce drinking and driving events (Baker 1987).

A range of programs, policies, and practices have been initiated to reduce the prevalence of drinking and driving. These include provision of alcohol-free recreational activities (NHTSA 1987) and alcohol-free gathering places (O'Donnell 1985), designated-driver programs (Apsler et al. 1987), taxicab services, safe ride home programs (Prugh 1986b), and deterrence legislation such as DWI laws. Other environmental changes and laws have been instituted to alter drinking patterns, such as responsible-server programs (Mosher 1987; Saltz 1987), sales restrictions (Mosher 1985; Hacker 1986; Saffer and Grossman 1987), taxes (Mosher and Beauchamp 1983), legal drinking-age requirements (Smith and Falk 1987), and host liability (Prugh 1986a).

Behaviors related to automotive safety are influenced by lower speed limits (Baker 1987; NIAAA 1987) and seatbelt laws (Fisher 1980; Williams and Lund 1986).

Education of decisionmakers in organizations such as schools, restaurants, bars, and alcohol retail outlets is crucial for the widespread adoption of voluntary approaches, and education of legislators and enforcers is important for maintaining existing protective laws and initiating new ones.

Environmental Protections

Several factors that protect against MVC injuries, alcohol-related or not, have been identified. Occupant protection devices—safety belts and airbags—reduce injury in-

cidence and decrease severity of injury (Bigelow 1982; William and Lund 1986). The mandatory installation of airbags in automobiles produced in 1989 and thereafter promises to substantially curtail mortality and morbidity (Williams and Lund 1986). Safer automobile designs can reduce injury incidence in the event of a crash, safer road designs can reduce the likelihood of the most serious collisions, and lower speed limits can reduce injury severity (Moore and Gerstein 1981; Baker 1984, 1987; NIAAA 1987).

Widespread adoption of these environmental protection policies and conditions is an important goal in injury control and one that requires education of the public and of governmental decisionmakers.

Targets and Objectives of Education

The behavior of three groups is important in preventing injury due to drinking and driving: (1) individuals who might drink and drive and their proximal others—peers, parents, and teachers—who may influence their behavior, (2) the general public, and (3) decisionmakers who can adopt or implement alcohol or injury control policies, practices, or programs. Table 1 shows some of the possible objectives of education for each of the three targets.

At-Risk Individuals and Proximal Others

Individuals who drink and who drink/drive form an important target group. As long as alcohol remains highly available, people will drink despite changes in environmental supports for nondrinking behavior. While abstinence may be a desirable goal for some individuals, different behavior goals may be appropriate for others (Simons-Morton et al. 1989b). Depending on the target population, behavior objectives may include (1) delaying initiation of drinking, (2) reducing the frequency of drinking, (3) reducing the amount drunk on each occasion, (4) refraining from drinking before or while driving, (5) refraining from riding with drivers who have been drinking, and (6) discouraging others from drinking and driving or riding with drinking drivers.

Mediating factors for personal behavior change in the individual and proximal others include changes in knowledge about alcohol and its effects, improved social skills, and increases in perceived availability of alternative activities to drinking. Youths should be taught peer resistance skills and skills in selecting one's peer group.

The effects of a specific message, such as don't drink and drive, can be more effective if modeled and reinforced by a variety of sources (Bandura 1986). Parents and other youth leaders can be trained to be more effective supervisors and models, but age peers may be the most important in this regard.

Adolescents and young adults, in particular, can be trained to restrain their friends and acquaintances from driving after drinking. Spouses and siblings can be trained to reinforce family members for not driving after drinking. Workmates and colleagues who socialize can be encouraged to take turns as the designated sober driver.

The Public

The general public is an important target of education because the knowledge, beliefs, attitudes, and practices of the public shape social norms regarding drinking and drinking/driving and dictate public tolerance of governmental policy regarding alcohol use and environmental protections. The task of educating at-risk individuals to moderate their drinking behavior and to not drink and drive might be much easier if the prevailing social norms supported such moderation. Such changes in social norms are important not only

in shaping the attitudes and practices of youths regarding alcohol, but also for maintaining individuals' health behavior changes. Further, the adoption and success of public policies regarding environmental control of and influences on both drinking and environmental protection may be limited by the public's acceptance of these restrictions on personal freedom (Malfetti 1985; Runyan and Earp 1985).

