Effects of Legislative Reform to Reduce Drunken Driving and Alcohol-related Traffic Fatalities

RALPH W. HINGSON, ScD
JONATHAN HOWLAND, PhD
SUZETTE LEVENSON, MPH

Dr. Hingson is Professor and Chief, Social and Behavioral Sciences, Boston University School of Public Health. Dr. Howland is an Assistant Professor at Boston University School of Public Health. Ms. Levenson is Assistant Research Professor at Boston University School of Public Health.

Requests for tearsheets to Dr. Hingson, Boston University School of Public Health, 85 East Newton Street, Boston, MA 02118-2389.

Synopsis

From 1980 through 1985, considerable progress was made across the Nation in reducing drunken driving and fatal automobile crashes. More than 400 chapters of local citizen groups concerned with reducing drunken driving were formed. New media coverage, measured in number of stories, increased fiftyfold from 1980 to 1984. More than 500 legislative reforms were passed. All States now have adopted a legal drinking age of 21. Many also adopted criminal and administrative per se laws and instituted penalty increases for drunken driving. By 1985, the total number of fatal crashes declined to 39,168, a decrease of 6,116, or 16 percent, from the 1980 level of 45,284. Single-vehicle fatal crashes occurring at night, those most likely to involve alcohol, declined by 20 percent, with 3,674 fewer crashes in 1985 than in 1980. Among teenage drivers, declines in fatal crashes were steeper: Fatal crashes decreased 26 percent, and single-vehicle night fatal crashes were down 34 percent.

After 1984, however, the number of new citizen groups established and the number of stories appearing in the media began to decline. In 1986, after decreasing for several years, the number of fatal crashes rose 5 percent, and single-vehicle night fatal crashes rose 7 percent, up 1,060 from 1985. Among teenage drivers, the increase in single-vehicle night fatal crashes was even higher, up 17 percent. In 1987, single-vehicle night fatal crashes declined slightly but still remained higher than in 1983, 1984, or 1985. Legal changes, while helpful in reducing drunken driving crashes, may not be sufficient to achieve optimal long-term declines.

To sustain the progress of the early 1980s, we need to:

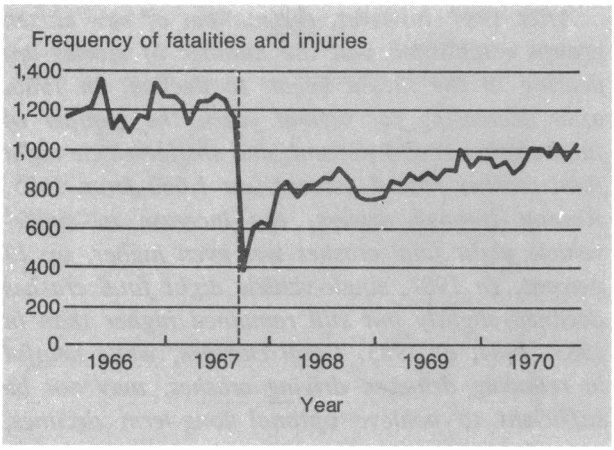
- *Refocus community and media attention on the drunken driving problem.*
- *Increase police enforcement and public support for enforcement of laws against drunken driving.*
- *Heighten educational and enforcement efforts that target risky traffic behaviors more common among drunken drivers—particularly speeding and failure to wear seatbelts.*
- *Develop educational efforts aimed at all segments of the population to increase informal social pressure to discourage drunken driving and riding in vehicles with drivers who are drunk.*

Traffic accidents remain the leading cause of death among persons ages 1 to 34; 52 percent of the 46,050 traffic fatalities in 1986 involved a driver or pedestrian who had been drinking. Without renewed attention to the problems posed by drunken driving, we may be unable to sustain the dramatic progress of the early 1980s.

A GROUNDSWELL OF PUBLIC CONCERN about the drunken driving problem occurred between 1980 and 1985, and for good reason. Traffic accidents are the leading cause of death among our Nation's youth, ages 1 to 34 (*1*). Fifty-two percent, or 23,987, of the 46,050 traffic fatalities recorded in 1986 involved a driver who had been drinking (*2*). Drunken drivers not only place themselves at greater risk of crash involvement, but 20 to 40 percent of the people killed in traffic accidents in which a driver was drunk are persons other than the drunken driver: passengers, pedestrians, or drivers of other vehicles.

During the early 1980s, citizens across the country began demanding an end to this waste of human life. From 1980 to 1985, more than 400

Figure 1. Effects of the enactment of the British Road Safety Act of 1967 on fatalities and serious injuries in the United Kingdom



SOURCE: Ross 1973, Copyright by the University of Chicago Press. Reprinted with permission.

