

## **Research Requirements for Underage Drinking and Drinking-and-Driving Prevention**

**ROBERT B. VOAS**

*Pacific Institute for Research and Evaluation*

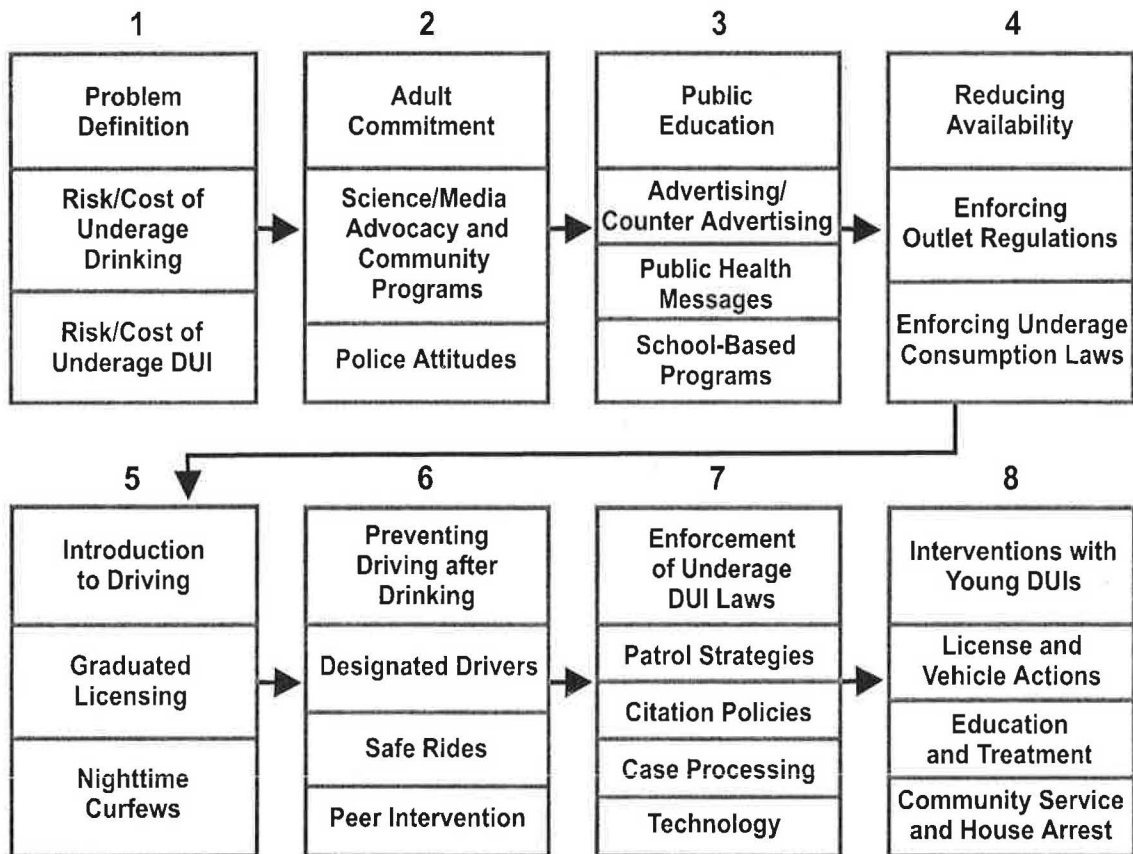
### **GOAL**

To identify the highest priority research studies required to provide public health, traffic safety activists, and government officials with the information required to establish effective programs to reduce underage drinking and drinking and driving.

### **INTRODUCTION**

Before the Surgeon General's Conference on Drunk Driving in 1988 (General Accounting Office, 1989), the field of alcohol and highway safety was fairly well limited to the factors related to impaired driving enforcement of drinking-and-driving laws, adjudication sanctioning, and public information programs related to drinking and driving. Because the minimum legal drinking age laws (MLDAs) have successfully reduced underage highway mortality and morbidity, the alcohol safety research field has expanded to include additional components of the public health field. These components include programs to reduce availability through pricing, modification of the conditions of sale, and the use of zoning regulations to reduce the density of alcohol outlets and exercise some control over their sales policies. As a result, in considering underage drinking and impaired driving, it is necessary to consider a large area of research. To inform this background paper and structure the discussion sessions for the TRB's summer 1999 meetings, it is useful to develop a model into which the research studies reported over the last three decades can be classified. The construction of a model is also useful in directing attention to the users of alcohol safety science. The model should reflect the major operating components of the social/legal system through which society attempts to control underage drinking and drinking-and-driving.

