

SURGEON GENERAL'S WORKSHOP ON DRUNK DRIVING

Background Papers

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FOREWORD

The combination of drinking and driving claims one life every 20 minutes and injures hundreds every day. Tragically, the major casualties are the youth of our Nation. Daily – as a society and as individuals – we make decisions about drinking, about serving alcoholic beverages, about driving, and about “having fun.” These decisions affect our own lives as well as those of our families, friends, and neighbors. Choices about drinking and driving can protect our lives or destroy them. This serious health and safety problem is preventable.

Many individuals and concerned groups have campaigned to end this devastation, but it cannot be reduced without national leadership. The Surgeon General’s Workshop on Drunk Driving was held in December 1988 to devise a combination of strategies for addressing the problem at the local, State, and National levels. Experts in diverse fields related to drinking and driving were invited to the workshop to share their expertise and experiences. Their recommendations, made after 3 days of intense discussion, can be found in the *Proceedings*.

The background papers in this volume were commissioned to provide a foundation for and launch the discussion of the 11 expert panels of the workshop. The authors presented the state of the art in the different fields and describe the various attempts throughout the country and the world to prevent alcohol-impaired driving – the trials, the errors, the successes, and the obstacles. With up-to-date knowledge about the problem and proposed solutions, and a coordinated comprehensive plan, we are ready to enlist our country’s help in preventing this major threat to our health and well-being.

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Abbreviations

402 Programs	23 U.S.C. 402 Highway Safety Programs. These formula grants to the States for highway safety programs are administered by the Governors' Representatives for Highway Safety.
408 Programs	23 U.S.C. 408-I incentive grants to States for alcohol traffic safety programs
410 Programs	23 U.S.C. 410-I incentive grants to States for drunk driving prevention programs
ABC	Alcohol Beverage Control
ADAMHA	Alcohol, Drug Abuse, and Mental Health Administration
ASAP	Alcohol Safety Action Projects
ASTHO	Association of State and Territorial Health Officers
BAC	Blood Alcohol Concentration
BIA	Bureau of Indian Affairs
CDC	Centers for Disease Control
CPL	Certified products list
DDP	Designated driver programs
DHHS	Department of Health and Human Services
DOJ	Department of Justice
DOT	Department of Transportation
DUI	Driving Under the Influence
DWI	Driving While Intoxicated The terms DWI and DUI are synonymous, meaning either driving while intoxicated or driving while under the influence. These are general terms referring to the criminal action of driving a motor vehicle either (1) while "illegal per se" or (2) while impaired, under the influence, or intoxicated by alcohol or other drugs.
EMS	Emergency Medical Systems
FARS	Fatal Accident Reporting System
FBI	Federal Bureau of Investigation
FCC	Federal Communications Commission
IACP	International Association of Chiefs of Police
IHS	Indian Health Service
Illegal per se	Refers to State laws that make it an offense to operate a motor vehicle while at or above a specified blood alcohol level.
MADD	Mothers Against Drunk Driving
MCD	Multiple Cause of Death file taken from death certificate data by National Center for Health Statistics
NAB	National Association of Broadcasters
NAGHSR	National Association of Governor's Highway Safety Representatives
NCADD	National Commission Against Drunk Driving

NCADI	National Clearinghouse for Alcohol and Drug Information
NCIC	National Crime Information Center
NHTSA	National Highway Traffic Safety Administration
NIAAA	National Institute on Alcohol Abuse and Alcoholism
NIDA	National Institute on Drug Abuse
NSA	National Sheriffs Association
OJJDP	Office of Juvenile Justice and Delinquency Prevention
OSAP	Office for Substance Abuse Prevention
PBT	Preliminary breath tester
PHS	Public Health Service
PI&E	Public information and education
PSA	Public service announcement
RADAR	Regional Alcohol and Drug Awareness Resource Network
RFP	Request for proposals
RID	Remove Intoxicated Drivers
RWID	Riding With Intoxicated Driver
SRP	Safe ride programs
TEAM	Techniques of Effective Alcohol Management
TIPS	Training for Intervention Procedures by Servers of Alcohol

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Alcohol Beverage Control Policies: Their Role in Preventing Alcohol-Impaired Driving ¹

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The phrase "alcohol control policies" refers to the entire constellation of laws and regulations at the Federal, State, county, and city levels that affect how alcoholic beverages are manufactured, packaged, distributed, sold, and consumed. Control policies are central in any comprehensive discussion of the prevention of impaired driving because the availability of alcoholic beverages is a necessary condition for impaired driving. Furthermore, alcohol control policies, interacting with private market mechanisms, directly determine the degree to which beverage alcohol is available to consumers.

Concern with alcohol control policies has grown over the past two decades. Scientists and professionals in the alcohol studies field increasingly recognize that alcohol is a risk factor for a number of health problems, including traffic crashes, at both the individual and societal levels. That is, the more alcohol a given individual drinks, the higher the risk for health problems associated with that drinking, including automobile crash involvement (NHTSA 1985).²

Perhaps more important for public policy, the relationship also holds true at the aggregate level. As a society consumes more alcohol, rates of alcohol-related problems are likely to increase (Moore and Gerstein 1981). Clearly, the relationship is not one-to-one, since hundreds of factors contribute to each health problem, including motor vehicle injuries. For example, an increase in injury risk associated with higher alcohol consumption could be offset by a decrease in risk resulting from other actions, such as increased safety belt use. The important point is that alcohol consumption and associated problems such as traffic crashes are viewed as public health problems, with a large population at risk of involvement in alcohol-related crashes. To be most effective, prevention strategies should reduce risks across the population, rather than focus on the relatively small segment of society that at any given time exhibits extensive problems with alcohol (i.e., addicted drinkers). Since customs and patterns of alcohol consumption

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2 Obviously, the relationship between alcohol consumption and alcohol problems is not deterministic, but probabilistic. Increased consumption of alcohol increases the probability of associated problems, such as traffic crashes. Many individual differences and situation-specific factors affect the outcome in any given case.

apparently spread through the population by social diffusion (Skog 1980, 1985), alcohol control measures are likely to affect all consumers of alcohol, including both those with low-risk drinking patterns and those with high-risk drinking patterns.

Another consequence of the public health view is recognition that very small changes in behavior by large populations can result in substantial net benefits to society in terms of reduced alcohol-related problems. For example, a small reduction in an individual's alcohol consumption is not likely to have an immediately observable effect on that person's health.³

However, the same proportionate decrease in alcohol consumption across the entire society is much more likely to have demonstrable benefits in terms of reduced rates of alcohol-related problems. Therefore, the relevant consideration is not whether a specific alcohol control policy has an observable effect on given individuals, but whether changes in behavior (perhaps undetectable at the individual level) cause demonstrable changes in rates of health problems in the aggregate.

Alcohol control policies might affect impaired driving by two mechanisms. First, such policies encourage or restrain the total *amount* of alcohol consumed, and amount is a risk factor for impaired driving and the injuries that result. Second, specific control policies alter the *pattern* of alcohol consumption (i.e., how a given quantity of alcohol is consumed across time and across situations). For example, it is sometimes suggested that policies that encourage drinking in one's own home rather than in a bar or tavern be adopted to reduce the likelihood of impaired driving. Obviously, such policies might reduce traffic crashes but exacerbate other problems associated with alcohol, such as household injuries or spouse or child abuse.

This chapter has three objectives. First, we describe the types of laws and regulations included under the broad rubric of Alcohol Beverage Control (ABC) policy. We briefly discuss many dimensions of ABC policy to encourage a broader consideration of the mechanisms already available that may be useful in efforts to reduce alcohol-impaired driving and its damaging consequences. We do not include a lengthy discussion and analysis of the research evidence for the efficacy of each of these many policy dimensions in reducing alcohol consumption and alcohol-related problems. For most dimensions of ABC policy, evaluation research is scarce, and many of the studies that are available have major research design or implementation problems that limit confidence in the results. Therefore, the second objective is more modest. We identify ABC policies that have a significant body of research available, specifically those for which there is a scientific basis for assessing their utility in reducing impaired driving. The third objective is to present recommendations for changes in ABC policy and its application, acknowledging that both scientific and political considerations necessarily influence both the development and implementation of public policy.

Alcohol Control Policies

To structure the discussion of the wide variety of alcohol control policies, we have grouped them into eight categories:

- Economic control policies
- Marketing control policies

³ This is not to minimize the benefits of relatively small changes in consumption in certain situations. For example, reducing a driver's blood alcohol concentration from 0.08 g/100 ml to 0.04 g/100 ml by consumption of two rather than four drinks in an hour reduces the risk of involvement in a traffic crash by more than 50 percent (Jones and Joscelyn 1978).

- Structure of the distribution system
- Regulation of individual outlets
- Selling/serving control policies
- Controls on product contents and packaging
- Legal availability control policies
- Social availability control policies

Some regulations span these categories; we have placed them in the category with which they are most closely identified. The major function of the categorization is heuristic—to show the breadth of policies that fall under the term “alcohol control policy” and to show how specific policies are conceptually related.

Economic Control Policies

The most significant influence of ABC policy on the price of alcohol is the level of excise and sales taxes on those beverages. Some jurisdictions have special tax rates for specific products (e.g., alcoholic beverages containing local citrus products are treated favorably in Florida). Federal excise tax rates on alcohol vary across beverage types (e.g., beer, wine, distilled spirits). They are levied on the quantity sold (e.g., bottle, barrel, gallon) rather than on price, and are not adjusted for inflation. Except for a small increase in the tax on distilled spirits, Federal excise taxes have remained constant since 1951. As a result of this and other factors, the real price of alcoholic beverages has fallen substantially over the last several decades. State excise taxes on alcohol have been increased periodically, but also tend to fall behind inflation. In addition, the effective price of alcohol to consumers is influenced by levels of disposable income available, with alcohol becoming less expensive when macroeconomic conditions are favorable and incomes rise, unless retail alcohol prices rise accordingly.

A number of other economic control policies affect the (nominal) price of alcohol to consumers. In some States, for some beverage classes, public policy determines the exact level of retail price charged to consumers, and prices are uniform throughout the jurisdiction. In some cases, price levels and variability are controlled, short of specification of exact retail prices of alcohol. Minimum/maximum prices can be established directly, or minimum/maximum markups over wholesale prices can be authorized. Rebates of purchase price after the sale are prohibited in some areas, as are special price promotions such as “happy hour” discounts. Other inducements to purchase alcohol—such as coupons, gifts, and prizes—may be regulated or prohibited. Provisions under which credit can be extended to retailers and consumers for the purchase of alcohol also influence the cost and accessibility of alcohol.

Finally, the price of alcohol to some consumers is significantly affected by whether alcohol purchases are tax deductible (Mosher 1983). For those in higher income categories (i.e., with higher marginal tax rates), tax deductions for alcohol consumed in the course of business activity effectively reduce the price by one-third.

Marketing Control Policies

Most discussion of ABC policies concerning marketing focuses on restrictions on the advertising of alcoholic beverages. Advertising may be prohibited outright for some beverages in some media. More commonly, the content of advertising is regulated. Content issues include whether prices may be listed, whether the alcohol content of the advertised beverage may be stated, whether actual consumption of alcohol may be depicted, and minimum age for models that may be used. Current policies frequently include limits on more subjective characteristics, such as content that appeals to “prurient interests”; is “offensive, gaudy, or blatant”; “illustrates women sensuously”;

uses "religious signs or symbols"; or uses words like "booze" or "saloon." Current Federal regulations include language regarding limits on misleading or deceptive advertisements, although these limits have not been consistently enforced (Mosher and Wallack 1981). Prohibitions on lifestyle advertising have been suggested. Lifestyle advertising closely ties alcohol consumption to personal, financial, athletic, and sexual satisfaction and success, in contrast to advertising that focuses on specific characteristics or descriptions of the beverage.

Which media are appropriate for alcoholic beverage advertising is an issue in ABC policy. Should such advertising be permitted on billboards and in the broadcast media, where a substantial part of the audience is under the legal drinking age? A similar question holds for magazines having most of their readers under the legal age. The role of advertising revenues in influencing media coverage of health and social consequences of alcohol use is also relevant. The extent of such influence regarding alcohol is currently unknown. However, research has shown a clear relationship between amount of revenues received from tobacco advertisers and editorial content on the hazards of smoking. Publications with large numbers of cigarette advertisements rarely mention the hazards of smoking in their articles on health (Warner 1985, 1986).

In addition to advertising, many other dimensions of the promotion of alcoholic beverages are susceptible to regulation. Displays and posters promote alcoholic beverages at the point of sale. T-shirts, jackets, and other clothing reinforce messages of advertising campaigns. Other products with beverage alcohol names and images are frequently marketed (e.g., Bud Light Spuds MacKenzie dolls are sold in toy and novelty stores). Sponsorship of sporting matches, music concerts oriented toward teenagers (rock concerts), and other events also promotes alcoholic beverages. Alcoholic beverages are distributed free of charge at special promotions. Fees are paid to movie producers in exchange for depicting on-screen, integrated into the plot, the use of a specific brand of alcoholic beverages. This practice constitutes advertising even though viewers may not perceive it as such.

In addition to controls on alcoholic beverage advertising, requirements for counter-advertising have been proposed. Requiring advertisements on the hazards of alcohol ("equal-time" policies) and specifying that alcoholic beverage containers have warning labels regarding those hazards are frequently mentioned as means to partially balance advertising claims that encourage alcohol use with information on the risks of such use. (Rarely do proposals for counter-advertisements literally specify "equal time." Typically, a lower ratio of advertisements to counter-advertisements is proposed, for example, one counter-advertisement for every four or five advertisements.) Other proposals include compulsory warning messages in all alcohol advertising (similar to the warnings in cigarette advertisements) and required warning posters where alcohol is sold or consumed.

Finally, allowing or limiting the tax deductibility of advertising and other promotional efforts is another dimension of ABC policy that affects the marketing of alcoholic beverages.

Structure of the Distribution System

The most commonly noted characteristic of the alcoholic beverage distribution system in the United States is whether a given State has a monopoly or license system. States are frequently dichotomized as to whether they have a monopoly on alcohol sales or whether they license private enterprises to distribute alcoholic beverages. In reality, the monopoly-license dimension is a continuum, with States distributed at varying points according to the degree to which they control alcohol sales. Monopolies are frequently limited to a single class of beverage; for example, distilled spirits may be monopolized, while beer and wine are not. Monopolies may be limited to the wholesale level, or may

cover both wholesale and retail sales. Conceptual and empirical development of scales to measure where each State is on the control continuum is in the very early stages (Holder and Janes 1987). Such development should be encouraged to help move the research and policy discussions away from the simplistic tendency to dichotomize distribution systems.

Related to the degree to which the distribution system is a public monopoly is the structure and power of the agencies responsible for alcoholic beverage control. The number and characteristics of the people on the governing board, the nature of the appointing authority, and the grounds for removal of board members and the agency director affect how responsive the control agency is to local community concerns about alcohol outlets.

Government regulation affects many other dimensions of the distribution system structure, and these dimensions warrant attention regarding their effects on alcohol consumption and associated problems such as alcohol-impaired driving. Regulation of franchise alcohol outlets, amount of competition permitted, degree to which private monopolies or oligopolies are permitted, provisions allowing localized prohibition of alcohol sales, and extent of local government or community review of alcohol outlets are only a few of the dimensions of ABC policy that directly affect the structure of the alcoholic beverage distribution system (Roth et al. 1987).