NOTE: Data combined for Friday nights, 10 pm to midnight; Saturday mornings, midnight to 4 am; Saturday nights, 10 pm to midnight; and Sunday mornings, midnight to 4 am. Corrected for weekend days per month and with seasonal variations removed.

local chapters of citizen groups such as Mothers Against Drunk Driving (MADD) were founded. News stories about the problem increased fiftyfold (*3*).

Between 1981 and 1986, 729 changes in laws were made in an effort to reduce fatal crashes involving drunken drivers (S. Hatos, U.S. Department of Transportation, personal communication, 1987). More than 40 States adopted criminal per se legislation. According to criminal per se laws, if a driver has a blood alcohol level above .10 (four to five drinks on an empty stomach), the driver is legally under the influence. Almost half of the U.S. States passed administrative per se laws. Administrative per se laws permit the drivers' licenses of drivers with blood alcohol levels above .10 to be suspended from the time of arrest until trial. In addition, many States increased the penalties for drunken driving: stiffer fines, suspension of licenses, and jail sentences for repeat offenders and for those involved in traffic accidents resulting in an injury or fatality (*4*).

From 1980 to 1985, when media attention, community organization, and legislative activity peaked nationwide, the number of fatal crashes declined 16 percent, from 45,284 in 1980 to 39,168 in 1985. Single-vehicle night fatal crashes, those most likely to involve alcohol, declined even more, down 20 percent, from 18,277 to 14,603. Among drivers in the high-risk 15- to 19-year-old group, the declines were even greater: Single-vehicle night fatal crashes declined 34 percent, with 1,285 fewer crashes occurring in 1985 than in 1980 (*5,6*).

Effects of Drunken Driving Laws

Several explanations have been offered for these dramatic reductions. First, the laws themselves may have contributed to the declines. Evaluation of drunken driving laws is constrained, however, because most States do not obtain blood alcohol information on all drivers involved in fatal crashes. Because the key dependent variable is not precisely observed, researchers have used surrogate measures, such as single-vehicle night fatal crashes. Based on estimates from States that comprehensively test alcohol levels of drivers in fatal crashes, 60 to 70 percent of single-vehicle night fatal crashes involve intoxicated drivers, compared with 33 percent of other fatal crashes.

However, single-vehicle night crashes account for less than half of the fatal traffic accidents involving intoxicated drivers, prompting some researchers to caution about the imprecision of such surrogate measures, particularly in short-term studies of small jurisdictions (*7*). Also, when several related laws are enacted within a short period of time, it is difficult to attribute effects to a single specific intervention. In addition, variables such as unemployment rates, use of seatbelts, and rates of speeding, which can all influence statistics on alcohol-related crashes, are seldom if ever controlled analytically in research evaluating drunken driving interventions.

Nonetheless, there is evidence to suggest that legal changes have produced declines in alcohol-related traffic fatalities. Well-controlled studies of increases in the legal drinking age revealed that although effects varied from State to State, in States that raised their drinking ages, night fatal crashes in targeted age groups declined 10 to 15 percent relative to States that did not (*8–11*).

An analysis of national traffic data from 1978–85 by the Insurance Institute for Highway Safety indicated that administrative per se laws, on average, reduced night crashes 9 percent relative to States that did not pass such legislation. Criminal per se laws against drunken driving and increased penalties were each accompanied by 6-percent declines in night fatal crashes relative to States that did not pass such laws. Most States have criminal per se laws against drunken driving, but only half have administrative per se laws. The Institute estimated that if all States passed such laws, 2,600 fewer fatal crashes would occur annually (*12*).

Police enforcement of drunken driving laws and court conviction rates also increased in numerous States. Quasi-experimental community studies have

shown that increased police enforcement of drunken driving laws is associated with declines in crashes (*13–15*).

Social Sanctions

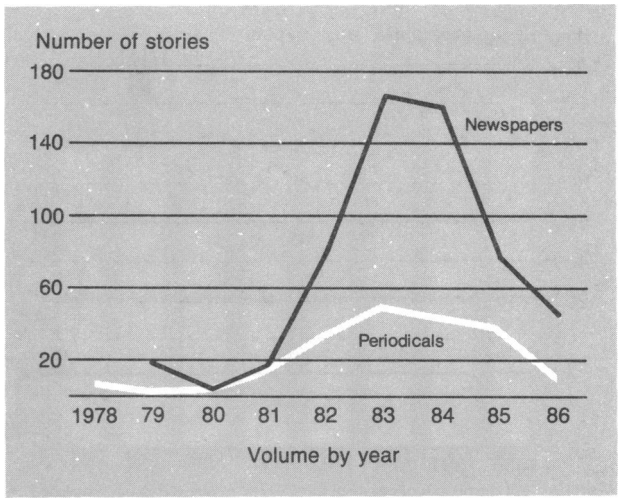
Perhaps as important as these formal legal countermeasures was the emergence of informal social pressure that discouraged drunken driving. Media attention and political lobbying often preceded new laws. Annual surveys conducted in Massachusetts from 1981 to 1985 revealed that the proportion of drivers who said they would not care at all if their best friends found out that they had been arrested for drunken driving declined from 25 percent to 12 percent (*16*). At the same time, the proportion of drivers who reported driving after five or more drinks in the preceding month declined from 18 percent to 6 percent. During that period, from 1981 to 1985, Massachusetts experienced marked fatal crash declines similar to the national trends. It should be noted that reported drunken driving and night fatal crash trends began to decline in Massachusetts and in many other States even before major legal changes occurred. Thus, the informal social pressures that stimulated the passage of drunken driving laws also may have produced reductions in drunken driving.