Figure 1 represents an attempt to construct such a system for use in the present report. This model identifies eight major elements of the current prevention system for controlling underage drinking and drinking and driving. The first element encompasses the effort to better identify and understand the underage, alcohol abuse problem and to identify measures useful in evaluating program effectiveness. A second element incorporates the problems and issues related to persuading adults that underage drinking, as well as drinking and driving, is a serious problem and the related problem of recruiting official support for police departments to increase the resources devoted to underage enforcement. A third element includes public education efforts designed to dissuade or deter young people from drinking and driving while impaired. The fourth element includes those programs directed at enforcing underage sales laws with owners of alcohol outlets and enforcing



**FIGURE 1 Eight major elements for controlling underage drinking and drinking and driving.**

underage possession and consumption laws with youths under age 21. A fifth element focuses upon methods for reducing the risk involved in introducing youth into the driving environment. The sixth element draws together those programs that are specifically designed to reduce pressures on drinkers to drive after consuming alcohol. The seventh element covers the strategies and procedures that police use to apprehend underage drinking drivers. And the eighth, and last, component brings together all of those intervention programs that become possible once an offender has been cited and the court or the state gains the authority to control their behavior and administer sanctions designed to prevent recidivism and promote recovery from problem drinking. The research needs in each of these eight elements are outlined in the following sections.

## RESEARCH NEEDS

### Underage Drinking Problem

**Problem Area:** What is known regarding morbidity and mortality related to underage drinking and impaired driving

**What We Know and Don't Know:** That drivers under age 21 are at elevated risk of crash-involvement per mile of exposure is well understood (Zador, 1991; Beirness et al.,

1993; Zador et al., 1999 in press). Recent evidence suggests that age of onset of drinking is an important factor in adult alcohol abuse and adult drinking and driving (Grant, 1998). This conclusion, however, is based on cross-sectional rather than longitudinal data. There is a need to verify Grant's results with longitudinal studies where early drinking is recorded for teenage cohorts and alcohol problems of drinking and driving assessed when the individuals reach adulthood. A review of studies on the costs of underage drinking has recently been issued (Levy et al., 1999, working paper); however, these costs may be underestimated if underage drinking significantly increases mortality and morbidity among adults.

**Research Issues:** The effect of early onset of drinking on adult morbidity and mortality needs to be determined.

**Likelihood of Successful Research:** There are a number of existing data sets that may provide the longitudinal information required.

**Application of Research Results:** A significant factor limiting the resources devoted by governments and police departments to enforcement of MLDA and zero-tolerance laws is the belief that, though underage drinking may be dangerous to youthful binge drinkers, it has relatively small impact on society as a whole compared to street crime and drug use among other adult problems.

**Broader Issues:** A clear demonstration that underage use produces adult morbidity and mortality would provide a stimulus to governmental activity similar to that produced by the knowledge that tobacco addiction begins with underage smoking.

### **Adult Commitment to Reducing Underage Drinking and Impaired Driving**

**Problem Area:** The lack of citizen and official support at the community level for strong efforts to reduce underage drinking and impaired driving.

**What We Know and Don't Know:** At the national level, there has been strong support for laws such as the MLDA and the zero-tolerance law that are designed to reduce underage consumption and impaired driving. At the local level and particularly among police departments, there has been considerably less concern with underage drinking. Enforcement of these laws is often given low priority relative to other law enforcement responsibilities (Voas and Williams, 1986; Preusser et al., 1994; Wagenaar and Wolfson, 1995).