Regulation of Individual Alcohol Outlets

Many analysts use the term "physical availability" to refer to the distance in space and time between individuals and a source of alcohol. A number of ABC policies affect when and where people can acquire alcoholic beverages. Typically, the number and density of retail outlets is limited by population or geographic area, with varying limits for different types of outlets (e.g., off-premise or on-premise consumption outlets; beer, wine, or distilled spirits outlets). Locations for alcohol outlets are controlled by prohibitions on alcohol outlets that are too close to schools, churches, or another alcohol outlet. When licensing new outlets in urban areas, proximity to public transportation should be considered to decrease the necessity of automobile use by impaired bar and tavern patrons (Ross 1982).

All States limit the days or hours that alcoholic beverages may be sold. Allowable opening and closing hours vary from State to State, and sales on Sundays and holidays may be prohibited or restricted to a few hours or to specific types of beverages.

Whether it is easy to open a new alcohol outlet or maintain a current outlet is influenced by license fees, limits on who may own a license, requirements for reporting and recordkeeping, financial means requirements, and availability and rates of mandatory liability insurance.

ABC policies also influence the nature and design of retail alcoholic beverage establishments. The types of retail establishments that may sell alcoholic beverages are also often restricted. The following types of outlets may be permitted to sell or restricted from selling alcoholic beverages: drug stores, convenience stores, grocery stores, hotels, resorts, sports stadiums, concert halls, private clubs, restaurants, and fast food restaurants. The architecture, lighting, visibility, number and placement of windows and doors, seating arrangements, and other physical characteristics of specific outlets—particularly those for on-premise consumption—are typically circumscribed to some degree. A number of ABC statutes and regulations specify other products that an alcohol outlet may, may not, or must, sell. For example, all on-premise alcohol outlets may be required to sell food or nonalcoholic beverages. The minimum portion of total revenues allowable from food sales may be specified. Whether gasoline stations and convenience stores that sell gasoline should be allowed to sell beverage alcohol is currently under debate in several States. Other activities in alcohol establishments may be restricted; for

example, nude dancing may be prohibited in places where alcohol is served. Many such regulations on specific alcohol outlets affect whether a new outlet opens, the characteristics of that outlet, the specific segment of the market it appeals to, the pattern of drinking encouraged by the establishment, and, as a result, the risk of alcohol-impaired driving.

Selling/Serving Control Policies

In addition to policies affecting alcohol outlets, many statutes and regulations, as well as a large body of case law, affect specific practices concerning how alcoholic beverages are sold or served. Some types of sales/serving practices are simply prohibited. On-premise consumption of alcoholic beverages has been limited to beer and wine in some jurisdictions, prohibiting sale of liquor by the drink. Self-service is not always allowed. Purchase of drinks "by rounds," where one person purchases drinks for a large group, may be prohibited. Size of serving containers may be controlled, prohibiting sales by the pitcher, for example. Serving alcohol to certain categories of consumers is typically prohibited. Such categories may include underage patrons, intoxicated drinkers, "habitual drunkards," or "known alcoholics." Finally, training may be required for those who sell or serve alcoholic beverages.

At least half of alcohol-related traffic crashes involve drinking at an on-premise establishment, even though only about a quarter of all alcohol sold is distributed by on-premise outlets (O'Donnell 1985). As a result, regulation of on-premise outlets may be particularly important for the prevention of impaired driving.

The best known dimension of ABC policy related to selling and serving practices is "dram shop" liability, that is, liability of sellers or servers for damage caused by alcohol-impaired persons. The typical case involves a bar patron who leaves an establishment after consuming large amounts of alcohol, and, while driving home, causes a traffic crash that maims or kills another motorist. The exact nature of the server's liability varies considerably across jurisdictions and is the consequence of complex interactions among statutory specifications, case law, and common law. Furthermore, administrative, civil, and criminal sanctions may be involved. Liability has typically been limited to commercial sellers/servers of alcoholic beverages. However, there have been cases in which social hosts have been held liable for damage caused by intoxicated guests, particularly if the guests are under the legal age.

Controls on Product Contents and Packaging

The amount of alcohol in alcoholic beverages is the most relevant product-content issue in terms of preventing impaired driving. Federal law currently prohibits labeling beer to show alcohol content unless State law requires such labeling. Beverages with very low alcohol content are frequently not considered alcoholic beverages. If such products (e.g., "near beer" with 0.5 percent alcohol) are marketed to underage drinkers, and if these drinkers use them as a gateway beverage before moving on to "real" beer, regulation might be considered appropriate. On the other hand, if consumption of very-low-alcohol beverages displaces consumption of beverages with higher alcohol content, tangible benefits in terms of reduced alcohol-impaired driving may result. Low-alcohol beer (2-3 percent alcohol) is another product that may affect alcohol-impaired driving, depending on whether the beverage substitutes for the same quantity of higher alcohol beverages or leads to adding new drinking occasions to existing consumption patterns.

A major component of the marketing strategies of alcoholic beverage industries is the development of new brands that are positioned to appeal to specific segments of the market. For example, some brands of beer are marketed to working-class males, others to upper middle-class males; some are targeted to blacks, others to women. Because

such market segmentation is central in efforts to increase alcohol consumption, some researchers have suggested that commoditization of the beverage alcohol market be considered (McGuinness 1988). Commoditization involves limiting the market to a small number of products and differentiating them based on product content, rather than on the image of the product and the market segment for which it is positioned. For example, the beer market might be restricted to light, medium, and heavy beer, based on alcohol content. With the exception of specifying the type, all packaging and labeling would be identical across all brands. The implications of such a move toward generic alcoholic beverages are complex and would represent a dramatic change from the current market structure.

Increased understanding of the nature of beverage alcohol markets and the potential role of ABC policy in structuring those markets to minimize risks associated with alcohol may help identify less dramatic (and more feasible) regulatory changes that nevertheless might minimize adverse effects on public health. For example, wine coolers are new products that have been successfully marketed in recent years. They are designed to appeal to a different population from traditional wine drinkers. Even more recently, wine coolers have been packaged in single-serving boxes that are indistinguishable from boxes containing fruit juice or punch (Trauma Foundation 1988). Effects of such new alcoholic products on drinking patterns and risks have not been studied, but they may warrant additional attention.

Finally, many detailed regulations deal with how various alcoholic beverages may be packaged. Container size (e.g., miniature versus larger bottles of distilled spirits), number of containers per case, position of any required tax stamps, ingredient labeling, and warning labels are a few examples. As noted already, warning labels may be one component of a larger effort to inform the public about the hazards of alcohol, particularly when related to driving.

Legal Availability Control Policies

The principal limit on legal availability of alcohol is the minimum drinking age. In all States, alcohol may not be sold to those under the age of 21, and those under 21 are prohibited from purchasing, possessing, or consuming alcohol. Specific legislative language varies from State to State. Some States prohibit all consumption of alcohol by underage individuals; others prohibit purchase or possession for personal consumption. Many States permit exceptions for religious ceremonies. Such legal proscriptions clearly do not prevent underage youth from acquiring alcohol; youth get alcohol from older friends and associates as well as from establishments that sell to youth despite the law (Hingson et al. 1983). Nevertheless, minimum-age statutes clearly make it more difficult for youth to obtain and consume alcoholic beverages.

Other legal availability control policies limit the locations and times when alcoholic beverages may be consumed. Open container laws in many States prohibit possession of an open container of alcoholic beverage in a motor vehicle that is being driven on a public road or highway. Consumption of alcohol in public is frequently prohibited, particularly on publicly owned property such as parks, plazas, and school grounds. Consumption of alcohol is prohibited or restricted where risks associated with consumption are perceived to be high, or where many nondrinkers are present, such as in sports stadiums and performance halls. Separate sections for nondrinkers may be required. Alcohol consumption is frequently prohibited on the job, especially by those whose positions directly affect public safety, such as commercial pilots, large-truck drivers, and railroad engineers. Policies mandating random or periodic testing of workers for alcohol (and other drugs) are currently under debate. Which occupations involve public safety to such a degree as to warrant such testing remains an open question.

Social Availability Control Policies

“Social availability” denotes the extent to which social norms regarding appropriate or inappropriate consumption of alcoholic beverages encourage behavior patterns that increase the risk of adverse effects of alcohol. The term is imprecise, and its definition is neither broadly accepted nor consistent. Nevertheless, it does point out possible public policies that may affect social norms regarding drinking, but that do not specifically regulate the distribution and sale of alcohol. For example, the depiction of alcohol use in movies and on television helps define social norms regarding drinking. The number of drinking occasions shown on prime-time television is disproportionate. Wallack and others (1987) found an average of 11 drinking occasions per hour during prime time in the fall of 1984. Depictions of alcohol consumption might be delayed until late in the evening to reduce the extent to which children and adolescents are exposed to them. Films might be rated with regard to their depiction of alcohol and other drugs, and these ratings provided to potential viewers.

Research Evidence: ABC Policies and Alcohol-Impaired Driving

Many dimensions of ABC policy are potentially relevant to reducing alcohol consumption, and thereby to reducing the death, disease, disability, and damage associated with use of alcoholic beverages, including motor vehicle crashes. Based on our broad knowledge about how economic, physical, and social environments influence people, the possible role of these policies must be considered in efforts to prevent alcohol-related problems, including traffic crashes.

However, stating clearly the known effects of each of the many dimensions of ABC policy is much more difficult. First, each specific policy dimension alone may have an effect so small as to be unidentifiable given available data and research technology. Nevertheless, their effect as a whole may be substantial. Second, no scientific literature exists on most of these dimensions of ABC policy, and limited research results are available for others. Excellent comprehensive reviews of the literature on many facets of ABC policy have already been published (Holder 1987; Ashley and Rankin 1988) and therefore will not be repeated here.

Of all the dimensions of ABC policy, two have been studied in detail, particularly with regard to their effects on traffic crashes. For these, sufficient scientifically credible evidence is available to make unambiguous policy recommendations.

Minimum Drinking Age

The minimum legal drinking age is perhaps the most thoroughly studied dimension of ABC policy. Furthermore, most of the studies explicitly focused on the effects of the minimum age on motor vehicle crashes. In the early 1970s, 29 States lowered the minimum age at which young people could legally purchase, possess, and/or consume alcoholic beverages (or at which alcoholic beverages could legally be sold to them). Soon afterward, there was a “dramatic increase” in the rate of alcohol-related crashes involving 18-, 19-, and 20-year-olds, according to a review by the General Accounting Office (GAO 1987).

Many studies of the lowered legal age laws were made, and a number of reviews have been published (Wagenaar 1983; Whitehead 1980). Reviewers concurred that, in the better designed studies (Cook and Tauchen 1984; Douglass et al. 1974; Whitehead et al. 1975; Williams et al. 1975), a decrease in the minimum drinking age was associated with

an increase in the rate of alcohol-related crashes among young drivers directly affected by the change in the law.

Persuaded in part by this evidence, States began to raise their minimum drinking ages in 1976—and a new generation of studies followed. In 1985, Congress asked GAO to review these studies critically and evaluate the degree to which they provided empirical support for Federal and State efforts to raise the legal drinking age (GAO 1987).

The GAO's search of the literature identified 32 studies of the impact of increasing the minimum drinking age on traffic crashes involving young people in the age group directly affected by the law. However, many of these studies were judged to be of insufficient scientific quality to inform policy decisions. Of the 14 studies that did meet GAO's methodological criteria, 4 addressed fatal crashes across several States and 5 addressed fatal crashes in individual states (Arnold 1985; DuMouchel et al. 1985; Emery 1983; FDCA 1983; Hingson et al. 1983; Hoskin et al. 1986; Klein 1981; Lillis et al. 1984; Maxwell 1981; Schroeder and Meyer 1983; Wagenaar et al. 1981; Wagenaar 1987; Williams et al. 1983).⁴ The remainder addressed crashes with other outcomes, such as injury and property damage. With one exception, these studies explored the effect of changes in the law on the number of young drivers involved in fatal or injury-producing crashes, whether or not the driver was killed or injured.

The GAO concluded that significant reductions in motor vehicle crashes among young people occurred in almost every State examined (GAO 1987). Further, despite differences in study design, analytic methods, outcome measures, and State characteristics, the reported reductions were often of similar magnitude. The findings provided by the four multi-State studies of fatal crashes lend themselves most easily to generalization. These studies reported reductions ranging from 5 to 28 percent. Studies of individual States obtained similar results. The GAO noted that results from multiple studies using multiple methods are rarely so consistent. States that did not show significant reductions in traffic crashes generally had small populations and few crashes, making it difficult to distinguish chance outcome from the effects of the law. Most of the studies reviewed by GAO addressed the immediate effect of raising the minimum drinking age. Two, however, explored the effects over the long term and found them to be sustained (Wagenaar 1987; DuMouchel et al. 1985).

Two studies meeting GAO's criteria for scientific adequacy (Lillis et al. 1984; Perkins and Berkowitz 1985) found that an increase in minimum drinking age was followed by a decrease in self-reported incidence of driving after drinking among young persons directly affected by the change in the law. However, both studies focused on New York, so the extent to which these results can be generalized to other jurisdictions is unknown.

Alcohol Price and Excise Taxes

With the exception of a 1985 increase in the distilled spirits tax (from \$10.50 to \$12.50 per proof gallon), Federal excise taxes on alcoholic beverages have remained constant for nearly four decades. If the Federal excise taxes on alcoholic beverages had increased by the same percentage as consumer prices between 1951 and 1985 (314 percent), they would have risen from \$10.50 to \$43.48 per proof gallon for distilled spirits, from \$0.29 to \$1.20 per gallon for beer, and from \$0.17 to \$0.70 per gallon for wine containing not more than 14 percent alcohol. Since most studies indicate that the price of alcoholic beverages influences consumption of alcohol (Ornstein and Levy 1983; Levy and Shefflin

⁴ A number of the studies that GAO identified in the form in which they originally appeared—conference papers and government reports—have since been published in the scientific literature. In their original version, most of these (Wagenaar 1986; DuMouchel et al. 1987; Hoskin et al. 1986; Saffer and Grossman 1987a) met GAO's criteria for scientific quality; others did not (Males 1986).

1983), the concern about the effect of current tax policy on alcohol-related problems is growing.

Three studies have specifically addressed the effect of changes in the real price of alcoholic beverages on motor vehicle crashes. Cook (1981) studied the impact of 38 changes in State taxes on distilled spirits that occurred in the 30 States with license (rather than monopoly) systems between 1960 and 1975. Although these tax increases were relatively small, nearly two-thirds of them were followed by a greater reduction (or smaller increase) in the auto fatality rate than occurred in the median State in the same year. Cook concluded that an increase in taxes on distilled spirits tends to reduce the rate of traffic fatalities.

Saffer and Grossman (1987*a*) explored the extent to which variations in State excise tax rates on beer contribute to fatal motor vehicle crashes among young people. They found that States with higher real beer taxes have lower motor vehicle fatality rates for three separate age groups (15-17, 18-20, and 21-24). Based on these results, they estimated that if the Federal excise tax on beer had been indexed to inflation since 1951, the number of 18- to 20-year-olds killed in motor vehicle crashes in 1975-81 would have been reduced by 15 percent. If alcohol in beer had been taxed at the same rate as alcohol in distilled spirits, the number of 18- to 20-year-olds killed would have been 21 percent lower. And a combination of these two tax policies would have reduced the number killed by 54 percent. Saffer and Grossman (1987*a*) also suggested that tax policy may be a more potent instrument than a uniform minimum drinking age of 21 for reducing traffic deaths among young people – in part because evasion is not possible. In another study, using different methods, Saffer and Grossman (1987*b*) estimated that a 100-percent increase in the tax on beer (approximately \$1.50 per 24-unit case) would reduce highway deaths 27 percent among 18- to 20-year-olds, 18 percent among 15- to 17-year-olds, and 19 percent among 21- to 24-year-olds.