Warning Signs Progress May Fade

Based on the experience in Great Britain (fig. 1) and in several other countries (*1*), declines in fatal crashes after the passage of drunken driving laws can be temporary. This situation can occur if public discussion of the problem diminishes and if people become aware that the chances of being caught by the police are extremely low.

Data suggest that this temporary decline could happen in the United States as well. The number of new citizen groups formed that were concerned with drunken driving peaked in 1983 (*3*). The number of news and feature stories about drunken driving decreased sharply after 1984 (*6*) (fig. 2). After several years of decline, single-vehicle night fatal crashes rose 7 percent in 1986, while other fatal crashes rose 3 percent (fig. 3). Among teenage drivers, the increase was even greater; teenagers experienced a 17-percent increase in single-vehicle night fatal crashes, with a 6-percent increase in other fatal crashes. Our projections closely parallel U.S. Department of Transportation estimates, which show an overall increase of 5 percent in the number of drivers involved in fatal crashes who had been drinking and an increase among teenage drivers of 14 percent in 1986 compared with 1985 (*2*). Data from 1987 indicate slightly fewer single-vehicle night fatal crashes than in 1986 among all ages and among teenage drivers, but the overall total is still 5-percent higher than in 1985, and the teenage total is still 9-percent higher than in 1985.

Figure 2. Volume of national newspaper and periodical coverage of drunken driving, by year



Newspaper volume based on count of stories in the National Newspaper Index. Includes New York Times, Los Angeles Times, Wall Street Journal, and Washington Post. Periodical volume based on magazine index.

SOURCE: Reference 3.

What Can Be Done To Sustain Declines?

It is not inevitable that the effects of drunken driving laws must fade. Several steps can be taken to maintain the national momentum in reducing drunken driving fatal crashes.

First, efforts are essential to keep the public's attention focused on this issue through local community organization and media attention. Each year, new cohorts of drivers enter the high-risk teenage driving category. It is not clear whether these new cohorts were influenced by the media attention and public discussion about drunken driving in the early 1980s. Consequently, we must continue to heighten awareness among this group. School-based education programs led by peers have been successful in reducing other health-compromising behaviors among adolescents (*17–19*) and may hold particular promise in the drunken driving area. But the programs aimed at youth must be accompanied by general programs for all age groups. Otherwise, teenagers may be given the erroneous impression that adults believe it is unsafe for teens to drink and drive, but it is an acceptable

Figure 3. Fatal single vehicle night crashes, United States, all ages, 1980–87

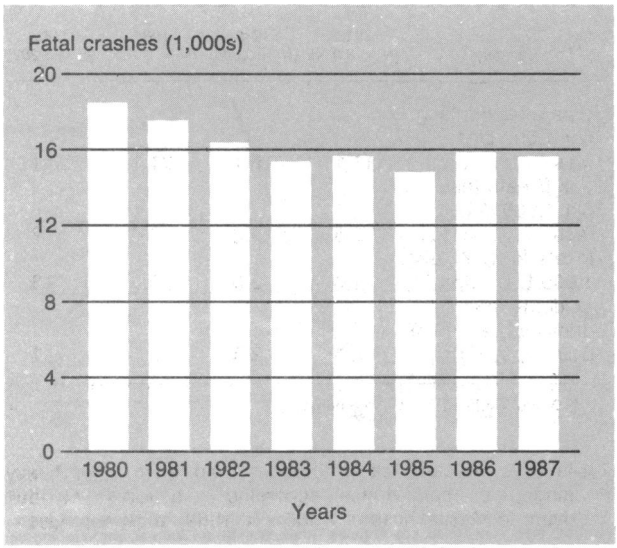
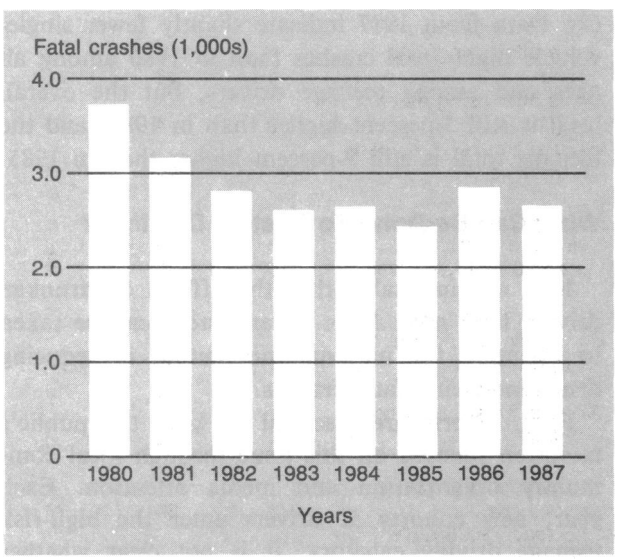