**Research Issue:** How can communities organize to promote increased enforcement of underage drinking laws?

**Likelihood of Successful Research:** Although large numbers of community substance abuse prevention programs have been funded (Robert Wood Johnson, Fighting Back, Center for Substance Abuse and Prevention, Community Partnerships, NHTSA Safe Community Programs), few of these efforts have been adequately evaluated. Recently,

three research projects (Community Trials, Holder et al., 1997a; Communities Mobilizing for a Change on Alcohol Project; Wagenaar et al., 1994; and Saving Lives, Hingson et al., 1996) have provided evidence for the effectiveness of science-based community efforts. This research has also developed initial models for community action (Holder et al., 1997b; Voas et al., 1997a). Additional studies are needed to confirm and expand these models.

**Application of Research Results:** The broad enthusiasm for community projects evidenced by government agency program mandates suggest that effective, validated models of community action will be implemented if they are available. Unless community support can be marshaled to demand stronger enforcement of underage drinking and drinking and driving laws, much of the potential value of this legislation will be unrealized.

### Public Education

**Problem Area:** Mass media efforts to influence underage individuals to reduce consumption and avoid impaired driving.

**What We Know and Don't Know:** There is substantial evidence that advertising sells products. The evidence that it influences underage drinking is more limited (Atkin, 1989; Grube and Wallack, 1994). Overall, there is little evidence that safety campaigns alone have any impact on driving behavior (Wilde et al., 1971). Similarly, the efficacy of school-based programs designed to delay the onset of drinking and reduce problematic consumption has been meager though there is some indication that involving parents may produce some reduction in alcohol consumption.

**Research Issue:** There are several important issues that require additional study:

1. To what extent does advertising and the content of television, movies, and musical entertainment increase underage consumption?
2. What is the efficacy, if any, of counter advertising and of general public health messages in reducing underage consumption?
3. Can a low-cost, effective school-based education program be developed that will reduce underage drinking and impaired driving?

**Likelihood of Successful Research:** Public information efforts occur in a complex media environment, overloaded with messages irrelevant to drinking and drinking-and-driving. Therefore, it has proved to be very difficult, despite considerable expenditure of scientific effort, to demonstrate conclusively that either alcohol advertising significantly increases consumption or that mass media public service messages reduce alcohol problems. At the same time, there is considerable evidence that publicity is an essential element for the successful introduction of new legislation and for the effectiveness of enforcement programs.

**Application of Research Results:** Because of the political success in gaining funds for counter-advertising in the tobacco area, it would appear important to determine where

similar counter-advertising would be effective in reducing alcohol consumption. The \$2 billion national antidrug mass media educational program illustrates the readiness of the public to support public information programs even if there is a lack of evidence for their effectiveness. The current state of knowledge that indicates that mass media campaigns, not linked to specific enforcement or safety programs, are ineffective suggest that the best use of prevention funds is to support media advocacy efforts at the local level where they are closely tied to community prevention activities.

### **Reducing Availability**

**Problem Area:** Laws directed at reducing the availability of alcohol for underage youth fall into two categories: (a) those that target the supplier and (b) those that target youth who illegally purchase and consume alcohol.

**What We Know and Don't Know:** We know that relatively little effort is placed on enforcement of the MLDA's in most communities in the nation, and that the numbered citations of underage users is significantly higher than the numbered citations of outlets for selling to those underage customers (Toomey et al., 1996; Wagenaar and Wolfson, 1995). There is, however, evidence that where enforcement occurs, the ease with which young people obtain alcohol is reduced (Grube, 1997).

**Research Issue:** What type and level of enforcement will produce a high level of refusal to sell to youth under age 21 by off- and on-premises outlets? What laws and enforcement techniques are most effective in deterring underage youth from consuming alcohol?

**Likelihood of Successful Research:** There is substantial reason to believe that well-publicized, energetic enforcement of age-21 sales laws will significantly reduce sales to minors. More problematic is the success of research directed at improving methods for detecting and apprehending underage drinkers. A particularly difficult problem is presented by binge drinking that normally occurs for those under age 21 away from adult supervision.