Discussion and Policy Recommendations

To initiate the discussion, we offer three recommendations. First, no policy changes should be considered that may result in an increase in the degree to which alcoholic beverages are available without careful analysis, study, and public debate on the potential deleterious effects of such a policy change on alcohol consumption and associated health and social problems. Permitting retail sales of distilled spirits for on-premise consumption where that particular form of sales had been prohibited is an example of a modest policy change that may not be expected to have a demonstrable effect on alcohol use and problems. However, careful analyses of such a policy change in North Carolina found that a significant increase in alcohol consumption and traffic crashes followed the policy change (Blöse and Holder 1987; Holder and Blöse 1987). A broader recognition is needed of the many dimensions of ABC policies and of their potential role in the prevention of alcohol-related problems. Making informed decisions regarding ABC policies will require a substantially increased commitment to research and evaluation of specific ABC policy dimensions.

Second, the minimum legal drinking age of 21 should be retained, and enforcement of the age-21 policy should be strengthened. The weight of the evidence clearly shows substantial benefits of the age-21 policy in terms of reduced traffic deaths and injuries. The burden of proof now rests with those suggesting a lower age to demonstrate the net benefits of such a change.

Finally, Federal excise taxes on alcoholic beverages should be adjusted for fairness and equity in three dimensions. First, Federal excise taxes should be equalized according to ethanol (pure alcohol) content across all types of beverages by an increase in the rates

for beer and wine to those of distilled spirits. Second, the resulting equal tax rate should be adjusted for past inflation by an increase that reflects changes in the Consumer Price Index for the previous year. The extant research evidence shows that an increase in the excise tax could have the largest long-term effect of all policy and program options available to reduce alcohol-impaired driving. Therefore, States should also change their excise taxes to equalize rates across beverages, adjust for past inflation, and index for future inflation. The proposed changes in alcohol taxes do not represent a radical change in policy. They simply increase fairness by taxing all alcohol at equivalent rates and correct for the unfortunate effects of inflation over the past two decades.

While we acknowledge the size and political power of the alcoholic beverage industries, the time appears to be right for such a change in excise tax policy. A "window of opportunity" (Kingdon 1984) for correcting the continuing erosion of alcohol excise taxes may appear in the next year or so. A broad concern with healthier lifestyles (e.g., diet, exercise, stress reduction), concern about medical care cost containment, and increased disapproval of drug use are providing a climate in which increased excise taxes on alcohol are supported. The huge Federal budget deficit will create continuing pressures to raise revenues and minimize program costs. Increases in alcohol excise taxes meet these needs well. They raise revenues and decrease levels of major health problems and their associated costs, and they do not require resources for new program development and implementation.

Public support for increased alcohol taxes is high. A recent Statewide probability survey in Michigan found 86 percent of the population in favor of increasing the alcohol excise tax to pay for programs to combat alcohol-impaired driving (Wagenaar et al. 1988). In an October 1986 Gallup poll, 66 percent of respondents approved of doubling the Federal excise tax on alcoholic beverages (Gallup 1987).

Finally, increased excise taxes can be recommended based on equity and justice arguments. Consumption of alcoholic beverages costs society billions of dollars in medical care, social damage, and lost productivity (NIAAA 1987). Those costs are shared by all through general sales and income taxes, insurance premiums, and prices of the goods and services consumed. An increased excise tax would result in a higher proportion of those costs being paid by those who consume alcohol (Mosher and Beauchamp 1983). Some may even want to term the excise tax a "user fee" rather than a tax, since only those who consume this particular hazardous product have to pay it, and its function is to ensure that consumers pay a higher proportion of the true costs of the product.

Arguments can also be made against increasing the excise tax on alcoholic beverages. The first is that such a policy may affect "social" drinkers but not the heavy drinkers who are causing social and health problems. Alcoholics, because of their addiction, will obtain alcohol no matter what the price, this argument contends. On the contrary, research has shown that addicted users of alcohol respond to price changes along with nonaddicted users (Cook 1981; Cook and Tauchen 1982). Even if addicted drinkers were less responsive to price, about half of alcohol-related traffic fatalities are caused by non-addicted or "social" drinkers (Vingilis 1983). A substantial decline in this portion of the traffic crash problem resulting from an excise tax increase would be a major success in itself.

The second argument against an excise tax increase is that excise taxes are regressive and fall disproportionately upon lower income families. It is true that lower income consumers pay a higher proportion of their disposable income for a particular product; however, alcoholic beverages are not necessities but, rather, discretionary goods. In addition, alcohol consumption is positively related to income—those at higher income levels consume larger quantities of alcohol and would therefore pay more of the tax. Furthermore, regardless of income level, significant benefits will accrue to families in which heavy alcohol users reduce their consumption because of the tax.

A third argument against an increase in the excise tax rate is that government revenues will fall, if in fact the policy is successful in reducing alcohol use. However, the best overall estimates of the price elasticity of alcohol are typically more than 0.4 but less than 1.0 (Levy and Sheflin 1983). As a result, an increase in excise tax rates from current levels will result in both increased government revenues and reduced consumption of alcohol.

Conclusion

Our objectives in this chapter were to:

- increase awareness of the complex multidimensional nature of alcohol beverage control policy in the United States,
- review research on effects of selected ABC policy dimensions on alcohol-related traffic crashes, and
- stimulate discussion regarding the most promising dimensions of ABC policy for the reduction of alcohol-impaired driving.

While it is unlikely that there will be universal agreement with every specific point in our analysis, most scientists studying alcohol policy issues appear to support the recommendations offered here. Nevertheless, this chapter has only outlined the approximate boundaries of the dialog. Continued research, policy analysis, and discussion among scholars, policymakers, and others will help further delineate the many issues involved. Finally, health education efforts are needed to increase awareness among the general public of the effects of ABC policy and to build public support for policy changes necessary to effectively reduce alcohol-impaired driving and its life-disrupting consequences.

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Mass Communication Effects on Drinking and Driving

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This chapter examines the role of mass communication in both preventing and encouraging alcohol consumption and drunk driving, particularly among young people in our society. It begins with an overview of public communication concepts relating drunk-driving behavior to advertising and public service campaigns and to entertainment and news media presentations, and then describes basic theoretical processes and topical literatures. The closing section identifies issues for discussion, suggests strategies for improving media influence, and recommends promising avenues for research.

The public may be influenced in a number of ways by exposure to media communications. The strongest effect generally occurs at the cognitive level (awareness, knowledge, beliefs, and images), with more modest effects at the affective level (attitudes, values, norms, interests, saliences, and intentions). In terms of overt *behavior*, key outcomes include:

- a. alcohol *drinking* patterns (frequency/quantity of consumption, hourly rate, settings),
- b. *driving* practices (driving after moderate drinking, drunk driving, general risky driving), and
- c. *interpersonal prevention* actions (persuading companion to drink moderately, prohibiting teen child from attending drinking parties, insisting on designated driver arrangement, serving driver nonalcoholic drinks, intervening to prevent intoxicated driver from taking the wheel).

These behavioral outcomes are interrelated, such that an effect on one behavior indirectly contributes to other actions. For example, messages stimulating consumption of a greater quantity also increase drunk driving; messages prompting interpersonal persuasion, in turn, reduce the quantity consumed before driving.

The scope of relevant media content ranges from hard news about police crackdowns on driving while intoxicated (DWI) to fictional entertainment portrayals of reckless driving, and from sensual commercial promotion of alcohol brand images to fear-arousing informational messages showing twisted wrecks. Several linkages between content presentations and audience behaviors are particularly noteworthy; the literature review will examine most closely the direct connections between: (a) alcohol advertising and drinking patterns, (b) entertainment programming and both drinking patterns and risky driving acts, (c) news stories and drunk-driving practices, and (d) public service campaigns and drinking, drunk driving, and prevention activities.

This chapter focuses on mass media communication rather than conventional alcohol *marketing* efforts (e.g., on-campus beer promotions, beer tie-ins with professional sports teams, positioning of wine coolers as quasisoft drinks, distribution of premixed cocktails

through convenience stores). The marketing perspective is primarily represented in the public service campaign section as a set of methods and strategies adapted by *social marketing* practitioners to unsell alcohol abuse and drunk driving. (Three interchangeable terms—social marketing campaigns, information campaigns, and public service campaigns—all refer to a series of promotional messages in the public interest that are intended to benefit individuals in the audience and/or to improve society as a whole.)

A number of theories are applicable to understanding the influence of mass communication on drinking and driving cognitions, attitudes, and behaviors. These general conceptions will be briefly reviewed before the empirical research for each specific topic area is examined. The first five perspectives are stimulus centered (focusing on message potency), while the rest are receiver centered (assigning a major role to audience predispositions in determining response to media presentations).

Social learning theory focuses on responses to messages portraying human models; vicarious learning of behaviors and consequences occurs by example through imitation and contagion mechanisms (Bandura 1977). The effect of a message is enhanced by models that are celebrities, high in status, or similar to the observers, and by depiction of positive social and personal reinforcement. Three processes explain the influence of visualized portrayals, especially in TV entertainment programming, commercials, and public service spots:

1. *Observational learning*, which is the transmission of social information about novel forms of behavior that may lead to imitative actions, for example, a public service announcement (PSA) showing successful physical intervention techniques to prevent drunk driving. Symbolic modeling can also shape definitions of normative social practice, for example commercials portraying appropriate situations for beer consumption.
2. *Altering inhibitions* governing overt expression of previously learned responses, for example, a film depicting early-morning drinking that reduces guilt about this practice, or a soap opera dramatizing humiliation of DWI arrest that inhibits driving after drinking.
3. *Response facilitation*, which is the modeling enhancement of socially sanctioned behaviors by a simple reminder cue to perform acts already established in the observer's repertoire, for example, a wine ad that prompts drink-pouring.

Verbal learning is a label encompassing a family of utilitarian-oriented persuasion theories such as instrumental learning and hierarchy-of-effects, which conceive of the individual as proceeding through attention, comprehension, yielding, and retention stages resulting in formation and change of beliefs and eventually of attitudes and behaviors (see McGuire 1981; Flay 1981; Bettinghaus 1986). The key elements are the presentation of relevant incentives (promised rewards and threatened punishments as the motivation for accepting the recommendation), the credibility or attractiveness of sources, and the structure, evidence, or arguments of the message appeals. This framework applies primarily to purposive media messages (e.g., anti-drunk-driving PSA's citing casualty statistics, or liquor magazine ads featuring substantive reasons for purchasing the product).

Cultivation theory focuses on the formation and shift of beliefs about society (e.g., perceived prevalence of drunk-driving behavior). Based on cumulative absorption of media content, viewers derive conceptions skewed toward the predominant portrayals (Gerbner et al. 1986; Signorielli 1987). While this perspective has been primarily applied to fictional content, it is also pertinent to news effects on perceptions of reality.

Agenda setting (McCombs and Gilbert 1986) is a theoretical model predicting that an issue or attribute that is frequently and prominently presented in the mass media will be regarded as more important and assigned a high priority in the thinking of the receiver.

For example, heavy news emphasis on a topic such as drunk driving will increase the public's perception that the problem is significant. Constant emphasis on camaraderie in beer advertising will elevate the salience of this attribute relative to safety concerns.

Classical conditioning applies to the affective impact of certain alcohol presentations, particularly in advertising, where an initially neutral stimulus is repeatedly paired with an unconditioned stimulus eliciting a favorable/unfavorable response, for example, linking alcohol consumption to masculinity, or associating drunkenness with joviality.

Uses-and-gratifications theory posits that individuals selectively use media channels and messages to satisfy needs (Rubin 1986). Psychological predispositions and social contextual factors shape motivations of receivers, who actively select media stimuli for specific purposes such as guidance or enjoyment. For example, readers who are instrumentally motivated to learn how to evade police detection will seek out and extract pertinent information from news stories, and TV viewers who watch soap operas for plotline excitement may not notice incidental portrayals of drinking. In addition, cognitive dissonance mechanisms explain certain exposure decisions. For example, drunk drivers may selectively avoid threatening messages about safety consequences.

Cognitive-response perspectives focus on the thoughts that the receiver generates while processing messages (Petty and Cacioppo 1981). Rather than passively consuming information, the person relates the content to prior knowledge and experience, and forms new connections or arguments. For example, receivers might think favorably about bars in response to a magazine ad showing a bar setting, or might raise critical objections and rehearse circumvention strategies when hearing a news story about drunk-driving roadside checkpoints.

Expectancy-value approaches emphasize the role of audience value predispositions in the formation of attitudes toward a behavior (Ajzen and Fishbein 1980). Attitude is conceived as a function of expectancies (e.g., beliefs about the likelihood of crashing or the probability of social approval for moderate drinking) and evaluations (e.g., positive or negative valence of an attribute or outcome).

Mass communication theorists also examine supplemental interpersonal influences, which can extend, reinforce, or counteract the effect of mediated messages. Relevant processes include:

- a. two-step flow (e.g., a news viewer relays an item about police crackdown to nonexposed coworkers; friend doesn't let friend drive drunk after hearing radio PSA),
- b. opinion sharing (e.g., coviewers of TV drama shape each other's evaluative reactions to humorous depiction of drunkenness),
- c. social influence (e.g., advertising-induced tendency to drink excessively is reinforced by prodrinking peer pressures), and
- d. social norms (e.g., anti-drunk-driving magazine message is counteracted by perceived appropriateness of males driving after drinking).

Research Literature

Empirical evidence assessing mass communication influences on drinking and driving behaviors is underdeveloped and often methodologically flawed. The greatest research attention has been devoted to the effects of advertising on alcohol consumption, owing to societal concerns and regulatory interest in this issue.

Alcohol Advertising

The mass media annually carry a billion-and-a-half dollars of advertising for beer, wine, and spirits, far exceeding expenditures for prevention and education by government and nonprofit agencies. Major content analyses by Atkin (1987) and Finn and Strickland (1982, 1983) showed that lifestyle portrayals are featured along with brand symbolism, as attractive and youthful (but not underage) characters display enjoyment (but not intoxication). Among the benefits frequently linked to the alcohol products are social camaraderie, romance, masculinity/femininity, adventure, relaxation, and elegance. Relatively few ads portray alcohol in hazardous contexts such as vehicle scenes, or depict negative drinking consequences such as hangovers, accidents, diseases, or embarrassment. Alcohol advertising practices have been subject to extensive criticism (Jacobson et al. 1983; Postman et al. 1987). Congress considered a ban on alcohol advertising in 1985 hearings.

Atkin (1988, 1989*a, b*) presented detailed assessments of the theoretical mechanisms by which these advertising messages influence both consumption patterns and risky driving behavior, particularly effects of TV commercials on adolescents. This chapter first summarizes the extensive empirical literature on advertising and drinking, then reviews a study focusing on drunk driving.

Drinking

In two recent reviews, Smart (1988) concluded that "alcohol advertising is, at best, a weak variable affecting alcohol consumption," while Atkin (1988) stated that "ads stimulate higher consumption by both adults and adolescents. . . there is a sufficient basis for rejecting the inference of null effects and for rejecting claims that advertising exerts a powerful influence on drinking behavior." The preponderance of the evidence suggests that advertising is a contributing factor that increases consumption to a modest extent, based on three types of investigations.

Six major experiments tested the effect of advertising messages on drinking behavior (Brown 1978; McCarty and Ewing 1983; Kohn et al. 1984; Kohn and Smart 1984; Sobell et al. 1986; Kohn and Smart 1987). The studies do not provide conclusive evidence, owing to the equivocal mixture of null and positive findings along with serious conceptual and methodological deficiencies (particularly in experiments showing apparent null effects). The critical review by Atkin (1988) interprets this set of results as suggesting limited prodrinking effects. Other experiments relying on verbal responses show that both sexual imagery and celebrity endorsements enhance the effect of advertising on youthful drinkers (Freidman et al. 1977; Atkin and Block 1981, 1983; Kilbourne et al. 1985).