Objectives for the general public can include the following: (1) a public informed about the effects of drinking on behavior and health, (2) social acceptance of only low-risk drinking, (3) adoption of moderating serving practices (e.g., serving food, nonalcoholic beverages, and more dilute forms of alcohol), (4) adoption of social practices that decrease drinking/driving events (e.g., offering rides to intoxicated friends, providing places to sleep after a party), (5) safety-related behaviors such as honoring speed limits and wearing seatbelts, and (6) support of environmental controls for drinking, drinking/driving, and environmental protection (e.g. occupant protection and roadway design).

Decisionmakers

One key to successful injury control is the widespread adoption of quality programs, practices, policies, and environmental protective factors. Hence, the appropriate target of education is often an organizational or governmental decisionmaker whose actions can effect such changes. Such decisionmakers include government representatives and legislators, school administrators, managers and owners of alcohol-serving and-selling establishments, and designers and manufacturers of automobiles.

Decisionmakers can be educated to increase their knowledge about the drinking and driving problem and its importance in relation to other health problems, particularly in relation to other drugs. Decisionmakers must also be convinced that proposed interventions are effective, cost-effective, without substantial social side effects, and without detrimental financial consequences. Further, decisionmakers must be provided with program, practice, and policy options that can be implemented through integration with existing structures. For example, the adoption of a health education curriculum by a school may depend not only on its content and methods, but also on how well it can be integrated into the existing school structure (Parcel et al. 1988). Similarly, practices, policies, and laws that can readily be integrated with those already in existence, and that have public support, may be more likely than others to be adopted.

Environmental influences on drinking and driving include practices in alcohol-serving or-selling establishments. The necessity of these establishments abiding by legal restrictions on sales is self-evident. Other potential contributions are the establishment of taxicab services, designated-driver policies, and trained servers. Server training programs have been highly effective in altering the actions of servers so they discourage further drinking by intoxicated patrons and encourage them to take a safe ride home (Mosher 1987; Saltz 1987). The widespread diffusion of server training programs appears to be warranted.

Depending on their roles, objectives for decisionmakers can include the following:

- Decisionmakers informed about the problem of drinking and driving
- Enforcement of existing laws such as alcohol sales restrictions
- Adoption of policies and practices to decrease drinking and driving events (e.g., server training, taxicab service, designated-driver policy, restrictions on alcohol serving)
- Implementation of educational programs
- Development and manufacture of safer automobiles and roads

- Support of environmental controls for drinking, drinking/driving, and environmental protection
- Passage of alcohol-related or safety legislation

The Process and Quality of Education

Education is a process of facilitating learning and behavior change through the acquisition of new knowledge, attitudes, and skills. A variety of educational approaches, some of which are listed in table 2, is available for health education for personal behavior change, public education, and education for adoption of environmental controls on drinking and environmental protection (Greene and Simons-Morton 1984; Green 1984; Simons-Morton et al. 1989b).

Social marketing of moderate drinking practices can be accomplished by information dissemination and persuasive communications delivered by mass media. Individual education, training, and counseling are available for addressing personal health behavior. Organizational change and policy formation, community organization, citizen advocacy, lobbying, political action, and diffusion can be employed to promote adoption by decisionmakers of environmental controls or environmental protections. While each of these approaches employs unique intervention methods, each is essentially an educational process.

Table 2. Educational approaches for influencing the at-risk population, general public, and decisionmakers.

Teaching
 Training
 Counseling
 Consulting
 Information dissemination
 Persuasive communications
 Citizen advocacy
 Community organizing
 Social action

Education for Personal Behavior Change

The task of education directed toward personal behavior change is to develop in individuals the acquisition of relevant knowledge and the mastery of essential skills that enable them to develop better control over their personal health behavior, and to foster attitudes conducive to their doing so. For injury prevention due to alcohol-related MVCs, both alcohol and automotive safety behaviors are important.