**Application of Research:** Laws against sales to underage youth and consumption by youth are in place; therefore, any effective measures for reducing sales to minors or for reducing underage drinking are likely to be implemented, providing that the community has been organized to take action and to support enforcement efforts. The effectiveness of any program to reduce sales and underage consumption is highly dependent on the local political will to commit significant resources to that effort. Thus, the success of these measures is dependent on the area "Adult Commitment to Reducing Underage Drinking and Impaired Driving."

### **Introduction to Driving**

**Problem Area:** Reducing risk among novice drivers.

**What We Know and Don't Know:** It is well-established that novice drivers are at particularly high risk for crash involvement whether drinking or not drinking. If drinking, they are particularly vulnerable to impairment. We also know that there is strong evidence that requiring a period of restricted driving to introduce novices to the driving environment appears to reduce crash involvement (Frith and Perkins, 1992; Langley et al., 1996; Preusser et al., 1984). What is less clear is the relative value of the various elements of current graduated licensing systems. For example, there appears to be evidence for the value of a nighttime curfew as a part of the graduated licensing program (Ferguson et al., 1996; Williams and Preusser, 1997). However, McKnight et al. (1983) found that the nighttime curfew in Maryland did not reduce crashes among nighttime novice drivers but did serve to motivate a reduction in daytime crashes in order to qualify for nighttime driving.

**Research Issues:**

1. To what extent are graduated licensing programs that do not include a nighttime curfew effective?
2. To what extent are police enforcing graduated licensing laws?
3. To what extent are current driver education programs effective in reducing alcohol-related crashes among novice drivers?

**Likelihood of Successful Research:** With a general trend for states to enact graduated licensing programs, there should be a number of states applying this concept in different ways. This should offer a good opportunity to evaluate differing provisions in the law.

**Application of Research Results:** Parents tend to strongly support the concept of graduated licensing. Therefore, there is a good chance that effective programs will receive support at both the state and community levels.

**Broader Issues:** There has long been a controversy regarding the effectiveness of driver education in reducing crash risk among novice drivers. In general, it has been difficult to demonstrate that driver education has a safety benefit. It is best justified as a method for training youth to the point where they can begin to operate a vehicle on the roadway. Because high schools are overloaded with educational demands, the provision of driver education within the school remains a controversial subject. Because of the expense, behind-the-wheel training has tended to move out of the high school into private driving schools. Whether the didactic educational materials that remain in driver education programs in the schools have any value needs to be determined.

**Preventing Driving After Drinking**

**Problem Area:** Includes those programs designed to prevent underage individuals who have been drinking from driving.



**What We Know and Don't Know:** Designated driver and safe ride programs have been widely used throughout the country, but separate evaluations for underage drivers have not been conducted. Though Roeper and Voas (1999) have presented evidence that suggests that underage drivers are making greater use of designated drivers than are their adult compatriots, Fell, Voas, and Lange (1997) have presented evidence from roadside surveys that the designated driver concept is widely used. However, those who act as designated drivers and those who use the services of such drivers, use a modified version of the basic concept that allows the designated driver to consume limited amounts of alcohol. Further, designating a driver is frequently postponed to the point where all potential designated drivers have been drinking (Lange et al., 1998). A major issue on which there is almost no data is the question of whether the availability of a designated driver or of a safe ride encourages drinkers to consume more alcohol, thereby making them more vulnerable to other consequences of abusive drinking even if they are protected from drinking and driving. McKnight et al. (1984) found that high school youth were more ready to intervene with their peers who were drinking than were adults.

**Research Issues:** Are designated driver and safe ride programs effective in reducing drinking and driving by underage youth? Do they encourage drinking by sending a mixed message regarding the no-consumption provisions of the MLDA or by encouraging youth, who accept these services, to drink more because they will not be driving? Does peer intervention training result in reduced drinking-and-driving by underage youth?

**Likelihood of Successful Research:** Research on designated driver and safe ride programs will be difficult among underage youth. Although consumption is illegal, youth tend to drink in locations where they are unsupervised (e.g., parks, beaches, or in private homes where parents are absent) and where it would be difficult to provide safe rides or encourage designated driver services. Follow-ups to the original McKnight studies on peer intervention should be possible; however, since these should take place within a school setting.