A second set of econometric studies and quasi-experiments based the analysis on aggregate statistics representing alcohol sales and advertising expenditures over time or across locales (Simon 1969; Ackoff and Emshoff 1975; Smart and Cutler 1976; Bourgeois and Barnes 1979; Ogborne and Smart 1980; Duffy 1981; McGuinness 1983; Schweitzer et al. 1983; Ornstein and Hanssens 1985; Wilcox 1985; Franke and Wilcox 1987). This type of research produces mixed findings, basically showing that advertising accounts for slightly higher levels of consumption; but these techniques have restricted potential for precisely tracing the effect of commercial messages.

Third, several major correlational surveys provide the most externally valid data on the advertising-consumption relationship (Atkin and Block 1981; Strickland 1982, 1983; Atkin et al. 1984; Atkin and Block 1984). Despite ambiguities about causal direction, the data suggest that televised beer ads mildly increase beer drinking, that magazine liquor ads have a modest positive influence on consumption of spirits, and that the effect of traditional wine advertising is weak.

Drunk Driving

Advertising has potential for direct effects on drunk driving, based on occasional content portrayals juxtaposing moving cars with scenes of beer drinking in TV commercials and the association of alcohol and professional racing cars, and on more subtle linkages between beer and the challenging excitement of speed and macho risk taking (see Postman et al. 1987). However, overt depictions of vehicles occur in a just a tiny percentage of ads, and characters are never shown drinking in the context of driving.

Advertisements rarely warn the audience about the dangers of drinking before or during driving, which precludes learning about this risk and possibly deemphasizes salience of unsafe consequences. Indeed, the audience may infer that safety is not a significant issue based on portrayals of characters consuming alcohol away from home settings without any recognition of how they will achieve safe transportation.

Advertising may also produce indirect effects that increase the likelihood of drunk driving. Many ads promote drinking in bars and in outdoor locations. To the extent that drinkers are influenced to consume more alcohol in these nonhome settings, the chance of driving after drinking is greater. Further, the effect of advertising in stimulating greater frequency and quantity of drinking heightens the odds of drunk driving.

In a sample of adolescents and younger adults, Atkin, Neuendorf, and McDermott (1983) found that advertising exposure was significantly related to a drinking-driving index (higher levels of driving after drinking, drunk driving, drinking while riding, drinking while parked, and estimated drink limit for safe driving). For example, 39 percent of heavily exposed individuals reported having driven "when you were really too drunk to drive," compared to 28 percent of lightly exposed respondents. This exploratory study has methodological shortcomings, and the evidence must be regarded as tentative.

Entertainment Media

Television programming is considered influential in shaping both drinking and driving behaviors, particularly among youthful viewers (Atkin 1989a, 1989b). Other entertainment media play a minor role because of limited reach and frequency (e.g., films, books) or low-potency content (e.g., radio, recordings). Televised depictions of drinking are remarkably prevalent, as are risky driving portrayals, but specific presentations involving drunk driving are infrequent.

Drinking

Content analyses over the past decade have documented that two-thirds to three-fourths of all prime-time episodes present at least one drinking incident involving characters ordering, pouring, holding, sipping or talking about alcohol (Greenberg et al. 1979; Lowry 1981; Greenberg 1981; Cafiso et al. 1982; DeFoe et al. 1983; Breed and DeFoe 1984; Futch et al. 1984; Hansen 1986; Wallack et al. 1987). The most comprehensive measurements have been performed by researchers at the Prevention Research Center. In the most recent study, Wallack, Breed, and Cruz (1987) reported 10.6 drinks per hour in 1984, continuing a trend that moved upward from 4.8 hourly acts in 1976 to 7.6 in 1978 to 8.7 in 1981. Fictional characters drink 10 times as much alcohol as soft drinks, even though real life Americans consume twice as much soft drink beverages.

While much of this alcohol drinking is gratuitous and incidental, more central and vivid depictions (e.g., bar and party drinking, heavy drinking, intoxication, and significant plot implications) still average well over one per hour. Most of the motivations and consequences associated with alcohol consumption are either positive or neutral, but TV occasionally portrays deficit reasons for drinking (e.g., escape, tension relief, crisis management, coping) and adverse outcomes (status loss, strained relationships, social disapproval, and health and safety risks).

In an attempt to change the portrayal of alcohol in TV programming, Breed and DeFoe (1982) helped develop a white-paper guideline for Hollywood writers and producers. Through cooperative consultation, creative personnel became more sensitive to the implications of the way drinking is depicted. However, the evidence of content analysis is not in convincing in demonstrating major reductions in quantity consumed or improvements along qualitative dimensions.

Very little research examines actual effects on the viewing audience. Two laboratory experiments examined responses of preteens to televised fictional drinking portrayals. In one study, Kotch, Coulter, and Lipsitz (1986) found slightly more favorable attitudes toward drinking after subjects saw a montage of scenes showing characters consuming alcohol. In the second (Rychtarik et al. 1983), exposure to *M.A.S.H.* martini scenes increased the youths' perceived appropriateness of serving liquor to adults.

These meager results hardly begin to address the question of entertainment effects, but several likely forms of influence can be hypothesized based on cultivation, social-learning, and expectancy-value theories. First, the sheer quantity of depicted drinking acts should cultivate the perception that alcohol consumption in society is frequent and widely practiced. Viewers, especially adolescents, are more apt to consider drinking as a routine, commonplace part of everyday life that is highly normative and appropriate in a varied array of social situations. Second, viewers can be expected to develop generally favorable stereotypes of drinkers, display imitative consumption after vicariously experiencing the attractive modeling acts, or feel less inhibited about performing certain proscribed drinking behaviors. By contrast, the depictions of characters declining drink offers may increase performance of that act. Third, prodrinking attitudes may evolve as the audience learns about the predominantly portrayed positive consequences of TV drinking, which outweigh the problematic outcomes.

Drunk Driving

The only content analysis focusing specifically on drunk driving is a qualitative study by Breed and DeFoe (1985-86). Rather than quantitatively tabulating incidents of conversations about drunk driving or actual driving after drinking, the authors describe 37 selected examples embedded in 700 hours of prime-time programming observed between 1976 and 1986. They conclude that the "attitude toward DWI was negative throughout the period studied," pointing to scenes judged as educational in *Lou Grant*, *CHiPs*, *Six Million Dollar Man*, *Happy Days*, *Starsky and Hutch*, *Rockford Files*, and *Cagney and Lacey* (e.g., portrayal of DWI arrests and accidents, and warnings by companions not to drive). Breed and DeFoe also identified problematic scenes (e.g., humorous or nonserious treatment of drunk driving) and critical omissions (e.g., depiction of a character drinking heavily at party and then appearing later in another location—presumably having driven there). Although DWI scenes are relatively rare, the authors argued that the potential for effect is substantial because the televised stories feature "heightened visualization and identification permitted by the medium, as personalized and dramatized."

One study explored the effects of a TV program that modeled a social intervention to prevent drunk driving (Atkin 1989a). An episode of *Valerie's Family* featured a teenage party in which a drunken guest is physically restrained from driving. In before-after survey of young adolescents, those who viewed the on-air program were slightly more likely than nonviewers to say they would employ physical intervention with a drunk friend.

Driving

Vehicle use is pervasively presented on television, as most programs shot in nonstudio settings prominently feature driving. A comprehensive 5-year content analysis found four to five driving scenes per hour (Greenberg and Atkin 1983). Most driving was routine.

However, one-fifth of the scenes depicted chase/escape driving, and several types of noisy or risky driving incidents were frequently portrayed. Quick braking appeared in 25 percent of all driving scenes, brakes squealing in 24 percent, tires screeching in 23 percent, speeding beyond the apparent limit in 20 percent, quick acceleration in 20 percent, weaving through traffic in 5 percent, leaving the road or ground in 5 percent, aggressive driving in 5 percent, automatic stunts in 4 percent, and other illegal driving such as recklessness, forcing a car off the road, or changing drivers while moving in 8 percent. Endangering acts were depicted almost once per hour. Almost 9 out of every 10 drivers were male, and three-fourths were in their twenties and thirties.

In terms of consequences, 9 percent of driving scenes portrayed positive outcomes for the driver, for example, impressing other people, escaping pursuers, power, and emotional satisfaction. On the negative side, death and injury were relatively rare, occurring in less than 1 percent of the scenes at a rate of one casualty each 5 hours. In only a few instances were immediate legal penalties imposed on bad drivers; one-tenth of speeding incidents and one-fourth of other illegal driving behavior resulted in police apprehension. The rate of safety belt use on TV was 1 percent in the late 1970s, but rose to the 20- to 25-percent range in the mid-1980s (Atkin 1989a; Geller 1988).

To date, no investigations have measured the effect of these portrayals on real-life drivers. Based on audience ratings, it can be estimated that the typical TV viewer annually sees several thousand irregular driving acts and hundreds of instances where people are endangered, usually performed in an engaging manner by attractive characters who suffer minimal harm. Media theory suggests the following types of effects might be expected:

- Viewers may vicariously acquire and imitate an array of unique and novel driving acts.
- Inhibitory constraints may be reduced as viewers learn that dangerous driving practices are commonplace and normative.
- External inhibitions may be minimized by the relatively infrequent portrayal of serious negative consequences such as legal punishment, social disapproval, and physical harm resulting from illegal or high-risk behavior.
- The prominent presentation of dramatic chase scenes, risky actions, and erratic vehicle handling may contribute to the feeling among some thrill-seeking viewers that risky driving is an exciting, exhilarating, glamorous, and challenging activity.

It should be noted that the absence of explicit drunk-driving depictions precludes direct modeling or disinhibition of this particular behavior. Nevertheless, a response to the other basic risky driving predispositions that TV induces may be generalized to the drunk-driving situation. Moreover, affirmative anti-drunk-driving messages are notably absent in entertainment content (e.g., demonstrations of intervention acts, modeling of decisions not to drive after drinking or not to drink before driving, portrayals of accidents or arrests as a result of drunk driving).

News Media

Over the past decade, both news reports and feature stories about drunk driving have increased in number, with newspaper and newscast items covering crashes, arrests, adjudication, policies, prevention approaches, and advocacy efforts. For example, one local study showed 16 times as many newspaper articles about DWI in 1983 than in 1980 (Luckey et al. 1984). Much of this heightened coverage can be attributed to the publicity-oriented activities of organized action groups such as Mothers Against Drunk Driving (MADD) and Remove Intoxicated Drivers (RID), which have sensitized journalists to the issue.

The most powerful role of the news media is in setting the agenda of policymakers and the general public, as more frequent and prominent coverage raises the salience of drunk driving, stimulates public discussion, and serves to legitimize the seriousness of the problem and attempts to address it (see Wallack 1989). In addition, news stories contribute to greater levels of audience awareness and information concerning this topic, and may have important effects on beliefs (e.g., probability of arrest or accidents), social attitudes (e.g., disapproval of drunk drivers), and political opinions (e.g., support for tougher countermeasures). The potential for influence is enhanced by the high credibility attributed to the news media by readers and viewers.

According to a statewide survey by Atkin, Garramone, and Anderson (1986), 60 percent of the public relies on newspaper and TV news sources for learning about chances of arrest, conviction, and penalization. These sources outscore PSAs, interpersonal conversations, driver's education classes, observation of police activities, and experience with police or courts. Further, among the half of the sample who reported having seen recent news stories about local police efforts to catch drunk drivers, the vast majority say that they subsequently believed the chance of arrest to be greater, that they were more likely to warn others about the need to drink safely before driving, and that they were more careful to drink safe amounts.

An analysis of crash-related fatalities in Great Britain during the 1983 Christmas Crusades against drunk driving showed a significant decrease attributable in part to unusually intensive news media publicity (Ross 1987). A combination of heightened police enforcement and news stories emphasizing the law's deterrent threat (particularly the risk of apprehension) was apparently effective in decreasing drunk driving during the crusade month and the following month as well.

Grunig and Ipes (1983) studied the effect of intensive newspaper coverage of the drunk-driving issue in Maryland, focusing on State legislative deliberations about age-21 minimum for drinking and tougher DWI penalties. They concluded that the publicity produced an agenda-setting effect, leading to high levels of problem recognition and involvement, and acceptance of simple solutions such as increased penalties.

Public Service Information Campaigns

In the mid-1980s, announcements on drunk driving became the most prevalent type of PSA on television owing to efforts of Federal agencies, citizens groups, and the National Association of Broadcasters. Brewers such as Coors and Anheuser-Busch also placed prevention messages on TV, and Seagrams continued magazine campaigns to discourage drunk driving and alcohol misuse. The National Highway Traffic Safety Administration (NHTSA), the National Institute on Alcohol Abuse and Alcoholism, the National Safety Council, the American Automobile Association, State highway safety agencies, and local police have used a variety of other channels including pamphlets, billboards, road signs, bumper stickers, cocktail napkins, litter bags, matchbooks, envelope stuffers, movie theater slides, radio spots, and TV talk show appearances.

A collection of campaign materials compiled by NHTSA appears in the handbook *Drunk Driving Public Information Program Strategies and Planning Guide* (DOT 1985). This guide lists hundreds of specific message ideas, classified into enforcement, alcohol effects, community, accident, arrest, sanctions, parent-youth, intervention, self-monitoring, and rehabilitation categories. It also includes a management planning checklist.

The research literature evaluating the effects of campaigns to prevent drunk driving is meager. After a thorough review of published studies and technical reports, Haskins (1985) concluded, "During the last 15 years, very little has been learned about the role of mass communications in drinking-driving despite the expenditure of many millions of dollars for campaigns and substantial amounts for research." Swinehart, Grimm, and Douglass (1974) tested reactions to two dozen magazine ads, discovering that the most

effective ones featured brief copy, dramatic graphics, emotional appeals, and specific action recommendations. The most elaborate field experiment was conducted by Worden, Waller, and Riley (1975) in evaluating the Vermont CRASH program. These authors found that the campaign produced significant improvements in knowledge, attitudes, and behaviors (especially when supplemented with countermeasures); however, this effect evolved slowly, with an increase in the second year of the campaign.

Atkin and Atkin (1986) carried out a project designed to stimulate parental prevention of teenage attendance at drinking parties (and resultant drunk driving). The parent-based approach was control-oriented, stressing actions to minimize teenager access to alcohol and opportunities for heavy drinking through rulemaking, surveillance, and punishment. Messages were disseminated to parents in two experimental communities through newspaper stories, radio PSAs, and pamphlets. In a postcampaign survey of parents, Atkin (1986) found that parents were strongly influenced; they showed evidence of greater awareness of the problem, elevated concern, more networking with other parents, more communication with teenagers about drunk driving and party attendance, and intensified monitoring. However, this effect on parents translated into only a slight indirect effect on bottom-line teenage drinking and drunk driving rates, as measured in student surveys.

In general, mediated drunk-driving campaigns appears to have had relatively little effect on drunk driving. This lack of significant influence is consistent with studies of related campaigns in the domains of safety belt promotion, substance abuse prevention, and other health practices (Atkin 1979; Blane and Hewitt 1980; Atkin 1981b; Flay 1981; Wallach and Barrows, 1982-83; Hewitt and Blane 1984; Manhoff 1985; Leathar et al. 1986; Rice and Atkin 1989).