Figure 4. Fatal single vehicle night crashes, United States, teenages, 1980–87



risk for adults. Such an impression would only convey the message that drunken driving, like smoking, is a symbol of adult status.

Second, police enforcement of drunken driving laws must be increased. In recent surveys of the New England States, only one-quarter of the drivers in the sample believed it is very likely that drunken drivers will be stopped by the police, even though a majority of drivers believe arrested drunken drivers will be convicted and punished (*6*). In those New England surveys, only 3 arrests for drunken driving occurred for every 1,000 drunken driving trips reported by respondents (table 1). We must consider whether 3 arrests per 1,000 drunken driving trips can serve as a credible deterrent.

Increasing police enforcement will require both a substantial expenditure of financial resources to mobilize more officers at high-risk times and locations (namely, weekend nights on high-speed roads) and the cultivation of public support for more enforcement. Despite the low levels of arrest, a sizable minority of drivers in New England believe police enforcement of drunken driving laws is adequate. Efforts are needed to make the public aware that more enforcement can be effective (*13–15*) and that appropriately conducted, active police enforcement is a public service, not an infringement of personal liberty.

Third, we must not shift attention from other risky traffic behaviors that are more prevalent among drunken drivers. In the New England surveys, respondents who reported driving after five or more drinks in the past month, when compared with those who never reported much driving after drinking, were

- 10 times more likely to drive after marijuana and other drug use,
- twice as likely to report speeding 20 or more miles per hour over the limit and running red lights in the previous week,
- one-quarter as likely to wear seatbelts,
- four times more likely to be given a traffic ticket for violations other than drunken driving, and
- five times more likely to have been involved in a crash resulting in an injury in the past year (table 2).

An intensive analysis of Maine's 1981 comprehensive drunken driving laws revealed that sharp initial declines in fatal crashes following enactment of the laws were compromised by a shift in police enforcement, after the enactment, away from speeding enforcement (*16*). State police arrests for speeding declined from 31,000 the year the laws passed to 10,000 2 years later. During that time, the proportion of drivers traveling 65 miles per hour or more on 55 mph posted roads almost doubled. Night fatal crashes, which had declined 33 percent the year after the laws were passed, returned to the previous level by the third year. When Maine officials responded by initiating a speeding crackdown in January 1985, fatal crashes again began to decline, dropping 16 percent in 1985 relative to 1984 (fig. 5).

In a 10-year retrospective study of the impact of the national 55 mph speed limit, the National Research Council concluded that this legislation reduced traffic fatalities initially by 3,000 to 5,000 per year and by 2,000 to 3,000 per year a decade after enactment (*20*). Because of their poor sensory-motor coordination and reaction time, drunken drivers may be particularly vulnerable to crashes at high speed.

Maine's experience unfortunately may be a precursor of the national experience. In 1987, 38 States raised their speed limits to 65 mph on rural interstate highways. A recent U.S. Department of Transportation report indicates that during the first 9 months, traffic fatalities *increased* 23 percent on rural interstates. At the same time, fatalities *declined* 13 percent on urban interstates and 5 percent on other roads in those States where speed limits were not raised (*21*). Benefits of strict drunken driving laws and strict enforcement of those laws may be compromised if States relax their speed limits and their enforcement of speed limits.

Fourth, we recommend the development of programs aimed at increasing informal social pressures not to drive drunk. Too often the public response to traffic problems is to delegate them to the police. An effective but less often pursued deterrent to drunken driving is social disapproval by one's peers. As noted earlier, declines in fatal crashes in many States began prior to the passage of drunken driving laws, as the public debated the problems posed by drunken drivers (*16*).

In addition, other behaviors that contribute to alcohol-related traffic fatalities, such as pedestrian intoxication or riding with a drunken driver, should be targeted. For example, every year approximately 4,000 persons who are passengers riding with a drunken driver are killed in crashes. Getting into a car with a drunken driver indicates tacit acceptance of the driver's behavior. Every effort must be made to persuade people not to ride with intoxicated drivers and to provide alternative transportation.