**Application of Research Results:** The widespread use of the Drug Abuse Resistance Education program and other efforts to discourage drug and alcohol use through classroom programs suggest that a peer intervention program and curriculum that had been shown to be effective would be likely to be adopted in most schools.

**Broader Issues:** The reasonably widespread use of limousines funded by parents for prom graduation and other special high school events is generally unsupported by significant evidence that this procedure reduces alcohol-related crashes. A better test of the value of this activity could be important to parental support for such programs.

### **Enforcement of Underage Driving Under the Influence Laws**

**Problem Area:** Drivers under age 21 in all 50 states are now subject to a 0.02 blood alcohol content (BAC) limit. This area is concerned with (a) the adequacy of these laws, (b)

the level at which they are being enforced; and (c) the extent to which the motor vehicle departments and the courts are imposing the requisite license penalties on youthful offenders.

**What We Know and Don't Know:** We know that there is substantial evidence that zero-tolerance laws work (Blomberg, 1992; Hingson et al., 1994; Hingson et al., 1991). On the other hand, there is considerable evidence that several zero-tolerance laws were hastily drafted and lack critical components that act as a barrier to their enforcement. We are also aware that enforcement of zero tolerance varies significantly between the states.

**Research Issues:**

1. Are there provisions in the current zero-tolerance laws that make them unenforceable?
2. Are the police enforcing zero-tolerance laws?
3. What patrol strategies are most likely to identify underage drinking drivers?
4. What detection methods are most likely to identify young drivers who have been drinking?
5. What citation policies and court processing methods are most conducive to strong enforcement of zero-tolerance laws?
6. How can police officers be induced to use passive sensing and preliminary testing to enhance zero tolerance enforcement?

**Likelihood of Successful Research:** The variety of current zero-tolerance laws provides significant opportunity to determine the factors that lead to the effective enforcement of this underage drinking and driving law. The principal problem for investigators will be to find police departments willing to try novel procedures for apprehending underage drinking drivers.

**Application of Research Results:** Although all 50 states now have zero-tolerance laws, there should be a significant opportunity to implement changes in these laws that are suggested by the research results. While the interest of police departments in enforcing underage drinking and driving laws is limited by the other priorities they must accommodate, where community support is available, it should be possible to persuade officers to implement new enforcement policies and procedures that show promise of increasing the effectiveness of zero tolerance enforcement.

**Broader Issues:** The enforcement of underage zero-tolerance laws highlights the basic issue confronting law enforcement officers in using chemical tests as the basis for enforcement actions. Low BAC levels in healthy youthful drivers will be difficult to detect because they will not generally appear to be measurably impaired. Almost all current enforcement is based on detecting impairment, therefore the zero-tolerance laws challenge the current driving under the influence (DUI) system by requiring the officer to respond to evidence of drinking rather than evidence of impairment. Ultimately, this



should put pressure on police departments to modify their current DUI arrest policies for individuals under age 21.

### **Intervention with Young DUIs**

**Problem Area:** Once a youthful offender has been identified and cited for a drinking-and-driving offense, there is an opportunity to exercise control over the individual to insure participation in one or three types of programs designed to reduce future drinking-and-driving

1. Incapacitation through license suspension or vehicle impoundment;
2. Educational and/or treatment programs; and
3. Community service or house arrest programs.

**What We Know and Don't Know:** There is ample evidence that suspension of the driver's license is an effective way of reducing recidivism and crash involvement by incapacitating, at least in part, the DUI offender. The negative aspect of this procedure is that it is difficult to enforce the license suspension sanction. As a result, youthful offenders continue to operate vehicles and get in crashes, albeit, at a lower rate than if not suspended. Vehicle impoundment has an effect over and above suspension alone in reducing recidivism (Voas et al., 1997b and 1998; DeYoung, November 1997). Education and/or treatment programs have a 7 to 9 percent impact in reducing recidivism over and above that of license suspension alone (Wells-Parker et al., 1995). Jail and/or community service has been shown to have relatively little effect on recidivism among adult DUIs (Zador et al., 1988; Nichols and Ross, 1989). However, the effect of jail and community service on underage drivers is unknown. House arrest has also been shown to be effective for adult drivers, but its impact on underage drivers is unknown (Jones et al., 1996). Additional attention needs to be given to the impact of systems proven for the adult drivers when applied to drivers under age 21. Relatively how effective is license suspension, vehicle impoundment, educational treatment, community service, or house arrest for this younger group?