In the past decade, specialists working in the fields of social psychology have made major advances in the development of conceptual frameworks for designing effective information campaign strategies (Flay et al. 1980; McGuire 1981; Dunn and Rogers 1986), mass communication (Mendelsohn 1973; Atkin 1981a; Grunig and Ipes 1983; Rice and Atkin 1989), public health (Albert 1981; Anderson and McCullough 1981; DHHS 1983; Wallack 1984), and social marketing (Fox and Kotler 1980; Bloom and Novelli 1981; Solomon 1981; Kotler 1982; Novelli 1984; Kotler 1984). These perspectives provide practical guidance for determining appropriate sources, message appeals, and channels for prevention campaigns. The most comprehensive approaches have been developed by social marketers, who stress the importance of the price, the place, and the product as well as the promotion elements emphasized by others. Experts agree that a critical beginning point for successful campaigns is formative evaluation.

Using Formative Research for Designing Campaigns

One key reason why campaigns to combat drunk driving have achieved only limited effectiveness is the lack of adequate evaluation research. Typically, goals are formulated and messages produced in an unsystematic fashion based on hunches of program planners and creative inspiration of copywriters and artists, patterned after normative standards of the genre. In developing campaign strategies for influencing the audience, commercial advertisers and social marketers rely extensively on market segmentation analysis, consumer opinion surveys, focus group interviews, and message pretesting. These approaches can be readily adapted to assist the planning and design of drunk-driving campaigns.

This section illustrates the formative process with selected findings from a series of surveys and supplemental focus group interviews (with teenagers, parents, party hosts, and the general public) carried out as part of a social marketing analysis for a NHTSA drunk-driving-prevention project (Atkin et al. 1986; Atkin and Freimuth 1989).

Identification of Target Audiences

Effective campaigns seldom aim at a broad cross-section of the public, focusing instead on specialized segments of the overall audience. Formative research data help identify the high priority target subgroups: which categories of individuals are at risk, which are most receptive to persuasion, and which are in a position to influence high-risk persons through interpersonal intervention.

Survey measures with representative samples are typically used in segmenting the audience along a number of dimensions defined in terms of demographic and psychographic characteristics, social role, behavioral risk profile, predispositions, future behavioral intentions, and media exposure patterns.

In the case of drunk driving, the surveys show that 16- to 24-year-old males who drink heavily at weekend parties are far more likely to drive while intoxicated or ride with a drunk driver. This high-risk segment constitutes less than 5 percent of the population. The research also indicates that several other target audiences display promising potential for attempting interpersonal intervention to prevent drunk driving: parents of high school students (who can prohibit their teenagers from attending unsupervised drinking parties), adult party hosts (who can discourage excessive drinking by guests, or arrange alternative transportation for intoxicated drivers), and female passengers riding with heavy-drinking dates or mates (who can warn their drivers not to overconsume, or take over the driving role on the ride home). In terms of receptivity, parents are an example of a favorably predisposed audience because most disapprove of teenage drinking, believe that teenage drunk driving is a serious problem, and desire to know techniques to prevent their son or daughter from becoming involved in drunk-driving incidents.

Target Behavior Specification

Typically, the ultimate goal of a campaign is bottom-line behavioral change, such as reducing the incidence of drunk-driving acts. However, most practices are a product of various component behaviors; for example, drunk driving may be reduced if the driver either abstains from alcohol, drinks limited quantities, or allows a sober person to drive home. These behaviors in turn are determined by social and environmental factors such as availability of attractive nonalcohol drinks or suggestions by companions to limit consumption. Formative research is helpful in specifying which particular behaviors and external factors are most influential in altering the focal practices, and which are most amenable to change through campaign messages. These variables are then incorporated as concrete objectives in the campaign plan.

In the case of social intervention to prevent drunk driving, survey research reveals two examples of priority target behaviors. One potentially effective tactic is to encourage the female passenger to drive the car back from a drinking occasion; the data show that women tend to become less intoxicated than their male drivers, yet most allow the male to drive. Findings also show that half of young adults planning to ride back with a driver hesitate to put pressure on that person to stay sober enough to drive safely, while most drivers say they would respond cooperatively to such dissuasion by cutting back on consumption. Thus another important target behavior is more frequent attempts by companions to prevent their driver from exceeding the safe drinking limit.

Regarding target audience receptiveness to behavioral recommendations, the survey of party hosts asked the sample to rate 22 potential hosting techniques in terms of acceptability: how comfortable they would feel in using each strategy, and how offensive they believed each strategy would be regarded by guests. Results indicate that certain techniques are highly acceptable, for example, actively offering food to drinkers, arranging for another guest to drive an intoxicated person home, or expressing concern that a driver is drinking too much. However, other actions are disdained, for example, having guests check in car keys on arrival, or warning drinking drivers about accident risks, stopping service of alcohol 2 hours before the party's end. Such formative evaluation

data enable designers to narrow the list to the most promising techniques, and to isolate less acceptable but critically important behaviors that would require extra persuasive emphasis in order to be changed.

Intermediate Response Elaboration

As a means to achieving the behavioral objectives, campaign messages must first influence preliminary or intermediate target variables along the response chain, ranging from exposure and processing to learning and yielding to actual use. In particular, campaign designers face certain barriers that must be overcome; these individual resistance points often involve misconceptions, dysfunctional attitudes, and behavioral inhibitions. Isolating the most crucial response stages is facilitated by an understanding of the characteristics and predispositions of the target audience. Focus groups and sample surveys are both valuable tools that provide topic-specific background information for mapping the domains of knowledge and lexicon, beliefs and images, attitudes and values, salience priorities, and efficacy and skills.

Knowledge and lexicon. Research illuminates the target audience's entry-level awareness and information-holding about the subject of the campaign, identifying what is already known, what gaps exist, what confusions must be clarified, and what misinformation must be corrected. The level of familiarity with and comprehension of topic-related vocabulary and terminology can also be ascertained.

For example, only one-quarter of the surveyed drinkers knew that 0.1 percent blood alcohol content (BAC) is the legal level that would result in arrest for driving under the influence. Just half realized that eating food before drinking substantially reduces intoxication, and one-fifth incorrectly think that drinking coffee helps to sober up a driver. People have diverse meanings for key terms such as "social drinker" and "moderation," diverse labels for the state of intoxication, and limited understanding of concepts such as intervention and designated driver.

Beliefs and images. Since many campaign message strategies seek to alter subjective conceptions such as perceived social norms or estimated probability of outcomes associated with the behavioral practice, it is important to be precise in measuring the preexisting cognitive orientations held by individuals. For example, data show that drinkers underestimate the degree of social disapproval of drunk driving (fully two-fifths believe that others excuse drunk driving, while just 5 percent of the public is actually tolerant) and overestimate the statistical risks of both crashes and police apprehension (the typical driver perceives that the odds of arrest while driving drunk on a given evening are 1 in 100, while police figures show the chances are 1 in 2,000). Such data tell a strategist that messages should feature information about social norms, but shouldn't emphasize facts about arrest probability.

Attitudes and values. Affective predispositions are also a significant consideration in message design, particularly evaluations of outcomes associated with practices. Depending on the direction, intensity, and structure of relevant values and attitudes, the campaign may concentrate on creation, conversion, reinforcement, or activation. The latter two strategies are appropriate for most drivers, who already hold a negative attitude toward drunk driving and regard the crash and apprehension consequences as undesirable. Messages that intensify the negativity of outcomes (e.g., monetary costs of conviction or difficulty of coping without a license) appear to be promising. On the other hand, the research shows that most men dismiss the embarrassment or threat to masculinity resulting from a wife or girlfriend driving them home, indicating that this presumed obstacle need not be addressed in campaign appeals.

Salience priorities. Research also provides guidance concerning which cognitive and affective orientations need to be made more or less salient. Since most drivers already

believe that there is a substantial risk of crash involvement, but only one-fourth consciously contemplate this possibility, increasing the perceived importance of this outcome would lead drivers to give it greater weight relative to other factors when setting a limit or deciding whether to consume additional drinks. By contrast, most regard drunk driving as a serious problem facing society, indicating little need for campaigning designed to raise this issue on the public's agenda.

Efficacy and skills. For certain practices, many well-intentioned and highly motivated people fail to carry out appropriate acts because they lack subjective performance competency. If research shows that this lack is a barrier, messages can emphasize personal efficacy enhancement or provide specific skills training. For example, survey findings demonstrate that, although most companions agree that it is important to help drivers limit consumption and to prevent intoxicated friends from driving, many of them wish they knew better techniques for discouraging excessive drinking or handling a drunk friend who insists on driving.

Channel Consumption Ascertainment

In deciding which channels are most efficient and effective for disseminating campaign messages, strategists need to determine the mass media preferences and interpersonal communication patterns of target audiences. While some basic exposure figures are available from commercial audience measurement services such as Nielsen, specialized surveys provide a much more elaborate and relevant array of data.

At a general level, it is useful to know the following information about the intended receivers:

- Amount of time spent watching TV, listening to the radio, and reading magazines and newspapers
- Use of specific media (local radio stations, magazine titles)
- Attention to various types of media content (news, public service messages)
- Exposure to secondary channels (movie theater slides, pamphlets, direct mail, billboards, bumper stickers, posters, matchbooks)
- Interpersonal contact networks

Topic-specific data are more pertinent to campaign planning:

- Consumption of media presentations containing subject matter that complements or competes with campaign messages (product ads, news items, feature stories, entertainment portrayals)
- Interpersonal communication about the topic (interactions with opinion leaders, informal conversations, peer pressures)
- Exposure to prior campaign messages (attention to topical PSA's and posters)

Beyond sheer exposure, formative researchers can obtain credibility ratings for media channels, vehicles, and content categories, and measure audience recall and evaluative reactions to messages disseminated in previous campaigns. For example, the drunk-driving surveys found the following:

- Teenage male drinkers tend to listen to rock music stations, while adult party hosts are heavy readers of local newspapers.
- The typical person is exposed each day to a dozen prodrinking portrayals in beer commercials and prime-time shows and to several depictions of risky driving behavior in crime dramas.

- One-fourth of adults have tried to verbally discourage a drunk person from driving.
- Teenage drivers perceive moderately strong peer pressure to avoid getting drunk if driving.
- Young adults attend to an average of two anti-drunk-driving TV PSAs per week, but almost no promoderation spots.
- More than half the public has noticed news stories about local police efforts to catch drunk drivers.
- Many teenage drinkers discredit safety threats featured in PSAs.

Preliminary Component Evaluation

Before campaign stimuli are drafted, strategic and creative approaches are facilitated by both informal feedback and formal ratings of prospective source presenters, message themes, persuasive arguments, and stylistic devices. In the drunk-driving project, focus group discussions explored reactions to altruistic as opposed to fear appeals for motivating intervention attempts, and examined the appropriateness of humorous as opposed to serious treatment of the subject. Survey questionnaires presented listings of several dozen spokespersons, arguments, and claims under consideration for campaign messages. Believability and effectiveness scores for each component were measured along a scale of 0 to 10.

Armed with background information collected in the preproduction phase of campaign design, the strategy and research specialists are in a position to work with creative personnel in the following tasks:

- Formulating potential message ideas (and specific headlines, slogans, copy points, layouts, formats, art work, music, and special effects)
- Selecting visible source presenter talent to appear in the messages
- Determining the most appropriate media for communicating the material

As stimulus construction progresses, research makes further contributions in the form of message pretesting.

Pretesting Research

Pretesting is the second basic phase of formative evaluation that is conducted in developing campaign messages. This term describes the process of systematically gathering target audience reactions to preliminary versions of messages before production in final form (Atkin and Freimuth 1989). Pretesting can help determine which of several alternative ideas or draft message executions are most effective, or it can identify strengths and weaknesses in single prototype executions. Significant progress has been made toward standardizing and implementing production testing methods in general health campaigns, with the initiation of the Health Message Testing Service program (Bratic et al. 1980) and the preparation of a pretesting handbook (HHS 1984).

Issues, Strategies, and Recommendations

This final section identifies issues for discussion, suggests strategies for minimizing deleterious effects and enhancing positive impact, and recommends priority research directions. The categories in this section are the same as the first four categories in the research literature section. The subject of alcoholic beverage marketing is specifically covered under the alcohol advertising topic.

Alcohol Advertising

A key question is whether a clear connection exists between alcohol advertising and drunk-driving behavior, particularly among youthful drivers. If so, what changes in the nature of advertising practices would reduce drinking by drivers (or driving by drinkers)? Would a ban on broadcast advertising lead to less drinking and thus reduce the incidence of drunk driving? Would eliminating vehicle portrayals in ads help minimize problematic effects? Should advertisers disclose safety risks involved in consuming their products in a driving context? Would it be beneficial if ads depicted positive role modeling, such as drivers refusing drinks or companions intervening to discourage excessive drinking or prevent drunk driving?

This first set of issues can be addressed in part in philosophical or intuitive terms, but the ultimate answer requires precise research data demonstrating the actual effects of advertising on key outcomes. Investigations are needed to isolate the features of advertising content that contribute to higher and lower levels of excessive drinking and drunk driving. Conclusive evidence will require longitudinal research with multiple data points, particularly over the formative teenage years during and following the onset of drinking and the initiation of driving. Special attention should be devoted to new products that are introduced; indeed, priority should be given to studies of wine cooler advertising.

Based on the current literature showing relatively modest degrees of harmful effects and the pragmatic political barriers to fundamental change, broad-scale restrictions on advertising do not appear to be promising. Instead, attempts should be made to eliminate a small array of the most problematic practices, to insert additional disclaimers and positive role modeling in ads, and to increase the number of brand-sponsored public service ads that promote moderation or warn against drunk driving. This approach will require discussion of the social responsibility of the advertising, media, and alcohol industries, and of the role of government and advocacy organizations in implementing reform. The optimum arrangements for collaborative efforts between representatives of the industry, the public health sector, and other interested parties should be aggressively explored.

Problematic effects of marketing practices have yet to be investigated by social scientists. Among the four Ps of marketing (product, place, price, and promotion), this panel's attention should focus on promotional activities since other panels are dealing with the first three components. Several types of marketing activities warrant examination:

- Alcohol promotions to underage college students (campus newspaper ads, sponsorship of drinking events, spring-break promotions)
- Tie-ins with professional athletic teams and promotion of drinking at sporting events
- Sponsorship of automobile races and product endorsements by race car drivers
- Licensing of youth-oriented clothing and toys featuring brand names, logos, or trade characters

Entertainment Media

The issues involving the entertainment media closely parallel those raised with advertising. What changes in the nature of TV portrayals would reduce drunk driving? Is the entertainment industry responsible for "social engineering" of appropriate drinking and driving practices? The potential for successful collaboration seems promising, owing to the precedent of the alcohol white paper (Breed and DeFoe 1982) and recent efforts of Harvard's Center for Health Promotion and the Entertainment Industries

Council to encourage depictions of designated drivers and safe party hosting in TV programs.

Thus, the highest priority is determining which types of content are most problematic and which portrayals should be emphasized. The sheer pervasiveness of drinking on TV is probably less critical than the mixture of motivations and consequences. Whether viewers see 100 or 200 drinking acts per week may not make much of a difference, but the ratio of positive to negative depictions can significantly determine attitudinal and behavioral outcomes (e.g., downplaying deficit motives and more realistically representing harmful consequences involving drinking and/or driving). Increased modeling of certain responsible behaviors would also be beneficial (e.g., declining drinks, choosing nonalcoholic beverages, stopping drinking before intoxication, intervening to prevent drunkenness or drunk driving). Research is needed to specify exactly how these various portrayals influence the audience (especially young viewers), and how the material should be packaged for maximum effectiveness.

News Media

As with advertising and entertainment, a general issue concerns the extent to which journalists are responsible for adjusting their professional news standards to accommodate the public interest in covering drunk driving. This problem is more complicated in the case of the news media owing to press freedom and autonomy priorities. Among the specific issues are whether editors and writers should adopt practices such as reporting whether drinking is involved when describing accidents, and identifying names of drunk drivers arrested after accidents or convicted of DWI. These practices are widely endorsed by the public in the Atkin, Garramone, and Anderson (1986) survey.