Social pressure has been shown to mediate risky behavior in other areas. Community-wide, multistrategy interventions for changing behavior related to heart disease risk factors (for example, smoking, diet, alcohol consumption, and sedentary lifestyle) have demonstrated long-term success. Large-scale controlled studies in Finland, California, and Minnesota assessed programs that target high-risk groups and the total community via the media, schools, workplaces, and civic organizations (*22–24*). Significant positive behavior changes were reported across socioeconomic and risk factor strata in the target communities relative to comparison communities. These studies indicate the potential for sustaining behavior change by developing a community consensus about a problem. Establishing this kind of program requires a substantial commitment of time, energy, and financial resources, not only from Federal and State governments, but also from grassroots public and private organizations and local communities. Whether such programs can successfully achieve long-term change

Table 1. Drunk driving enforcement in New England, 1982–85

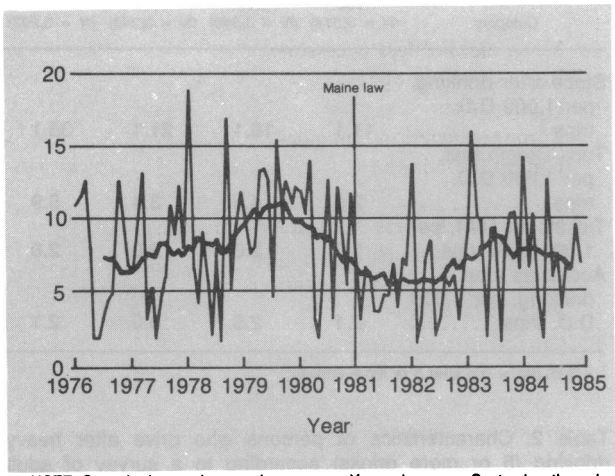
Category	1982 (N = 3,314)	1983 (N = 3,340)	1984 (N = 3,248)	1985 (N = 3,282)
Stops after drinking, per 1,000 D.D. trips [1]	11.1	16.1	21.1	33.1
Took Breath test, per 1,000 D.D. trips	2.5	4.6	3.4	5.9
Tickets for DWI, per 1,000 D.D. trips	1.0	2.0	2.0	2.8
Accidents after drinking, per 1,000 D.D. trips	2.1	2.5	3.0	2.1

[1] D.D. trip = trip after 5 or more drinks.

Table 2. Characteristics of persons who drive after heavy drinking (5 or more drinks) according to a survey of adult drivers in Massachusetts, 1985 and 1986, in percentages

Other risky behaviors	Times drove in previous month after heavy drinking: 0 (N = 1,758)	1–3 (N = 88)	More than 4 (N = 30)
Previous month			
Drove after using marijuana	4	18	41
Drove after using other drugs	3	4	27
Wore seatbelts 90 percent of the time	43	22	11
Previous week			
Ran a red light	8	12	18
Speed 20 mph over limit	15	39	32
Previous year			
Driving violation other than drunk	11	29	40
Driver in crash	9	19	19
Driver in crash resulting in injury	1	2	5
Strongly oppose—			
Seatbelt law	18	26	26
Safe roads act (drunk driving law)	9	17	70
55 mph speed limit	11	12	35

Figure 5. Fatal single vehicle night (SVN) crashes per nighttime vehicle miles traveled and annual fatal and SVN crash frequencies, Maine, 1976-85



NOTE: Smoothed curve is a moving average. Years shown are September through August.

in social norms about drunken driving warrants careful study.

Finally, in addition to measures that aim to separate drinking and driving, policies can restrict the availability of alcohol to reduce drinking, restrict access to vehicles among groups likely to drink, and make vehicles and roadways safer and thereby reduce alcohol-related traffic deaths (see box).

Taxation, dram shop laws, minimum drinking ages, server and host liability, land use laws governing the location of alcohol outlets, and prohibitions on advertising alcoholic beverages can affect the driver's access to alcohol. Increasing taxes on alcohol has been associated with reduced drinking, specifically among teenagers (*25-27*), and with declines in fatal crashes (*28*).

Also, States that delay licensure among teenagers have fewer traffic deaths among the targeted age groups, without any apparent increase in the rate of fatalities once teenagers reach driving age (*29,30*). Teenagers are overrepresented among nighttime traffic fatalities, and night fatal crashes disproportionately involve alcohol. In recent years, 12 States have adopted nighttime driving curfews for young drivers, and curfews have been shown to result in substantial reductions in crashes among 16-year-olds (*31*). Expanding public transportation or otherwise providing alternatives to automobiles, in conjunction with measures that restrict access to vehicles among young, high-risk drivers, might further increase the effectiveness of driver age and curfew restrictions.

In 1984, more than 90 percent of vehicle occupants killed in crashes involving drunken drivers were not wearing seatbelts. Since that time, 33 States, representing over 80 percent of the U.S. populations, have adopted mandatory seatbelt legislation. It has been estimated that by the end of 1986, occupant deaths declined 5 to 10 percent in States that had seatbelt laws compared with States that did not have such laws, saving 1,000 lives (*32,33*). However, because there is evidence that persons who drive drunk are also least likely to adopt seatbelt use (*33,34*), the potential benefits of these laws on reducing drunken driving fatalities may not have been fully realized.