**Research Issue:** Determine effectiveness with drivers under age 21 of sanctions demonstrated to impact recidivism and crash involvement of adults.

**Likelihood of Successful Research:** Although the extent to which the new zero-tolerance laws will be enforced in the 50 states is unknown, to the extent that they are effectively implemented, additional numbers of underage drivers should come under the authority of the motor vehicle department or the courts. This should open up opportunities to study the effectiveness of suspension, treatment, and community service with this age group.

**Application of Research Results:** Because of the general concern with underage drinking and drinking and driving, adults are generally willing to see underage drinking drivers

receive reasonable penalties. Thus, it should be possible to implement sanctions shown to be effective in reducing recidivism and crash involvement among youth.

**Broader Issues:** Though national polls such as those conducted by NHTSA suggest that adults are willing to apply reasonable sanctions to underage drivers, it is likely that there will be significant resistance to criminalizing youthful offenders. Thus, it is expected that, ultimately, most states will adopt administrative sanctioning procedures focusing on license suspension rather than treating zero-tolerance citations as if they were an impaired driving offense. This may limit the available sanctions to license suspension and education programs that are generally favored for underage individuals. It is possible, however, that house arrest may be a very effective sanction for underage drivers if adults are willing to see that imposed on this age group. Additionally, the alcohol safety interlock would appear to be an appropriate sanction for young drivers apprehended drinking and driving. The principal issue will be the potential cost of the device and the question of whether the youth has his or her own vehicle or is driving the family vehicle.

## SUMMARY

There are a large number of issues pertaining to underage drinking and drinking and driving that need additional research work. Because potential research areas are so broad, and the availability of federal funds appears to be limited, it is important to develop some priorities to guide funding agencies and investigators interested in entering the underage drinking and drinking and driving field.

## REFERENCES

- Atkin, C. K. Advertising and Marketing: Mass Communication Effects on Drinking and Driving. In *Surgeon General's Workshop on Drunk Driving: Background Papers*, Washington, D. C., Dec. 14-16, 1988. U. S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General, Rockville, Md. 1989, pp. 15-34.
- Beirness, D. J., H. M. Simpson and D. R. Mayhew. Predicting Crash Involvement Among Young Drivers. In *Alcohol, Drugs and Traffic Safety-T92. Proceedings of the 12th International Conference*. (H. D. Utzelmann, G. Berghaus, and G. Kroj, eds.) Cologne, Verlag TUV, Rhineland, Germany, 1993, pp. 885-890.
- Blomberg, R. *Lower BAC Limits for Youth: Evaluation of the Maryland .02 Law*. DOT HS 806 807. U. S. Department of Transportation, Washington, D. C., 1992.
- DeYoung, D. J. *An Evaluation of the Specific Deterrent Effect on Vehicle Impoundment on Suspended, Revoked and Unlicensed Drivers in California*. Final Report No. DOT HS 808 727, NHTSA, U. S. Department of Transportation, Washington, D. C., Nov. 1997.
- Fell, J., R. B. Voas, and J. E. Lange. Designated Driver Concept: Extent of Use in the USA. *Journal of Traffic Medicine*, Vol. 25, No. 3-4, 1997, pp. 109-114.

Ferguson, S. A., W. A. Leaf, A. F. Williams, and D. F. Preusser. Differences in Young Driver Crash Involvement in States with Varying Licensure Practices. *Accident Analysis and Prevention*, Vol. 28, 1996, pp. 171–80.

Frith, W. J., and W. A. Perkins. *The New Zealand Graduated Driver Licensing System*. Ministry of Transportation, New Zealand, 1987.