Of all the settings available, the school provides by far provides the best opportunity for alcohol prevention education for youth (Malfetti 1985). School curricula are the foundation of school-based alcohol prevention education. Not all curricula, however, are equal. Of 29 alcohol curricula reviewed by Rundall and Bruvold (1988), all were credited with improving knowledge and 19 with changing attitudes. Curricula that also addressed social norms and social skills, however, were much more likely to change alcohol behavior. Curricula that are most effective include not only information trans-

mission but also personal skills training (Stoudemire et al. 1987) and peer and parental involvement (NIAAA 1987; Hanson 1988). To improve the potential for success, school drug and alcohol prevention programs should focus on changing social norms related to alcohol consumption, should be comprehensive, and should foster collaboration among schools, parents, local service organizations, and other community structures (Stoudemire, et al. 1987; Pentz 1987; Hanson 1988). A number of model school-based programs are available (NIAAA 1987; Marshall, et al. 1985).

The clinical setting provides numerous opportunities for patient education about drinking and driving, particularly during "teachable moments" after MVC injuries have occurred. Providers of clinical care can give patients advice, counseling, information, and other education during both emergency and routine clinical visits (Lewis and Gordon 1983).

Worksite health promotion programs are another possible avenue for educating at-risk individuals about drinking and driving. Most existing worksite health promotion programs, however, address alcohol in the context of drug abuse and from the perspective of treating problem drinkers or alcoholics, rather than preventing workers without alcohol dependence from drinking and driving (Nathan 1983). Moore and Gerstein (1981) recommended that worksite health promotion programs expand their focus to include education on the drinking/driving issue.

A number of important groups—including parents, teachers, youth leaders, peers, spouses, and other significant people in the lives of at-risk individuals—can be educated to reinforce avoidance of drinking and driving. They can be reached through the same avenues as the at-risk population.

Public Education

Education of the general public can be accomplished through media campaigns employing persuasive communications and sound principles of information dissemination. However, media campaigns must compete with more than a billion dollars worth of advertising a year by the alcohol industry, which is a powerful socializing force, particularly for adolescents (Atkin and Block 1980). The success of media campaigns, like that of other approaches to alcohol-related injury control, is likely to be much greater as part of a more comprehensive approach than as a standalone program (Wallack 1984).

Hochheimer (1981), drawing upon the successful experience of the Stanford Heart Disease Prevention Program and other such programs, suggested that media campaigns that provide practical education based on sound communication principles can foster knowledge and attitude changes in the public. Wallack (1984) noted

an isolated mass media campaign will be of little direct value in changing rates of alcohol-impaired traffic crashes. On the other hand, ongoing campaigns may be essential to keep drunk-driving high on the public agenda and to link these problems with broader environmental conditions. Experience with seatbelts in many foreign countries suggests that mass media campaigns designed to increase voluntary use were generally unsuccessful, but were effective in creating a public environment that was more conducive to accepting subsequent legislation requiring seatbelts. (p. 480)

The experience with safety belt promotion is instructive for other alcohol and safety behaviors. Mandatory safety belt laws dramatically increase safety belt use (Williams and Lund 1986), yet nearly half the population does not wear them despite the law. Vigorous enforcement increases use, but still a substantial proportion do not use safety belts (Fisher 1980). Public education is essential if we are to obtain a gradual upward shift in safety belt use. Similarly, a downward shift in the percentage and frequency of

drinking/driving can be facilitated by changes in public awareness of the importance of not drinking/driving and in the social norms that influence this behavior.

Publicity also appears to be an important component of the deterrence approach. Jonah and Wilson (1983) concluded, "DWI legislation that is not enforced and publicized seems to be little better than no legislation at all" (p. 464).

Education for Environmental Change

Environmental protection and environmental control of drinking and drinking/driving do not just happen. The process of gaining passage or adoption of legislative acts, maintaining them in practice, and enforcing them has proven to be an excruciatingly slow and exacting process that requires educating the decisionmakers who control the legislative process.