In the 1960s, Federal laws established vehicle design safety standards. Included were requirements for the installation of seatbelts, energy absorbing steering columns, head restraints, and side door beams. Several studies suggest that these interventions have been effective. An analysis by Graham and Garber suggests Federal safety standards for vehicle construction have resulted in reductions of 15 to 35 percent in traffic fatalities (*35*). A study by Robertson concludes that some 37,000 fewer deaths occurred between 1975 and 1978 than would have been expected without the Federal standards (*36*). The effectiveness of roadway design in preventing traffic fatalities is suggested by the fact that the crash rates on interstate highways are considerably lower than on secondary roads (*2*). The full benefits of new safety standards, such as those requiring airbags or other automatic restraints in new vehicles, may take several years to realize, however, because those persons most likely to drive after heavy drinking tend to drive older cars (*37*).

Conclusion

Some researchers have hypothesized that low levels of police enforcement and difficulties inherent in the ability of police to identify drunken drivers compromise the long-term potential for increased penalties or measures to facilitate court conviction to deter drunken driving (*1*).

However, we contend the drunken driving laws of the 1980s did not occur outside of a larger social context, nor do they exert their effects only through fear of apprehension and punishment. Laws are an expression of emerging social norms. In this sense, they are statements by society of new standards of acceptable behavior (*38*). In responding to changes in social norms, as opposed to only fear of apprehension, the individual can become the monitor of his or her own behavior and,

through individual actions and attitudes, the disseminator of behavioral change. Peers can also monitor each other's behavior and exert influence by confirming new norms.

We suggest that drinking and driving laws should be viewed within the context of the development of social norms about the appropriateness of drinking and driving. The process begins with the perception of drunken driving as a social problem and progresses to social activism and the formation of the political consensus required to enact legislation. Public debate about the law raises the issue in the public's consciousness and may independently stimulate behavior change. The legislation itself can have the immediate effect of deterring drunken driving by reason of fear of apprehension. This deterrent effect, however, can dissipate in the long run, particularly if media attention to the law and enforcement of the law slacken. But the effects of the law in anchoring new social attitudes and norms may continue.

This sequence of events is not, of course, predestined. Public concern about drunken driving may wane before social norms become firmly established. We have seen, for example, a gradual erosion in compliance with the 55 mph speed limits, and in 1987, 38 States passed legislation raising speed limits on some of their roads. New norms about drinking and driving are not inevitable, but the process of perceiving a social problem and of enacting and enforcing legislation to address the problem must be viewed within the context of changing public attitudes and beliefs.

Viewing the law as an element in the process of social change has implications for how we implement and evaluate drunken driving legislation. To the extent that laws function to disseminate and reinforce social norms about drunken driving, outcome measures of the impact of laws should not only examine fatal crash trends, but they should also examine attitudes about the laws and their enforcement, perceived dangers of drunken driving, and social pressure not to drive drunk, as well as behavioral variables. The periods of pre- and post-law observations should be extended to allow time for normative change to occur and to observe when it occurred relative to the passage of the law. This extension would permit an assessment of whether the law initiates or reinforces normative change.

If laws contribute to social change by way of the evolution of behavioral norms, then the implementation of these laws should be accompanied by activities aimed at accelerating social change. Legal interventions should be accompanied by increased police enforcement as well as educational programs and community organization aimed at all strata of the driving population. Those programs should heighten informal social pressure not to drive drunk and should disseminate information about behavioral alternatives to drinking and driving.

The legislative reforms of the 1980s, such as raising the legal drinking age, enactment of criminal and administrative per se laws, and increases in penalties, as well as public discussion about drunken driving and its dangers, have all helped reduce drunken driving across the Nation. Progress has been made and further progress can be made in reducing alcohol-related traffic deaths and injuries. But we should not be lulled into complacency simply because efforts in the early 1980s proved

Strategies to reduce traffic fatalities and injuries associated with drunk driving

Make alcohol less accessible
Raise drinking age
Higher taxes
Zoning restrictions on sales
Happy hour laws

Make vehicles less accessible or necessary
Raise taxes on vehicles
Increase public transportation
Raise driving age
Curfews
Interlock system for driver

Make driving environment safer
Make crashworthy vehicles
  airbags
  automatic seat belts
Reduce speeds
Widen lanes, better marking, banking
Fewer two-lane, high-speed roads
Seatbelt laws
Improve EMS and medical care

Dissuade drivers from drinking
Education
General deterrence
Increased fines
Greater police enforcement
Longer license suspension
Increase convictions

Specific deterrence
Treatment and re-education
License revocation, etc.

successful in reducing the number of fatal crashes. The drunken driving problem will quickly re-emerge if we do not continuously engage in efforts to keep public attention focused on this issue and develop a strong social consensus that driving after heavy drinking and other risks, such as speeding and not wearing seatbelts, are unacceptable behaviors that pose a threat to drunken drivers and to others as well.