*Surgeon General's Workshop on Drunk Driving: Background Papers, Dec. 14–16, 1988*. GAO, Office of the Surgeon General, U. S. Department of Health and Human Services, Public Health Service, Washington, D. C., 1989.

Grant, B. The Impact of Family History of Alcoholism on the Relationship Between Age at Onset of Alcohol Use and DSM-III Alcohol Dependence. *Alcohol Health and Research World*, Vol. 22, No. 2, 1998, pp. 144–147.

Grube, J. W. Preventing Sales of Alcohol to Minors: Results from a Community Trial. *Addiction*, Vol. 92, Supplement 2, S251–S260, 1997.

Grube, J. W., and L. Wallack. Television Beer Advertising and Drinking Knowledge, Beliefs, and Intentions Among School Children. *American Journal of Public Health*, Vol. 84, No. 2, 1994, pp. 254–259.

Hingson, R., T. Heeren, and M. Winter. Lower Legal Blood Alcohol Limits for Young Drivers. *Public Health Reports*, Vol. 109, No. 6, 1994, pp. 739–744.

Hingson, R., J. Howland, T. Heeren, and M. Winter. Reduced BAC Limits for Young People (Impact on Night Fatal) Crashes. *Alcohol, Drugs and Driving*, Vol. 7, No. 2, 1991, pp. 117–127.

Hingson, R., T. McGovern, J. Howland, T. Heeren, M. Winter, and R. Zakocs. Reducing Alcohol-Impaired Driving in Massachusetts: The Saving Lives Program. *American Journal of Public Health*, Vol. 86, 1996, pp. 791–797.

Holder, H. D., R. F. Saltz, J. W. Grube, A. J. Treno, R. I. Reynolds, R. B. Voas, and P. J. Gruenewald. Summing Up: Lessons from a Comprehensive Community Prevention Trial. *Addiction*, Vol. 92, Supplement 2, S293–S301, 1997a.

Holder, H. D., R. F. Saltz, A. J. Treno, J. W. Grube, and R. B. Voas. Evaluation Design for a Community Prevention Trial: An Environmental Approach to Reduce Alcohol-Involved Trauma. *Evaluation Review*, Vol. 21, No. 2, 1997b, pp. 140–165.

Jones, R. K., J. H. Lacey, A. Berning, and J. C. Fell. Alternative Sanctions for Repeat DWI Offenders. *Proc., 40th Annual Meeting of the Association for the Advancement of Automotive Medicine*. Association for the Advancement of Automotive Medicine, Des Plaines, Ill., 1996, pp. 307–315.

Lange, J. E., R. B. Voas, and P. O'Rourke. What Is a Designated Driver Anyway? Results of a California Survey on Definitions and Use of Designated Drivers. *Journal of Traffic Medicine*, Vol. 26, No. 3-4, 1998, pp. 101-108.

Langley, J. D., A. C. Wagenaar, and D. J. Begg. An Evaluation of the New Zealand Graduated Driver Licensing System. *Accident Analysis and Prevention*, Vol. 28, No. 2, 1996, pp. 139-146.

Levy, D. T., T. R. Miller, K. Stewart, and R. Spicer. Underage Drinking: Immediate Consequences and Their Costs. 1999, working paper.

McKnight, A. J., P. Hyle, and L. Albrecht. *Youth License Control Demonstration Project*. DOT HS 7 01765, NHTSA, U. S. Department of Transportation, Washington, D. C., 1983.

McKnight, A. J., R. W. Mason, K. McPherson, and J. F. J. Oates. *Evaluation of Peer Intervention Training for High School Alcohol Safety Education*. NHTSA Contract No. DTNH22-82-C-06036, NHTSA, U. S. Department of Transportation, Washington, D. C., 1984.

Nichols, J. L., and H. L. Ross. The Effectiveness of Legal Sanctions in Dealing with Drinking Drivers. In *Surgeon General's Workshop on Drunk Driving: Background Papers*. Office of the Surgeon General, Public Health Service, U. S. Department of Health and Human Services, Washington, D. C., 1989, pp. 93-112.