The adoption of public policy options, such as restricting beverage alcohol sales by service stations or raising the legal age for drinking alcohol, is an inherently political process. Because of the active resistance of the alcohol industry (Cahalan 1987), each initiative must survive on its political merits. Federally mandated requirements for motor vehicle safety designs and features are similarly buffeted by lobbyists for the transportation industry and for the public interest. Before passage is likely, legislators must have evidence of the effectiveness of the initiative, of public support, and of political acceptability. The task of education in the larger political process is to inform decisionmakers so as to facilitate the adoption, implementation, and/or maintenance of policies, practices, or programs to prevent drinking and driving injuries.

While the public health practice and research communities are now strong lobbying forces for injury control policy initiatives, citizen advocacy groups such as MADD and SADD have been given the major share of credit for galvanizing political action with respect to drinking and driving. Citizen advocacy groups have worked primarily to introduce stiffer legal penalties and stricter enforcement of drinking and driving laws. Citizen advocacy has tended to focus both on public education through mass media (primarily mailed printed materials) to generate support and enthusiasm for the anti-drunk driving movement and on legislators through lobbying efforts to generate support for stricter drunk driving penalties. Ross (1985) cautioned that not all of the measures advanced by citizen activists are equally reasonable and are often presented in such a way as to preclude scientific analysis.

At the local level, the role of education is to foster adoption of injury control and environmental protection programs, practices, and policies. Administrators, managers, and trustees of private or public sector organizations (e.g. schools) are the targets. Education serves as one part of the promotion and diffusion of injury control and environmental protection, informing decisionmakers about the use, utility, adoption, and implementation of specific alcohol prevention programs, or alterations in policies and practices regarding onsite use of alcohol. Training of workers responsible for implementing these programs is then needed.

Issues

Following are the major issues regarding education for prevention of alcohol-related MVC injuries.

Personal behavior PLUS environmental protection. Both are important for decreasing drinking/driving injury; education is important in achieving both. The incidence of drinking and driving injuries can be decreased by changes in personal health behavior, in environmental factors that influence drinking and driving, and in environmental

protection. Education is a major aspect of the process of changing personal health behavior and of changing decisionmaker behavior for establishing environmental change.

Education for health behavior change and environmental protection are compatible strategies for preventing drinking/driving and reducing injury and should be seen as complementary rather than competitive. To rely on personal behavior change alone to protect the public against alcohol-related MVC injuries would be poor public health practice, as would the sole reliance on environmental control and protection mandated top-down without adequate public support.

Context and comprehensiveness of education for personal behavior change. Successful prevention of drinking/driving injuries is not likely to occur without changes in current patterns of drinking, particularly among adolescents, young adults, and males. Drinking/driving cannot be understood outside the context of a society in which drinking/driving is a socially accepted behavior, where it may be a natural product of our patterns of drinking and dependence on private automobiles for transportation (Ross 1985). And drinking cannot be understood except by appreciating the dominant socializing influence of the beverage alcohol industry (Cahalan 1987).

Within this context, specific, short-term alcohol prevention programs are unlikely to be successful in changing drinking behavior unless they are part of more comprehensive approaches (Moore and Gerstein 1981; Malfetti 1985; Wallack 1984). The task seems to be to develop broader and more comprehensive approaches to the prevention and control of alcohol-related injuries.

Education of individuals to prevent drinking and driving can be delivered through each of the settings identified by the Federal government for health promotion and disease prevention: schools, worksites, health care institutions, and communities (ODPHP 1982). Schools and communities, by virtue of existing structures, may be the most effective settings for reaching young persons, while health care institutions, communities, and worksites may be more promising for older persons (Moore and Gerstein 1981; Simons-Morton et al. 1989b). Unfortunately, few worksite or health care alcohol prevention programs exist.

Educational quality. Only those educational programs based on sound theoretical principles (with quality implementation) appear to produce the desired effects (Moore and Gerstein 1981; Wallack 1984). There is ample evidence that only those media programs based on sound communication principles can achieve targeted changes in knowledge and attitudes that can contribute to more moderate social norms regarding drinking and promote support for public policy initiatives (Wallack 1984). Similarly, alcohol prevention curricula that are practical and skill-oriented are more likely to be effective than those that are not (Rundall and Bruvold 1988). The literature on media campaigns and on the effects of alcohol-prevention curricula suggests that these approaches are more likely to be effective in the context of more comprehensive programs that include environmental supports for behavior change.