References

1. Ross, H. L.: Deterring the drinking driver: legal policy and Social Control. D. C. Heath and Company, Lexington, MA, 1982.
2. U.S. Department of Transportation: Fatal Accident Reporting System 1986. Publication No. DOT HS 807 245. National Highway Traffic Safety Administration, Washington, DC, March 1988.
3. McCarthy, J., Wolfson, M., and Baker, D.: The founding of local citizen groups opposing drunken driving. *In* Ecological models of organizations, edited by G. R. Caroll. Ballinger Press, Cambridge, MA, 1988, pp. 71-84.
4. National Commission Against Drunk Driving: Progress report on recommendations proposed by the Presidential Committee on Drunk Driving. Publication No. DOT HS 807 043. U.S. Department of Transportation, Washington, DC, Dec. 19, 1986.
5. Hingson, R., Howland, J., Morelock, S., and Heeren, T.: Effects of legal penalty changes and laws to increase drunk driving convictions on fatal traffic crashes. Bull NY Acad Med. In Press.
6. Hingson, R., et al.: Legal interventions to reduce drunken driving and related fatalities among youthful drivers. Alcohol, Drug and Driving 4: 1-12 (1988).
7. Heeren, T., Smith, R., Morelock, S., and Hingson, R.: Surrogate measures of alcohol involvement in fatal crashes: are conventional indicators adequate? J Safety Research 16: 127-134 (1985).
8. Williams, A. F., Zador, P. L., Harris, S. S., and Karpf, R. S.: The effect of raising the legal minimum drinking age on involvement in fatal crashes. J Legal Studies 12: 169-179 (1983).
9. Hingson, R., et al.: Impact of legislation raising the drinking age from 18-20 in Massachusetts. Am J Public Health 73: 163-170 (1983).
10. Du Mouchel, W., Williams, A., and Zador, P.: Raising the alcohol purchase age: its effects on fatal motor vehicle crashes in 26 states. Insurance Institute for Highway Safety, Washington, DC, 1985.
11. U.S. General Accounting Office: Drinking age laws—an evaluation synthesis of their impact on highway safety. Publication No. GAL/PEMD-87-10. Washington, DC, 1987.
12. Zador, P., Lund, A., Fields, M., and Weinberg, K.: Fatal crash involvement and laws against alcohol impaired driving. Insurance Institute for Highway Safety, Washington, DC, 1988.
13. Lacey, J. H., et al.: Enforcement and public information strategies for DWI general deterrence: arrest drunk driving—the Clearwater and Largo, Florida, experience. Publication No. DOT HS 807 066, U.S. Department of Transportation, Washington, DC, 1986.
14. Voas, R., Rhodenizer, A. E., and Lyon, C.: Evaluation of Charlottesville checkpoint observation. Final report to the National Highway Traffic Safety Administration. Charlottesville, VA, April 1986.
15. Voas, R., and Hause, J.: Deterring the drinking driver: the Stockton experience. Accident Analysis and Prevention 19: 81-90 (1987).
16. Hingson, R., et al.: Effects of Maine's 1981 and Massachusetts' 1982 driving under the influence legislation. Am J Public Health 77: 593-597 (1987).
17. Botvin, G., et al.: A cognitive behavioral approach to substance abuse prevention. Addict Behav 9: 137-147 (1984).
18. Klepp, K. I., Halper A., and Perry, C. L: The efficacy of peer leaders in drug abuse prevention. J Sch Health 56: 407-411 (1986).
19. Botvin, G., and Wills, T. L.: Personal and social skills training. Cognitive behavioral approaches to substance abuse prevention. *In* Prevention research: deterring drug abuse among children and adolescents, edited by C. Bell and R. Bettjes. NIDA Research Monog. 63: Washington, DC, 1986, pp. 8-49.
20. National Research Council: 55: a decade of experience. Transportation Research Board Special Report 204. Washington, DC, 1984.
21. U.S. Department of Transportation: Interim report on the safety consequences of raising the speed limit on rural interstate highways. National Highway Traffic Safety Administration, Washington, DC, May 1988.
22. Puska, P., et al.: Change in risk factors for coronary heart disease during 10 years of a community intervention programme (North Karelia project). Br Med J 287: 1840-1844, Dec. 17, 1983.
23. Farquhar, J.: The community based model of lifestyle intervention trials. Am J Epidemiol 108: 103-111 (1978).
24. Perry, C. L., Murray, D. M., and Klepp, K. I.: Predictors of adolescent smoking and implications for prevention. *In* Psychosocial predictors of smoking among adolescents. MMWR (Suppl) 36, Sept. 4, 1987, pp. 41s-45s.
25. Grossman, M., Coate, D., and Arluke, G.: Price sensitivity of alcoholic beverages in the United States. National Bureau of Economic Research, New York, 1984.
26. Saffer, H., and Grossman, M.: Effects of beer prices and legal drinking ages on youth motor vehicle fatalities. National Bureau of Economic Research, New York, 1985.
27. Coate, D., and Grossman, M.: Effects of alcoholic beverage prices and legal drinking ages on youth alcohol use. Working Paper No. 1852. National Bureau of Economic Research, Cambridge, MA, 1986.
28. Cook, P. J.: The effect of liquor taxes on drinking, cirrhosis and auto accidents. *In* Alcohol and public policy: beyond the shadow of prohibition, edited by M. Moore and D. Gerstein. National Academy Press, Washington, DC, 1981.
29. Williams, A. F., Karpf, R. S., and Zador, P. L.: Variations in minimum licensing age and fatal motor vehicle crashes. Am J Public Health 73: 1410-1403 (1983).
30. Williams, A. F., and Lund, A. K.: Teenage driver licensing in relation to state laws. Accident Analysis and Prevention 17: 135-145 (1985).
31. Preusser, D. F., Williams, A. F., Zador, P. L., and Blomberg, R. D.: The effect of curfew laws on motor vehicle crashes. Law and Policy 6: 115-128 (1984).
32. Campbell, B. J., and Campbell, F.: Casualty reduction and belt use associated with occupant restraint. *In* Preventing