Preusser, D. F., R. G. Ulmer, and C. W. Preusser. *Obstacles to Enforcement of Youthful (Under 21) Impaired Driving*. NHTSA Technical Report No. DOT-HS-807-878, NHTSA, U. S. Department of Transportation, Washington, D. C., 1994.

Preusser, D. F., A. F. Williams, P. L. Zador, and R. D. Blomberg. The Effect of Curfew Laws on Motor Vehicle Crashes. *Law and Policy*, Vol. 6, 1984, pp. 115-128.

Roeper, P. J., and R. B. Voas. Underage Drivers Are Separating Drinking from Driving. *American Journal of Public Health*, Vol. 89, No. 5, 1999, pp. 755-757.

Toomey, T. L., C. Rosenfeld, and A. C. Wagenaar. The Minimum Legal Drinking Age: History, Effectiveness, and Ongoing Debate. *Alcohol Health and Research World*, Vol. 20, No. 4, 1996, pp. 213-218.

Voas, R. B., H. D. Holder, and P. J. Gruenewald. The Effect of Drinking and Driving Interventions on Alcohol-Involved Traffic Crashes Within a Comprehensive Community Trial. *Addiction*, Vol. 92, Supplement 2, S221-S236, 1997a.

Voas, R. B., A. S. Tippetts, and E. Taylor. Temporary Vehicle Immobilization: Evaluation of a Program in Ohio. *Accident Analysis and Prevention*, Vol. 29, No. 5, 1997b, pp. 635–642.

Voas, R. B., A. S. Tippetts, and E. Taylor. Temporary Vehicle Impoundment in Ohio: A Replication and Confirmation. *Accident Analysis and Prevention*, Vol. 30, No. 5, 1998, pp. 651–655.

Voas, R. B., and A. F. Williams. Age Differences of Arrested and Crash Involved Drinking Drivers. *Journal of Studies on Alcohol*, Vol. 47, No. 3, 1986, pp. 244–248.

Wagenaar, A. C., D. M. Murray, M. Wolfson, J. L. Forster, and J. R. Finnegan. Communities Mobilizing for Change on Alcohol: Design of a Randomized Community Trial. *Journal of Community Psychology*, CSAP special issue, 1994.

Wagenaar, A. C., and M. Wolfson. Deterring Sales and Provision of Alcohol to Minors: A Study of Enforcement in 295 Counties in Four States. *Public Health Reports*, Vol. 110, No. 4, 1995, pp. 419–427.

Wells-Parker, E., R. Bangert-Drowns, R. McMillen, and M. Williams. Final Results from a Meta Analysis of Remedial Interventions with DUI Offenders. *Addiction*, Vol. 90, No. 7, 1995, pp. 907–926.

Wilde, C. J. S., J. L. Hoste, D. Sheppard, and G. Wind. Road Safety Campaigns: Design and Evaluation. In *Organization for Economic Co-Operation and Development*, Paris, France, 1971, pp. 75.

Williams, A. F., and D. F. Preusser. Night Driving Curfews for Young Drivers. In *Proc., 14th International Conference on Alcohol, Drugs and Traffic Safety – T97, Annecy, Sept. 21-26*. (C. Mercier-Guyon, ed.) Vol. 3. Annecy, France: Centre d'Etudes et de Recherches en Médecine du Trafic, 1997, pp. 1043–1048.

Zador, P. K., A. K. Lund, M. Field, and K. Weinberg. *Alcohol-Impaired Driving Laws and Fatal Crash Involvement*. Insurance Institute for Highway Safety, Washington, D. C., 1988.

Zador, P. L. Alcohol-Related Relative Risk of Fatal Driver Injuries in Relation to Driver Age and Sex. *Journal of Studies on Alcohol*, Vol. 52, No. 4, 1991, pp. 302–10.

Zador, P. L., S. A. Krawchuk, and R. B. Voas. Alcohol-Related Relative Risk of Driver Fatalities and Driver Involvement in Fatal Crashes in Relation to Driver Age and Sex: An Update Using 1996 Data. *Journal of Studies on Alcohol*, 1999.