Thus, it is essential to promote only the best educational interventions, as some, especially those based on sound theory, are likely to be more effective than others. In addition, practices, policies, and legislation that are to be disseminated should be evaluated and improved upon.

Effective coalitions for injury control. A number of groups are working vigorously to advance injury control initiatives: citizen advocacy groups, public health practitioners and researchers, and governmental agencies. Cooperative mechanisms need to be developed between citizen advocacy groups and the research community (Ross 1985) and among medical, public health, and traffic-safety communities to alter effectively the national policy agenda with respect to the control of alcohol-related injuries (NHTSA 1989). Better cooperation and coordination between citizen advocacy groups and public

health groups in advancing reasonable and scientifically justifiable public policy initiatives is desirable.

Consistent public health messages. Clear and simple informational messages about alcohol and drinking/driving need to be established and disseminated. Adolescents, at least, do not know the number of drinks that will impair their abilities (Williams et al. 1986). Transportation safety advocates have unintentionally added to the confusion by concerning themselves with "drunk driving" rather than drinking and driving, contributing to the misconception that impaired driving occurs only when the driver is inebriated or legally intoxicated, rather than when the driver has ingested relatively low amounts of alcohol.

If we are truly interested in reducing alcohol consumption, we should develop easy-to-understand guidelines about the frequency and amount of drinking for those who drink. Such guidelines, however, are difficult to develop. The effect of alcohol on behavior is a product of a number of factors, most importantly the number of drinks, but also the available blood volume (which varies with body size), the availability of food to impede absorption, drinking experience, and mood. Individuals appear to range in their sensitivity to the effects of alcohol, making one drink quite intoxicating to some people yet barely noticeable to others. Further, different alcoholic beverages contain different amounts of alcohol, making simple messages difficult. The inability to develop clear and unambiguous messages about safe levels of consumption is an impediment to public education.

Moore and Gerstein (1981) noted the difficulty of establishing boundaries around appropriate drinking practices.

Those whose practices are now well within the boundary may feel outraged that the government could be so irresponsible as to license a kind of drinking that seems very reckless to them. Those whose practices are outside the boundary may feel indignant that the government is discouraging conduct that seems quite safe to them and may complain that the government is interfering (p.99).

Perhaps we can agree on a simple public-information message. Some possible alternative messages include one, or combinations, of the following statements.

If you drink alcohol:

Drink no more than one to two drinks per day. (Recommended in the U.S. Dietary Guidelines – USDA/USDHHS 1985)

Drink no more than one or two times per week.

Never drink five or more drinks on one occasion.

Never drink more than two drinks on one occasion.

Never drink more than one or two drinks before or during engaging in any high-risk activity such as driving or sports.

Recommendations for Research

Educational Methods

Small-scale studies are needed to investigate the efficacy of various methods and theory-based programs of education and the means of improving their efficacy. Appropriate outcome measures in such studies would include changes in mediating factors for

behavior (knowledge, attitudes, skills) and changes in drinking, drinking/driving, and safety behaviors.

With respect to school-based and youth-oriented alcohol prevention programs, we need to address the following research questions:

- What methods are most efficacious in teaching youths peer-resistance skills and how to be proponents of moderation with their peers?
- What methods are most efficacious in training parents, teachers, and youth leaders to be effective supervisors and role models?
- At what grade level should alcohol education begin and what content and skills should be taught at each grade?

With respect to settings that are currently underutilized for drinking/driving prevention, such as worksites and health care organizations, we need to address the following research questions:

- What methods are most efficacious in the worksite for changing drinking, drinking/driving, and safety behaviors?
- What methods are most efficacious in educating patients to change drinking, drinking/driving, and safety behaviors?
- What methods are most efficacious in educating health care providers in how to intervene with their patients?
- How effective can health care providers be as interveners?

With respect to the promotion of environmental control and protection initiatives, we need to address the following research questions:

- By what processes do decision makers make decisions and how can these processes best be influenced by educational methods?
- What methods are most effective for achieving adoption, implementation, and maintenance of environmental controls?