automobile injuries, edited by J. Graham. Auburn Publishing, Dover, MA. In press.
33. Williams, A., and Lund, A.: Mandatory seat belt laws and occupant crash protection in the United States: present status and future prospects. *In* Preventing automobile injuries, edited by J. Graham. Auburn Publishing, Dover, MA. In press.
34. Hingson, R., et al.: Repeal of the Massachusetts seat belt law. Am J Public Health 78: 548–552 (1988).
35. Graham, J., and Garber, S.: Evaluating the effects of automobile safety regulation. Journal of Policy Analysis and Management 3: 206–224 (1984).
36. Robertson, L. S.: Automobile safety regulations and death reductions in the United States. Am J Public Health 71: 818–822 (1981).
37. Hingson, R., and Howland, J.: Prevention of drunk driving crashes involving young drivers: an overview of legislative countermeasures. *In* Young drivers impaired by alcohol and drugs, edited by T. Benjamin. Royal Society of Medicine International Congress and Symposium Series No. 116. Royal Society of Medicine, London, 1987, pp. 337–348.
38. Andeneas, J.: The effects of Scandinavia's drinking-and-driving laws: facts and hypotheses. Scandinavian Studies in Criminology 6: 35–53 (1978).

University Students' Drinking Patterns and Problems: Examining the Effects of Raising the Purchase Age

RUTH C. ENGS, RN, EdD
DAVID J. HANSON, PhD

Dr. Engs is Associate Professor of Applied Health Science at Indiana University and a Board Member of the Alcohol and Drug Problems Association of North America. Dr. Hanson is Professor of Sociology at the State University of New York College at Potsdam.

Tearsheet requests to Dr. Engs at Department of Applied Health Science, HPER, Indiana University, Bloomington, IN 47505.

Synopsis

An extensive review of the literature on college students' drinking patterns and problems since the mid-1930s revealed no radical changes over the past several decades. However, during the past 10 years, drinking and problems related to drinking and driving have gradually decreased among college students.

Results of a study of students at the same 56 colleges and universities throughout the United States (3,145 in 1982–83, 2,797 in 1984–85, and 3,375 in 1987–88) revealed few changes in collegiate drinking patterns and problems attributable to the nationwide increase in the minimum age for alcohol purchase. There was a decline in the proportion of students who drank in the period during which the law changed. However, the proportion of students categorized as heavy drinkers remained constant over time and the proportion of underage students (81 percent) who drank was higher than the proportion of legal age students who drank (75 percent). Of 17 problems related to drinking, all but 5 remained stable over the time periods. Three of the problems represent the continuum of an established trend of fewer students to indicating drinking and driving-related problems.

As discussed in this paper, creative alcohol programming can assist in controlling alcohol abuse among college students.

COLLEGE STUDENT DRINKING, legal or illegal, is not a recent occurrence in the United States. As far back as the early 18th century, alcohol was used by students, and there were admonitions and strict regulations on the part of authority figures regarding the practice. However, students have drunk over time regardless of restrictions or prohibitions (*1*). In spite of laws and their many changes, only gradual changes in collegiate drinking patterns have occurred over the past several decades.

Cross-Sectional Studies

A number of cross-sectional or point-prevalence studies have been conducted over the years within individual universities, States, or regions as well as