Several approaches to improving news media treatment appear to be promising. Efforts should be made to generate more extensive news coverage of drunk driving in newspapers and local television newscasts. The publicity tactics developed by antismoking advocates can be examined and adapted to drunk driving (see ACS 1987; AI 1988). There is also a need for more stories reporting newsworthy aspects of the problem about which the public is ignorant and misinformed, such as BAC levels, penalties for conviction, and host liability. Special efforts should be made to work more closely with news media personnel who cover the alcohol and drunk-driving beats, perhaps by convening annual conferences at State or national levels to update gatekeepers on the latest information on these problems.

Research is required to identify the types of content in news and feature messages that attract audience attention and influence the beliefs and attitudes of key subgroups such as drinking drivers and intervenors. For example, tests could be performed to:

- a. determine the relative effect of news items emphasizing the likelihood of getting caught versus the severity of punishment,
- b. measure the extent to which apprehension of the social stigma of news publicity is induced by local newspaper identification of drunk drivers, or
- c. ascertain the effect of stories reporting the arrest of well-known people.

Public Service Information Campaigns

The first issue concerns the degree of current and potential impact of anti-drunk-driving campaigns. Are present information campaigns working well enough, or are additional efforts needed? Can mass media education and persuasion have a meaningful effect in preventing drunk driving, or should resources be redirected elsewhere? Is it necessary to place paid ads in order to reach target audiences effectively?

Second, discussion should explore various forms of coordination that can be

developed to enable more comprehensive campaign programs. How can cooperation between government agencies, private organizations, and the mass media be further enhanced? How can campaign messages be better coordinated with local police enforcement efforts and judicial handling of drunk driving cases?

A third set of issues involves the specification of campaign objectives: Should campaigns recommend absolutely no drinking before driving, or set more realistic guidelines such as one drink per hour? What should be the balance between messages fundamentally discouraging excessive consumption of alcohol and messages focusing on drinking only in the context of driving? Should campaigns intensively focus on specific occasions such as graduation or holiday periods? Or should they run continuously with a lighter schedule of messages? What portion of campaign efforts should be targeted to drivers, to companions, to hosts, and to the general public? For example, interventions can be performed at several points:

- Parents can prevent party attendance by teenagers (precluding the opportunity to drink and drive).
- Designated driver arrangements can prevent drivers from drinking.
- Companions and hosts can persuade drivers to limit drinking before driving.
- Friends can prevent intoxicated drivers from driving.

Campaign strategies can be improved in a number of ways. Concepts and principles from the fields of mass communication and social marketing should be refined and implemented by designers of anti-drunk-driving campaigns. Channels beyond the standard TV PSA should be used more extensively, especially alternatives nearer in time to the drinking and driving event (e.g., radio spots heard on the way to a bar, onsite reminder signs). New message themes and appeals should be created, with more emphasis on positive persuasive incentives and concrete demonstrations for carrying out good intentions. A portion of campaign materials should be devoted to countermessages that inoculate young people against undue influence from problematic themes and depictions in ads and entertainment programming. Research examining the relative effectiveness of various sources, messages, and channels in anti-drunk-driving campaigns would be useful in improving the design and construction of stimuli.

Summative evaluation research is also needed to trace the naturalistic effect of campaigns, using sophisticated and sensitive methods proposed by Haskins (1985). However, at this time a higher priority should be placed on formative evaluation research. More extensive use of preproduction research and message pretesting is one of the more promising avenues for increasing the effectiveness of public communication campaigns. Formative evaluation techniques provide campaign strategists and message producers with valuable information for decisions along each step of the design process from identifying target audiences to refining rough executions.

Formative research has played an instrumental role in the success of educational television programming produced by the Children's Television Workshop, ranging from the development of *Sesame Street* to the recent *Be Smart Don't Start* campaign aimed at predrinkers (Atkin 1989c). Formative evaluation has been centrally featured in a number of recent health campaigns, and is a mainstay in the commercial campaign sector. However, such research is still the exception rather than the rule in the drunk-driving public service domain. It is rarely conducted during development of mass media campaigns because of insufficient funding, lack of technical expertise, and minimal appreciation for the value of background information and feedback. Until this important form of evaluation is given higher priority by managerial and creative personnel, drunk-driving campaigning will continue to be handicapped and only sporadically influential.

Finally, the creation of a new handbook for campaign design would make a major contribution. This document could incorporate social marketing principles, persuasive

strategy guidelines, and evaluation research techniques in a practical package that could be used at national, State, and local levels to improve the effectiveness of public service information campaigns.

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Epidemiologic Perspectives on Drunk Driving

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What is the one element found in approximately half the U.S. highway fatalities? This question has been raised over the last few decades and the answer is still the same: Alcohol. This answer generates another question: If a single, identifiable element is involved in such a large portion of a serious public health and public safety problem, should it not receive top priority for investigation, intervention, and prevention?

Alcohol produces both pleasure and pain, euphoria and depression. Alcohol also produces many jobs and billions of dollars in tax revenues to the States and to the Nation. Each year, alcohol also produces unintentional death to thousands and injury to millions. When mixed with driving, alcohol is the basis for a major public health and public safety problem. In our automotive society, the car is used for almost all facets of social activity. Therefore, since alcohol is involved in many aspects of social behavior, driving after drinking is a relatively frequent occurrence. Fortunately, the vast majority of such driving-after-drinking instances do not result in crashes. One very important task for researchers is to identify variables that differentiate between those driving-after-drinking instances that do result in a crash and those that do not.

How do we learn about the contribution of alcohol to unintentional injury and death on the highways? In attempting to do so, we still find a large gap between description and explanation that, at this time, can be bridged only provisionally through inference. Two widely separated research approaches have been used to date as a basis for inferring the contribution of alcohol to highway crashes: epidemiologic and experimental.

NOTE: Primary responsibility for parts of this chapter is as follows: J.C. Fell, the subsection entitled "Alcohol Involvement in Fatal Highway Crashes"; R.C. Peck, the subsection entitled "Characteristics of Drunk Drivers"; M.W. Perrine, all other sections. The first author is grateful to Robert B. Voas for early discussions of this chapter and for material provided in the sections on "Other Roadside Research" and "Enforcement Checkpoints." Preparation of M.W. Perrine's part of this chapter and production of the manuscript were supported by PHS Research Grants AA74, AA06926, and AA07876 from the National Institute on Alcohol Abuse and Alcoholism.

The epidemiology of alcohol and highway safety can be traced from the first review of the problem presented in 1933 (Miles 1934). Over the years, high blood alcohol concentration (BAC) has been thoroughly implicated in serious and fatal injury highway crashes by post hoc epidemiologic studies. Most evidence for relating this alcohol contribution to highway crashes has been obtained by examination of the distribution of BAC both among drivers involved in actual crashes (fatal and nonfatal) and—on the basis of case-control roadside surveys—among drivers using the highways, but not involved in crashes at the time. A number of such case-control studies have demonstrated that alcohol is overrepresented among deceased drivers relative to drivers in the population-at-risk using the highways at corresponding times and places (e.g., Borkenstein et al. 1964, 1974; Perrine et al. 1971; for reviews see NRC 1987; NHTSA 1985; Perrine 1975*a, b*).

The second approach consists of controlled administration of alcohol in experiments conducted on isolated variables that are assumed to be relevant for actual driving. Alcohol impairment of real-world driving performance is then typically inferred from the mosaic of these bits of behavior examined separately in the laboratory, in driving simulators, and in instrumented cars driven on closed courses (NRC 1987).

Both research approaches to the study of drunk driving are necessary and have been productive (NRC 1987; Perrine 1976). However, this chapter is limited to epidemiologic aspects; it is organized as follows:

- A discussion of the scope of the drunk-driving problem from an epidemiologic perspective

- A brief outline of the major components involved in studying the problem by means of the available data sources

- A review of the most relevant literature, focusing on alcohol involvement in fatal as well as nonfatal highway crashes and in noncrash drivers; crash risk and alcohol; and characteristics of drunk drivers

- An examination of current issues and problems

- Recommendations

Scope of the Problem

The primary problem clearly consists of those motor vehicle crashes that result in fatal injuries. It is now generally well established that alcohol is involved in approximately half of all such fatal crashes. For example, the total number of highway fatalities in 1986 was 46,056, of which some 24,000 (52 percent) involved alcohol. More specifically, BACs exceeded the typical legal limit (0.10) in 41 percent of all fatal crashes.

An estimated 4.8 percent of deaths in the United States during 1980 were directly or indirectly attributable to alcohol (NIAAA 1987). Of these, motor vehicle crashes were the largest single cause of death. Approximately 26,000 deaths in 1980 were attributed to alcohol in motor vehicle crashes; these deaths constituted about 27 percent of the total number of deaths (approximately 98,000) attributable to alcohol (NIAAA 1987, p.6). The number of alcohol-involved motor vehicle deaths is about two times that of the second largest single cause of alcohol-involved death, namely, homicide (approximately 12,000 or 12 percent) (NIAAA 1987, p.6).

The scope of the alcohol and traffic safety problem has recently been reviewed briefly both from a public health perspective (NIAAA 1982, 1985, 1987) and from a public safety perspective (NHTSA 1985, 1987*b*; NRC 1987). In this chapter, the problem is examined further to provide a more integrated synthesis of the literature from both these perspectives.

Major Components of the Study

Aside from epidemiologic methodology considerations, the major components involved in the present perspective on drunk driving consist of the data sources. The two primary sources of data for this area are official records and surveys of various types.

The official records consist primarily of the following:

- The citation report for driving under the influence of alcohol (DUI)
- The accident report, if alcohol is involved
- The prosecutor record
- Court records
- Department of Motor Vehicle records
- Treatment/service provider records
- Probation department records

Of special importance are those reports of accidents in which a fatality resulted, since these data are collected at the State level and then forwarded to the Fatal Accident Reporting System (FARS) of the National Highway Traffic Safety Administration (NHTSA). As an example of using such data, analyses of DUI processing from the point of the arrest citation through the other official records, including the postconviction countermeasures, have been prepared for the State of California (Perrine 1984; Helander 1986; Peck 1987).

The other major source of data for epidemiologic studies consists of surveys. The main varieties are:

- roadside surveys,
- telephone surveys (in recent years, the random-digit-dialing telephone survey),
- household surveys, and
- special location surveys (bars, jails, etc.).

Of these various types, only the roadside surveys can obtain direct measurements of the major criterion variable—namely, BAC—from drivers actually using the roads at the time. All the other survey methods depend on self-reported information from the respondents, including data concerning driving after drinking. Thus, only the direct measurement of BAC at roadside can be used to provide criterion measures for estimating alcohol crash risk and for evaluating the impact of countermeasure programs on the motoring public.

Review of the Most Relevant Literature

Alcohol Involvement in Fatal Highway Crashes

In 1986, 46,056 people were killed in traffic crashes (NHTSA 1988), which are the leading cause of death for Americans age 6-34 (Richardson 1985). Traffic fatalities in 1986 resulted in 1,425,517 years of potential life lost before age 65, an amount greater than deaths from cancer, heart disease, and all other causes. Traffic crashes cost society approximately \$74 billion annually in terms of damage, insurance costs, injury treatments, lost work, and so forth. (NHTSA 1987c). Since 1900, over 2,600,000 Americans have died in traffic crashes; that is 1,500,000 more than the total number of Americans killed in all the wars in U.S. history.

It is well known that alcohol is a leading factor in traffic crashes. It was involved in over half of the traffic fatalities in 1986, resulting in close to 24,000 deaths (NHTSA 1988). Each year, nearly 560,000 additional people suffer injuries in alcohol-related crashes — an average of one person injured every minute of the day. About 43,000 of these injuries are serious (NHTSA 1988).

During the 1982-86 period, approximately 119,000 people lost their lives in alcohol-related traffic crashes — an average of one alcohol-related fatality every 22 minutes over the past 5 years. About two out of five Americans will be involved in an alcohol-related crash in their lifetime (NHTSA 1987a). Approximately 1,800,000 drivers were arrested in 1986 for DUI — an arrest rate of about 1 out of every 90 licensed drivers in the United States (Greenfield 1988).

The problem is especially devastating for young people. In 1986, more than 40 percent of all teenage deaths resulted from motor vehicle crashes. Over half of these were alcohol related, making alcohol-related traffic crashes the leading cause of death for teenagers. For traffic crash victims age 20-24, close to 70 percent of the 8,000 who died in 1986 were in alcohol-related crashes (NHTSA 1988). The probability that a given death is due to a traffic fatality is 55 times as great for a 20-year-old male as for a 65-year-old male; the corresponding ratio for females is 43 (Evans 1987).

The average BAC of drinking drivers involved in fatal crashes was 0.15 in 1986 (NHTSA 1985). The legal intoxication limit in most States is 0.10. In a recent survey of drivers jailed for drunk driving offenses, over a quarter of the drivers had consumed at least 20 beers or 13 mixed drinks within 3-4 hours before they were arrested (Greenfield 1988). Research has shown that a driver with a BAC of 0.15 has a 26-times greater probability of being involved in a crash than a sober driver (NHTSA 1985).

FARS indicated that 41 percent of the traffic fatalities in 1986 involved either a driver or a pedestrian with a BAC of 0.10 or greater. This percentage translated to 18,890 fatalities. An additional 11 percent (5,100 fatalities) involved a driver or pedestrian with some alcohol (BAC = 0.01-0.09). Only 48 percent of the fatalities involved all drivers and pedestrians with zero alcohol.

Alcohol involvement did vary by time of day, day of week, and type of crash (table 1). Seventy-seven percent of the fatal crashes that occurred between 8 p.m. and 4 a.m. on any night of the week involved alcohol. Alcohol was also much more prevalent in single-vehicle crashes than multiple-vehicle crashes. Almost half the collisions resulting

Table 1. Alcohol involvement in fatal crashes: 1986

Crashes	N	BAC		
		0.00 (percent)	0.01-0.09 (percent)	0.10 and higher (percent)
Fatal	41,062	48	11	41
Daytime (4 a.m. - 8 p.m.)	23,828	67	9	25
Nighttime (8 p.m. - 4 a.m.)	16,900	23	14	63
Weekday	22,700	59	9	32
Weekend (8 a.m. Fri - 4 a.m. Mon)	16,277	35	12	53
Single vehicle	17,114	38	11	51
Multivehicle	16,244	58	11	31
Nonoccupant (pedestrian/bicyclist)	7,704	51	9	40

Table 2. Drivers and nonoccupants (pedestrians/bicyclists) involved in fatal crashes: 1986

	N	BAC		
		0.00 (percent)	0.01-0.09 (percent)	0.10 and higher (percent)
All drivers	60,297	66	8	26
Driver fatalities	26,613	52	9	39
Surviving drivers	33,684	77	8	15
Nonoccupant fatalities	7,770	64	7	29
Male drivers	46,622	63	9	28
Female drivers	12,734	79	6	15

in a nonoccupant (pedestrian or pedalcyclist) death involved alcohol, mostly on the part of the pedestrian.

When examining data for all drivers involved in fatal crashes, keep in mind that in multiple-vehicle crashes, at least two drivers are involved in one crash. In 1986, 60,297 drivers were involved in the 41,067 fatal crashes. Twenty-six percent of these drivers were legally intoxicated (BAC greater than or equal to 0.10) at the time of their crashes (table 2). Of the 26,613 drivers who were killed in their crashes, 39 percent were legally intoxicated compared with only 15 percent of the drivers who survived fatal crashes. Male drivers were almost twice as likely to have over 0.10 BAC at the time of their crashes as female drivers (28 percent versus 15 percent).