Multicomponent Educational Approaches

Medium-size, population-based studies are needed to test the feasibility and effectiveness of promising, multicomponent educational programs for alcohol-related injury control. Such studies could be conducted in several schools, worksites, health care institutions, or communities. Appropriate outcome measures would include changes in behavior, mediating factors for behavior (knowledge, attitudes, skills), and MVC injuries.

Demonstration Studies

Large community demonstration studies are needed to test the feasibility and effectiveness of comprehensive broad-based approaches to alcohol-related injury control, including school and public education along with environmental control of behavior and environmental protection. Appropriate outcome measures for such studies would include behavior change, MVC injuries, and MVC mortality.

REFERENCES

- Apsler, R.; Harding, W.; and Goldfein, J. *The Review and Assessment of Designated Driver Programs as an Alcohol Countermeasure approach*. DOT HS 807 108, Washington, DC: Department of Transportation, 1987.
- Atkin, C., and Block, M. *Content and Effects of Alcohol Advertising. Report I: Overview and Summary of the Project*. East Lansing, MI: Michigan State University, 1980.

- Baker, S.P.; O'Neill, B.; and Karpf, R.S. *The Injury Fact Book*. Lexington, MA: Lexington Books, 1984.
- Baker, S.P. Intervention strategies: Report of the working group, unintentional injuries. In: Amber, R.W., and Dull, H.B., eds. *Closing the Gap: The Burden of Unnecessary Illness*. New York: Oxford University Press, 1987. pp.190-193.
- Bandura, A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall, 1986.
- Bergman, A.B. Use of education in preventing injuries. *Pediatric Clinics of North America* 29(2):331-338, 1982.
- Bigelow, B. *The NHTSA Program of Safety Belt Research*. SAE Technical Paper Series No.820 797. Warrendale, PA: Society of Automotive Engineers, 1982.
- Cahalan, D. *Understanding America's Drinking Problem*. San Francisco, CA: Jossey-Bass, 1987.
- Coombs, R.H.; Wellisch, D.K.; and Fawzy, F.I. Drinking patterns and problems among female children and adolescents: A comparison of abstainers, past users, and current users. *American Journal of Drug and Alcohol Abuse* 11:315-348, 1985.
- Donovan, D.M.; Jessor, R.; and Jessor, L. Problem drinking in adolescence and young adulthood: A follow-up study. *Journal of Studies on Alcohol* 44(1):109-137, 1983.
- Fell, J. *Alcohol Involvement in Traffic Accidents*. National Highway Traffic Safety Administration, DOT Pub. No. HS-806-269, Washington DC: Supt. of Doc., U.S. Gov. Print. Off., 1982.
- Fisher, F.B., Jr. *Effectiveness of Safety Belt Usage Laws*. Washington DC: NHTSA, US DOT, 1980.
- Gerstein, D.R. Alcohol use and consequences. In: Moore, M.H., and Gerstein, D.R., eds. *Alcohol and Public Policy: Beyond the Shadow of Prohibition*. Washington DC: National Academy Press, 1981.
- Glynn, T.J. From family to peer: A review of transitions of influence among drug-using youth. *Journal of Youth and Adolescence* 10:363-383, 1981.
- Green, L.W. Models of health education and health promotion. In: Matarazzo, J.D., et al., eds. *Behavioral Health: A Handbook of Health Enhancement and Disease Prevention*. New York: John Wiley, 1984.
- Greene, W.A., and Simons-Morton, B.G. *Introduction to Health Education*. New York: Macmillan, 1984.
- Hacker, G.A. Perspectives. *Alcohol Health and Research World* 10(4):41, 1986.
- Hanson, W.B. Effective school-based approaches to drug abuse prevention. *Educational Leadership* 45(6):9-14, 1988.
- Hochheimer, J.L. Reducing alcohol abuse: A critical review of educational strategies. In: Moore, M.H., and Gerstein, D.R., eds. *Alcohol and Public Policy: Beyond the Shadow of Prohibition*. Washington DC: National Academy Press, 1981. pp. 286-335.
- Johnston, L.D.; O'Malley, P.M.; and Bachman, J.G. *National Trends in Drug Use and Related Factors Among High School Students and Young Adults, 1975-1986*. DHHS Pub. No.(ADM)87-1535. Rockville, MD: National Institute of Drug Abuse, 1987.
- Jonah, B.A., and Wilson, R.J. Improving the effectiveness of drinking-driving enforcement through increased efficiency. *Accident Analysis and Prevention* 15:463-481, 1983.
- Lewis, D.C., and Gordon, A.J. Alcoholism and the general hospital: The Roger Williams Intervention Program. *Bulletin New York Academy of Medicine* 59(2):181-197, 1983.
- Malfetti, J.L. Public information and education sections of the Report of the Presidential Commission on Drunk Driving: A critique and discussion of research implications. *Accident Analysis and Prevention* 17(4):347-353, 1985.
- Malin, H.J.; Trumble, J.; Koelber, C.T.; and Lubron, B. Alcohol-related highway traffic fatalities among young drivers - U.S. *Morbidity and Mortality Weekly Report* 31(48):641-644, 1982.
- Marshall, K.M.; Smith-Donals, L.; Cooke, P.; DeLucas, P.; Blasinsky, M.; and Klitzner, M. *Determinants of Youth Attitudes and Skills Towards Which Drinking/Driving Prevention Programs Should be Directed. Volume II: An In-depth Review of Twelve Youth DWI Prevention Programs*. USDOT Pub. No. DTNH 22-84-C-07284. Washington, DC: NHTSA 1985.
- Miller, P.M., and Nirenberg T.D., eds. *Prevention of Alcohol Abuse*. New York: Plenum, 1984.
- Moore, M.H., and Gerstein, D.R., eds. *Alcohol and Public Policy: Beyond the Shadow of Prohibition*. Washington D.C.: National Academy Press, 1981.
- Mosher, J.F. Server intervention: A guide to implementing local and state programs. *Advances in Substance Abuse Supplement* 1:233-251, 1987.
- Mosher, J.F. Alcohol policy and the nation's youth. *Journal of Public Health Policy* 9:295-299, 1985

- Mosher, J.F., and Beauchamp, D.E. Justifying alcohol taxes to public officials. *Journal of Public Health Policy* 4(4):422-439, 1983.
- Moskowitz, H., and Robinson, C.D. *Effects of Low Doses of Alcohol on Driving-Related Skills: A Review of the Evidence*. Pub. No. (DOT) HS 807-280, Washington, DC: National Highway Traffic Safety Administration, 1988.
- Nathan, P. Failures in prevention: Why we can't prevent the devastating effect of alcoholism and drug abuse. *American Psychologist* 38:459-467, 1983.
- National Highway Traffic Safety Administration. *Join the Celebration: Project Graduation*. U.S. DOT HS Pub. No. 807 063, January, 1987.
- National Highway Traffic Safety Administration. *Consensus Report on Impaired Driving*. U.S. DOT HS 807 390, Wash., D.C., March, 1989.
- O'Donnell, M. Research on drinking locations of alcohol impaired drivers: Implications for prevention policies. *Journal of Public Health Policy* 6:510-525, 1985.
- Office of Disease Prevention and Health Promotion. *Prevention* 82. U.S. DHHS, Public Health Service, DHHS (PHS) Pub. No. 82-50157, Washington, DC: DHHS, 1982, pp. 2-14.
- Onei, T.P.S., and Jones, R. Alcohol related expectancies: Have they a role in the understanding and treatment of problem drinking? *Advances in Alcohol and Substance Abuse* 6:89-105, 1986.
- Parcel, G.S.; Simons-Morton, B.G.; and Kolbe, L.J. School health promotion: Integrating organizational change and student learning strategies. *Health Education Quarterly* 15(4):435-450, 1988
- Pentz, M.A. Community organization and school liaisons: How to get programs started. *Journal of School Health* 56(9):382-387, 1987.
- National Institute on Alcohol Abuse and Alcoholism. Petrakis, P.L., ed. *Sixth Special Report to the U.S. Congress on Alcohol and Health from The Secretary of Health and Human Services, January, 1987.*, DHHS Publication No. (ADM)87-1519. Rockville, MD: The Institute, 1987.
- Prugh, T. Social host liability. *Alcohol Health and Research World* 10(4):32-34, 1986a.
- Prugh, T. Arena managers project: A team approach. *Alcohol Health and Research World* 10(4):30-31, 1986b.
- Robertson, L.S.; Kelley, A.B.; O'Neill, B.; Wixom, C.W.; Eiswirth, R.S.; and Haddon, W., Jr. A controlled study of the effect of television messages on safety belt use. *American Journal of Public Health* 64(11):1071-1080, 1974.
- Robertson, L.S. Behavioral and environmental interventions for reducing motor vehicle trauma. *Annual Review of Public Health* 7:13-34, 1986.
- Rose, G. Sick individuals and sick populations. *International Journal of Epidemiology* 14(1):32-38, 1985.
- Ross, H.L. Summary of Topic C—Countermeasures. *Journal of Studies on Alcohol* Supplement No. 10:207-209, 1985.
- Rubin, D.; Hoar, R.; and Klinger, D. *Report on Traffic Accident and Injury, 1981—The National Accident Sampling System*. U.S. DOT, NHTSA Contract No. DTNH22-81-C-07617, Annual Report, March 1983.
- Rundall, T.G., and Bruvold, W.H. A meta-analysis of school-based smoking and alcohol use prevention programs. *Health Education Quarterly* 15(3):317-334, 1988.
- Runyan, C.W., and Earp, J.A.L. Epidemiologic evidence and motor vehicle policy making. *American Journal of Public Health* 75(4):354-357, 1985.
- Saltz, R. The roles of bars and restaurants in preventing alcohol-impaired driving. An evaluation of a server intervention. *Evaluation and Health Professions* 10(1):5-27, 1987.
- Saffer, H., and Grossman, M. Drinking age laws and highway mortality rates: Cause and effect. *Economic Inquiry* XXV:403-417, 1987.
- Schoenborn, C.A. Health promotion and disease prevention: United States, 1985. Data from the National Health Survey Series. *Vital and Health Statistics*. Series 10, No.163, DHHS Pub. No. (PHS) 88-1591. Washington, DC: Supt. of Docs., U.S. Gov. Print. Off., 1988.
- Simons-Morton, B.G.; Brink, S.G.; Simons-Morton, D.G.; McIntyre, R.; Chapman, M.; Longoria, J.; and Parcel, G.S. An ecological approach to the prevention of injuries due to drinking and driving. *Health Education Quarterly*, in press, 1989a.
- Simons-Morton, B.G.; Brink, S.G.; Parcel, G.S.; Simons-Morton, D.G.; McIntyre, R.; Longoria, J.M.; and Chapman, M. *Preventing Acute Alcohol-Related Health Problems Among Adolescents and Young Adults*. Atlanta, GA: Centers for Disease Control, in press, 1989b.