Alcohol involvement did vary substantially by driver age in 1986 (table 3). While 21 percent of teenage drivers were legally intoxicated at the time of the crash, an additional 13 percent had also been drinking. Drivers 20-24 years old had the highest alcohol involvement rate: 47 percent. In contrast, only 7 percent of drivers age 65 and older were legally intoxicated at the time of their crash.

Examining certain combinations revealed that while almost two-thirds of the fatal

Table 3. Alcohol involvement by driver age, 1986

Driver's age	Driver's BAC			N*
	0.00 (percent)	0.01-.09 (percent)	0.10 and higher (percent)	
16-19	66	13	21	7,854
20-24	53	12	35	11,427
25-34	59	8	33	16,163
35-54	72	6	22	14,305
55-64	81	5	14	4,017
65 and older	89	4	7	4,881
All ages	66	8	26	60,297

*N = Number of drivers in age group where age was known.

Table 4. Drivers involved in fatal crashes, 1986

	N	BAC		
		0.00 (percent)	0.01-.09 (percent)	0.10 and higher (percent)
Male/weekend/night	10,573	38	14	49
Female/weekday/day	6,503	90	3	7
Driver age groups				
15-20	10,467	64	13	23
21-44	34,518	60	9	31
45 and older	13,968	82	5	13

crashes involving a male driver on a weekend night were alcohol related, only 10 percent of the crashes involving a female driver in a weekday crash in the daytime involved alcohol (table 4).

Alcohol involvement was also found to vary considerably by the type of vehicle driven (indicating the type of driver, in most cases) (table 5). Drivers of motorcycles involved in fatal crashes had by far the highest alcohol involvement rate: 54 percent. Only 3 percent of heavy-truck drivers involved in fatal crashes had BACs over 0.10. Drivers of older vehicles were more often legally intoxicated than drivers of newer vehicles (34 percent versus 22 percent).

Intoxicated drivers in fatal crashes also tended not to use safety belts. Of the fatally injured drivers who were at zero alcohol, 20 percent were wearing safety belts compared with only 7 percent of the fatally injured drunk drivers. Thirty-six percent of the zero-alcohol surviving drivers were reported as using belts, in contrast to only 15 percent of the intoxicated surviving drivers.

Contrary to some popular misconceptions, the victims of alcohol-related fatal crashes are most often the drinking driver or drinking pedestrian. Two-thirds (66 percent) of the 23,990 victims of alcohol-related crashes in 1986 were the drinking driver or drinking pedestrian (table 6). An additional 20 percent of the victims were passengers in the

Table 5. Drivers involved in fatal crashes, 1986

Drivers of:	N	BAC		
		0.00 (percent)	0.01-0.09 (percent)	0.10 and higher (percent)
Motorcycles	4,542	46	13	41
Passenger cars	35,920	65	9	26
Light trucks and vans	11,724	63	8	29
Medium trucks	653	92	3	5
Heavy trucks	4,355	95	2	3
Older vehicles (older than 1976)	13,168	59	9	34
Newer vehicles (1984-87)	15,579	70	8	22

Table 6. Alcohol-involved fatal crash victims, 1986

	N	Percent
Drinking drivers killed	13,190	55
Drinking pedestrians and pedalcyclists killed	2,640	11
Passengers in drinking driver's vehicle killed	4,800	20
Sober drivers killed in crash with drinking driver's vehicle	1,680	7
Passengers in sober driver's vehicle killed in crash with drinking driver	960	4
Sober pedestrians/pedalcyclists killed by drinking driver	720	3
Total	23,990	100

drinking driver's vehicle. Additional analyses revealed that in fatal crashes where BACs were known for drivers and their passengers, 36 percent of the time the driver was legally intoxicated but the passenger was not.

Table 7 shows the basic trend with regard to the alcohol problem in fatal crashes over the past 5 years. The percentage of drivers in fatal crashes who were intoxicated (BAC = 0.10 or greater) at the time of the crash decreased from 30 percent in 1982 to 26 percent in 1986—a 13-percent reduction, which is substantial. The reduction was especially great for teenage drivers (table 8). While 29 percent of the teenage drivers in 1982 were legally intoxicated, this amount dropped to 21 percent in 1986, a 28-percent reduction. While this teenage driver trend is encouraging, one must still keep in mind that teenage driver involvement in fatal crashes per mile driven is substantially higher than other driver age groups (Fell 1987).

The nature of this 5-year alcohol reduction trend was examined in the following manner. Specific decreases of certain types of drivers and certain types of crashes were compared with the overall reduction. If these specific reductions were substantially greater than the overall reduction, then that would indicate that these drivers or conditions were affected most. Figure 1 summarizes the key findings concerning the nature of the reduction.

The largest reductions noted were for teenage drivers (28 percent), followed by teenage pedestrians killed in collisions (26 percent). Also affected were drivers of vans (23 percent reduction), female drivers (21 percent), and drivers who survived the fatal

Table 7. BACs for all drivers involved in fatal crashes, 1982-86

(in percents)

BAC	1982	1983	1984	1985	1986	1982-86 change
0.00	61	62	64	66	66	
0.01-0.09	9	9	9	8	8	
0.10 and higher	30	29	27	26	26	-14
N	56,029	54,656	57,512	57,883	60,297	

Table 8. BACS for teenage (16-19) drivers involved in fatal crashes
(in percents)

BAC	1982	1983	1984	1985	1986	1982-86 change
0.00	58	61	63	67	66	
0.01-0.09	13	13	13	11	13	
0.10% and higher	29	27	24	22	21	-28
N	7,467	7,050	7,366	7,151	7,854	

crashes (17 percent). The absolute reduction was also larger in weekday crashes (17 percent) and in multivehicle crashes (16 percent).

Drivers age 25-34 had only a slight reduction during this 5-year period (6 percent). Motorcycle drivers, with the highest percentage of alcohol involvement to begin with, experienced no change in the percentage of drivers legally intoxicated during this period. Pedestrians age 20-64 also had no reduction in the percentage legally intoxicated between 1982 and 1986. Late night crashes and single-vehicle crashes showed only modest reductions in the percentage of drivers who were at 0.10 BAC or higher (6 percent and 9 percent, respectively).

The average BAC of drinking drivers in fatal crashes in States where most of the drivers were tested showed a modest decrease from 0.165 in 1980 to 0.153 in 1986.

Alcohol consumption per capita decreased in the United States between 1982 and 1986. But if that decrease was a prime factor in the decreased alcohol involvement of drivers in fatal crashes, then a similar reduction should have occurred in intoxicated adult pedestrians in fatal crashes, which was not the case.

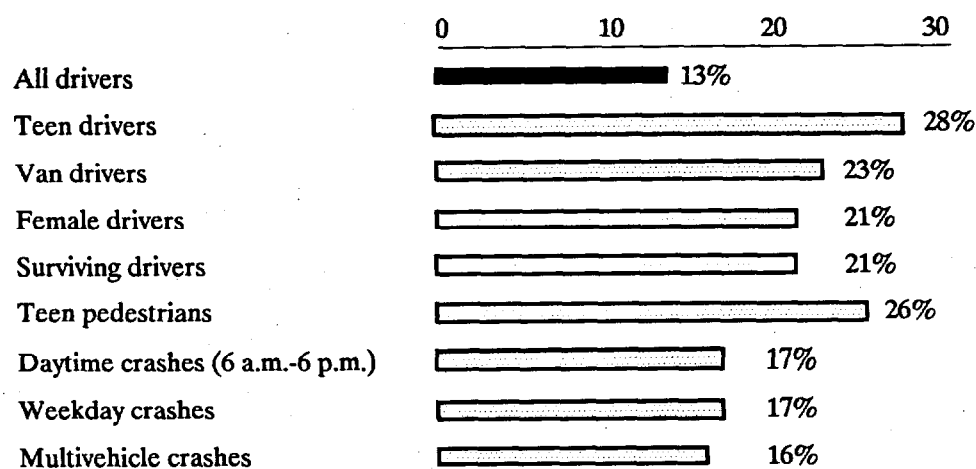


Figure 1. Nature of alcohol reduction in fatal crashes, 1982-86
Decrease in percentage drunk (BAC = 0.10 or higher)

Table 9. Nature of alcohol reduction among fatally injured drivers with known BACs in 15 good reporting States*

(percents)

BAC of fatally injured drivers	1980	1981	1982	1983	1984	1985	1986	1980-86 change
00	39	40	41	43	46	49	48	+23
.01-.09	11	11	11	10	11	10	12	+9
.10-.19	27	26	25	25	23	22	22	-19
.20+	24	23	23	21	20	19	18	-25

*Test and report BACs on 85 percent of fatal drivers.

The nature of the reduction of alcohol in fatal crashes does seem to point to main effects in responsible social drinkers, i.e., substantial reductions in daytime crashes, by female drivers, drivers of vans, and teenagers. However, there is some evidence that the percentage of drivers with very high BACs is also decreasing, at least in the 15 "good-reporting" States in FARS. Table 9 shows that, in 1980, almost a quarter (24 percent) of the fatally injured drivers in these States had BACs of 0.20 or greater. That portion in 1986 was 18 percent, which was a 25-percent reduction – greater than the reduction for the drivers at BACs between 0.10 and 0.19. Most researchers would agree that drivers at 0.20 BAC or greater are most likely problem drinkers or alcoholics. Yet the percentage of drivers at these levels has decreased significantly since 1980 (in that 15-State sample). Are these problem drinkers finding alternatives to driving? Are they confining their drinking to their homes? Have many of them stopped drinking? More research is necessary to answer these important questions.

Alcohol in Noncrash Drivers

Accurate determination of alcohol actually present in drivers while they are using the highways can be estimated only by obtaining measurements from samples of these drivers at roadside. (Thus, self-reported drinking-and-driving data from telephone or household surveys are not considered here.) Measurement of alcohol in noncrash drivers is generally obtained at roadside for four major purposes:

1. To estimate the contribution of alcohol to crash risk
2. To provide data for describing a particular problem by identifying and specifying relevant parameters
3. To provide data for evaluating the results of any changes in circumstances surrounding the particular problem, whether they result from unplanned natural events or from controlled countermeasures
4. To foster general deterrence of drunk driving and to enforce DUI laws

Research designed to accomplish the first purpose involves case-control studies. Activities designed for the fourth purpose are currently referred to as either enforcement checkpoints or sobriety checkpoints. Studies designed for the second or third purpose have a broader range of objectives. Useful epidemiologic data can be obtained from activities designed for any of these four purposes, but the most fundamental question is addressed in investigations of alcohol and crash risk by means of case-control studies.

Case-Control Roadside Surveys and Alcohol Crash Risk

That alcohol is found in approximately 50 percent of fatally injured drivers tested does not necessarily prove that alcohol actually contributed to the occurrence of these crashes. To begin building a case for or against the actual contribution of alcohol, it is first necessary to determine the extent to which fatally injured drivers with alcohol are representative of drivers with similar exposure, but not involved in the crashes. Thus, it is necessary to compare the distribution of BACs obtained from control or comparison drivers randomly selected while passing the same place as the crashes and at equivalent times. By comparing these two sets of data, it is then possible to determine the similarities and differences between the two sets of drivers in terms of the percentages of each with no alcohol, with detectable alcohol, with medium BACs, with high BACs, and so forth.

For example, a number of studies have indicated that between 40 and 50 percent of fatally injured drivers examined had BACs of 0.10 or higher. If we had been able to examine the other motorists who were actually driving at the same times and places that these fatal crashes occurred, and if we had found that about 45 percent of these noncrash-involved drivers also had BACs of 0.10 or higher, then we would have no basis for concluding anything at all about the contribution of alcohol to highway crashes. That is, the percentages of high-BAC drivers in the fatally injured sample would have been the same as the percentage of high-BAC drivers in the comparison sample from the population-at-risk—namely, about 45 percent. Therefore, in this hypothetical instance, high-BAC drivers would have been neither under- nor overrepresented in terms of the percentage of the population-at-risk made up of high-BAC drivers, namely, about 45 percent.

Conversely, if we had found a significant difference between the percentage of high-BAC fatally injured drivers and the percentage of high-BAC control drivers from the same population-at-risk, then we would be able to make some strong inferences about the relative contribution of alcohol to these fatal crashes. This line of reasoning provides the logical basis for attempting to obtain these BAC data from the population-at-risk using the case-control design with roadside research surveys.

The first such study was conducted in Evanston, Illinois, 50 years ago by Holcomb (1938), and several more studies have been conducted in the United States and abroad since that time. These case-control studies have been analyzed from a variety of perspectives and summarized in a number of publications (Hurst 1973, 1985; NHTSA 1985; Perrine 1975*a, b*; Reed 1981; Zylman 1971). However, the material that follows in this subsection is taken primarily from the most recent review (NRC 1987). In all these reviews, a consistent pattern is revealed by the case-control studies: crash risk increases sharply as BAC rises.

The relative probability of being involved in a crash is defined as the ratio of the BACs of comparison drivers to those of drivers involved in crashes. This probability remains roughly equivalent for crash-involved drivers compared with noncrash drivers up to about 0.08 BAC (figure 2). (However, these relative risk curves understate the risk of involvement at low BACs.) Although the rate of increased risk varies across studies (in part because some studies examine all crashes and some examine only fatal crashes), the risk increases after about 0.08 BAC in all cases and increases dramatically after 0.10 BAC in most studies.

The curves depicted in figure 2 are based on groups of drivers of different ages who have varying experience with alcohol and with driving. Because of the heterogeneity of control groups and the lack of perfect comparability, the effect of alcohol at low BACs is masked by other variables. For example, the major shortcoming of the Grand Rapids study (among the most cited case-control studies) is the lack of comparability between the drivers involved in crashes and the control drivers regarding the frequency of consuming alcohol. This lack of comparability is the source of the apparent improvement in crash risk at low BACs in the Grand Rapids data (the much debated "Grand Rapids

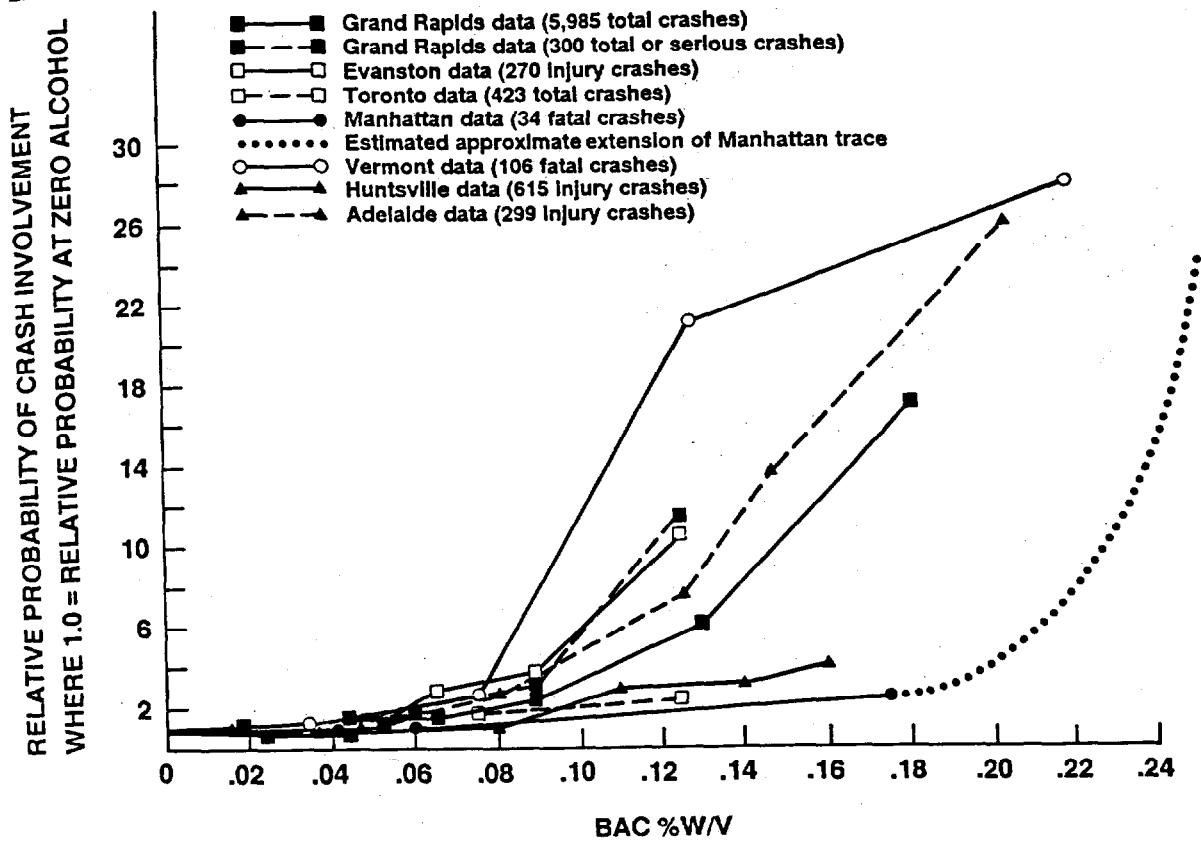


Figure 2. Relative probability of crash involvement as a function of BAC. (Hurst 1985.) Reprinted with permission.