- Smith, G.S., and Falk, H. Unintentional injuries. In: Amber, R.W., and Dull, H.B., eds. *Closing the Gap: The Burden of Unnecessary Illness*. New York: Oxford University Press, 1987. pp. 143-163.
- Stoudemire, A.; Wallack, L.; and Hedemark, N. Alcohol dependence and abuse. In: Amber, R.W., and Dull, H.B., eds. *Closing the Gap: The Burden of Unnecessary Illness*. New York: Oxford University Press, 1987. pp. 9-18.
- Thornberry, O.T.; Wilson, R.W.; and Golden, P.M. Health promotion data for the 1990 objectives: Estimates from the National Health Interview Survey of health promotion and disease prevention: United States, 1985. *Advance Data, Vital and Health Statistics*, NCHS No 126, September 19, 1986.
- USDA, USDHHS. *Nutrition and Your Health: Dietary Guidelines for Americans, 2nd ed.* USDA Home and Garden Bulletin No. 232, Washington, DC: Supt. of Docs., Govt. Print. Off., 1985.
- Wallack, L. Drinking and driving towards a broader understanding of the role of mass media. *Journal of Public Health Policy* 5:470-496, 1984.
- Williams, A.F.; Lund, A.K.; and Preusser, D.F. Drinking and driving among high school students. *The International Journal of the Addictions* 21:643-655, 1986.
- Williams, A.F., and Lund, A.K. Seat belt use and occupant crash protection in the United States. *American Journal of Public Health* 76(12):1438-1442, 1986.