dip”) and the understatement of the risk of crash involvement at low BACs. Hurst (1973) noted that the control group had a higher percentage of drivers who were regular consumers of alcohol. Their apparently greater tolerance for alcohol had made them safer drivers at low BACs than the drivers involved in crashes at low BACs, presumably because the latter had less experience as drinkers. Hurst recalculated the relative risk of crash involvement in the Grand Rapids data based on the drivers’ self-reported frequency of alcohol consumption (figure 3). He drew three conclusions from the results. First, drivers with frequent experience as drinkers are less likely to be involved in crashes than light and medium drinkers at comparable BACs. Second, regardless of the tolerance for alcohol, the risk of crash involvement increases with BAC. Third, the curves greatly underestimate the risk for the average driver at any BAC; they only demonstrate the relative hazard to drivers who regularly drink and drive. The curvilinear relationship between relative risk of crash involvement and BAC is therefore caused in part by the comparison of drivers with varying degrees of experience as drinkers and experience driving under the influence of alcohol. When experience with alcohol is controlled for, the risk of crash involvement increases with BAC without evidence of a threshold effect.

As noted by Perrine (1975b) in his review of the literature, the relative risk of involvement is not the same as evidence of causality. Given the many interacting factors that may contribute to a crash (and the lack of data on many of them), the role of any single factor is difficult to isolate. Three of the case-control studies deserve special attention because they also estimate the effect of alcohol on the probability of being responsible for a crash.

The methodology for estimating crash responsibility was first developed by McCarroll and Haddon (1962) in their case-control study of fatal crashes in Manhattan. They

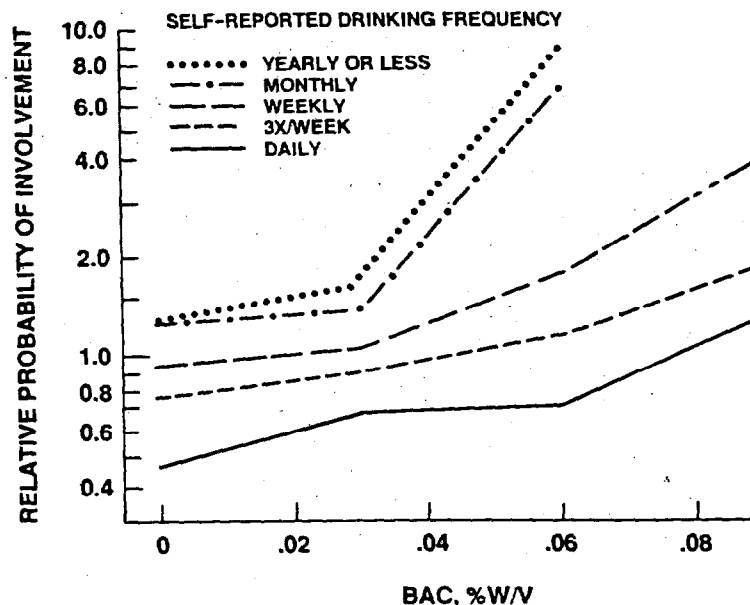


Figure 3. Relative probability of crash involvement by self-reported drinking frequency (Hurst 1973). Reprinted with permission from the *Journal of Safety Research*, a joint publication with the National Safety Council and Pergamon Press, Ltd.

categorized the crashes into five classes, the first three of which were assigned responsibility:

1. Only one vehicle involved
2. Two vehicles involved but only one moving
3. More than one vehicle involved and in motion, with responsibility assigned based on circumstances of the crash (cases in which there was any doubt were excluded from this category).

The Manhattan study is based on a sample of 43 drivers fatally injured in crashes that occurred between June 1950 and June 1960. For the 26 drivers in the assigned responsibility classes, 19 (65 percent) had positive BACs, of which 14 (46 percent) had BACs greater than 0.10. Of these 14 drivers, 12 had BACs of 0.25 or greater. Of 156 drivers randomly selected as controls at or near the sites of the crashes, 39 (25 percent) had positive BACs, of which only 8 (5 percent) were at or above 0.10.

The Grand Rapids investigation involved by far the largest sample of all the case-control studies (5,985 crashes of all types) (Borkenstein et al. 1964, 1974). By comparison, the 423 cases in the Toronto study constituted the next largest sample (Lucas et al. 1955; Hurst 1985). Using McCarroll and Haddon's method for assigning responsibility, Borkenstein, Crowther, Shumate, Zill, and Zylman estimated that 3,305 of the involved drivers were responsible for the crash that occurred. They used the innocent drivers as controls.

The Vermont study was the third to estimate crash responsibility, based on 106 cases (all fatal crashes) (Perrine et al. 1971). These crashes resulted in 113 fatalities, and 97 of the drivers were assigned responsibility, again relying on the method developed by McCarroll and Haddon. Of the drivers judged responsible, 60 percent had positive BACs and 46 percent had BACs at or above 0.10. Perrine, Waller, and Harris (1971) also calculated a crash-responsible curve, but in contrast to the Grand Rapids study, the drivers stopped at roadblocks were used as controls.

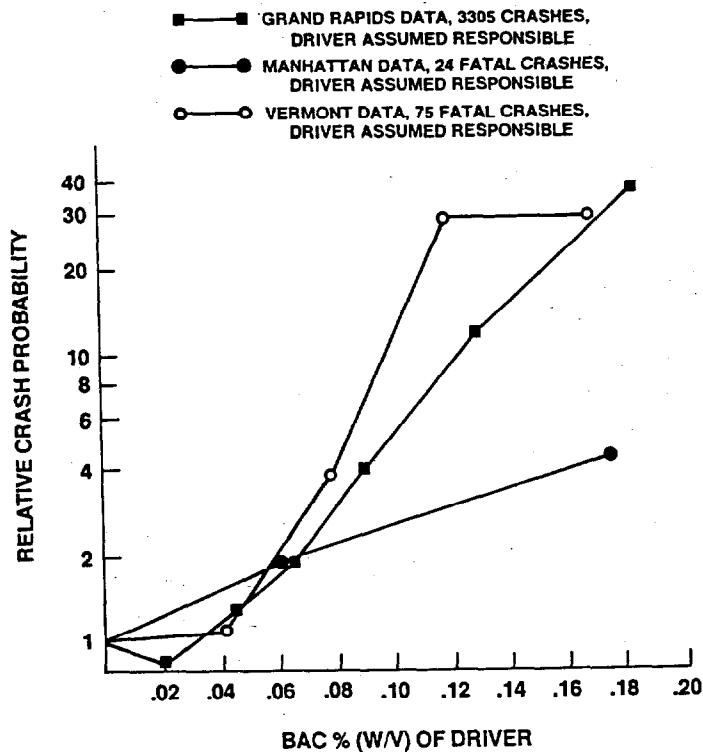


Figure 4. Relative crash responsibility for drivers assumed responsible and those not assumed responsible as a function of BAC, where 1.0 = relative probability at zero alcohol. (Hurst 1973.) Reprinted with permission from the *Journal of Safety Research*, a joint publication with the National Safety Council and Pergamon Press, Ltd.

Hurst (1973) replotted the curves from these three studies on a logarithmic scale to facilitate comparison (figure 4). Although risk of crash responsibility increases as BAC increases in all three studies, several disadvantages with the underlying data should be noted.

The trend in the Manhattan data is based on a very small number of crashes: 25 responsible drivers with positive BACs. In addition, the trend at the higher BACs is greatly understated. For the fatal crashes in which the driver had a BAC of 0.25 or higher (about half those in the driver-responsible category), no driver in the control group had an equivalent BAC. "Hence, the relative hazard calculated from the case/control ratio would be infinite within the range, were it possible to graph it" (Hurst 1973).

One of the shortcomings of the relative risk curve estimated in the Grand Rapids study is the inclusion of drivers involved in single-vehicle crashes in the group of responsible drivers. Although the responsibility of the driver is not in question, because of the nature of the crash, a control driver is not available. The published data do not provide sufficient detail to allow the curve to be completely recalculated without the single-vehicle crashes to determine the effect of including these crashes, but the available data suggest that the curve would shift to the right. It would still accelerate after 0.04 BAC and at an exponential rate, but the curve would not rise as quickly as shown in figure 4.

One problem with the Vermont data is the small number of crashes in the sample. In the comparison of crash risk as BAC rises, one or two drivers are responsible in some of the BAC ranges. Chance occurrence could distort the results when so few drivers are the basis of the calculations.

Despite the weaknesses in the case-control studies, some important conclusions can be drawn. In several of the case-control studies done in the United States and abroad, a consistent increase in risk of crash involvement has been shown. When experience with drinking is controlled for, this risk increases with BAC without any evidence of a threshold effect (or dip). The three studies that attempted to estimate crash responsibility showed that the risk of causing a crash increases even more rapidly than the risk of crash involvement as BAC increases (NRC 1987).

Another important aspect of the alcohol contribution to crash risk is reported by Voas (NHTSA 1985). To emphasize the significance of the difference in BAC between drivers assumed to be responsible versus those assumed not to be responsible for crashes, Hurst (1974) also presented an additional calculation on the data from the Grand Rapids study. His results for the drivers assumed to be responsible are represented by the center plot in figure 4. However, the probability of being innocently involved in a crash remains essentially level and does not increase with increasing BAC; the plot is basically flat and would lie between the relative crash probability of 1 and 2 in figure 4. The same result was found in the Huntsville/San Diego study by Farris, Malone, and Lilliefors (1977). These results provide further evidence for the causal role of alcohol in crashes.

Other Roadside Research

The success and utility of the case-control procedures for investigating alcohol crash risk stimulated interest in using the roadside survey technique for evaluating alcohol safety programs by measuring the change in the number of high-BAC drivers actually on the roads. Standardized procedures for conducting roadside surveys were developed (Perrine 1971) and applied successfully in 28 of the 35 Alcohol Safety Action Projects (ASAPs) funded by the Department of Transportation between 1970 and 1975 (Voas 1972; Carr et al. 1974). In these programs, the roadside surveys were used to evaluate project effectiveness (Levy et al. 1978) by serving as a means to collect data used as the primary criterion or dependent variable (BAC). Roadside surveys were conducted before and after program implementation to measure the change in average driver BAC (if any) resulting from project activities (Lehman et al. 1975). When used for program evaluation, sampling was conducted during periods when a high percentage of drinking drivers was on the road (i.e., Friday and Saturday nights) rather than at times and places at which accidents had occurred. By a return to the same sites, changes over time can be measured.

Roadside surveys provide a more direct method of evaluating alcohol safety counter-measure programs than does the use of accident data, because highway crashes result from a large number of factors (weather, roadway construction, economic conditions, etc.) that are unrelated to the evaluation of enforcement activities. The BAC values of drivers serve as an intermediate measure between action programs and the ultimate criterion of accident prevention. While a reduction in the average BAC of drivers on the road does not guarantee a reduction in crashes, the relationship between driver BAC and risk of crash involvement is close enough to make this measure a credible criterion for program effectiveness.

During the ASAP period (1970 through 1974), some 77 roadside breath-testing surveys of nighttime drivers were conducted. In addition, a national roadside breath-testing survey was conducted in 1973, and a computer archive of these 78 roadside surveys is stored at the University of Michigan Highway Safety Research Institute (Lehman et al. 1975). The file contains breath-testing results, demographic data, and so forth, for some 78,000 randomly selected drivers, as well as 2,700 passengers. Analysis

of these aggregated data show the following percentages of drivers with BACs at or exceeding 0.10: 1 percent of weekday-early drivers, 3 percent of weekend-early drivers, and 6 percent of weekend-late and weekday-late drivers. Significant reductions in the percentages of drivers above the legal limit (0.10 BAC) were demonstrated for those jurisdictions that used this evaluation method (Levy et al. 1978).

Based on the utility of this roadside BAC measure in the ASAP program, it was applied again in a 4-year study of a special DUI enforcement effort in Stockton, California (Voas and Hause 1987). In this study, survey procedures were modified to permit low cost and low profile surveys that were conducted every weekend for 3 ½ years (Hause et al. 1982). Drivers with a BAC of 0.10 or greater on Friday and Saturday nights decreased from 88 per thousand before the Stockton project to 50 per thousand during the third year.

The roadside survey technique also permits (through an application of Bayes' Theorem) estimation of the probability that a driver at a given BAC will be arrested by the police. This procedure was first applied by Beitel, Sharp, and Glauz (1975) to the ASAP survey data in Kansas City. Hause, Voas, and Chavez (1982) used the same procedure in Stockton. These studies provided roughly similar results indicating that the chances of being arrested at a BAC of 0.15 is roughly 1 in 100, while the chance of arrest at 0.10 BAC is half that amount, about 1 in 200. Since both these studies involved intensive enforcement programs, they provide a reasonable indication of the maximum arrest rate that can be achieved with traditional patrol methods.

The ASAP experience with roadside research surveys and with the success of the manual for conducting and evaluating them (Perrine 1971) provided the basis for subsequent international activity. An invitational international workshop was conducted in Paris in an attempt to coordinate the methodology for roadside research surveys to be implemented in other countries in order to maximize the comparability of the obtained data. The workshop resulted in a useful manual (Carr et al. 1974) and complemented parallel activities being conducted under the auspices of the Organization of Economic and Cooperative Development. As a result of these activities, use of roadside surveys for international comparisons of countermeasure programs was stimulated in Canada, the Netherlands, Norway, Sweden, and Finland. The resulting data permitted an international comparison of driver BACs (Voas 1982), which indicated that approximately 12 percent of drivers on weekend nights were at or above 0.05 BAC in Canada, the Netherlands, and the United States, whereas less than 2 percent of drivers were at this level in Scandinavian countries.

Although use of roadside research surveys has diminished in the United States since the end of the ASAP activities in the mid-1970s, the technique continues to be used effectively in other nations, for example, Canada, Australia, Denmark, and Norway. Nevertheless, a few studies of the population-at-risk in the United States either have been conducted recently or are currently being conducted. In the spring of 1986, U.S. National Roadside Breathtesting Survey II (Wolfe 1986) was conducted in a representative sample of 32 localities, 18 of which had participated in the 1973 U.S. National Roadside Breathtesting Survey I (Wolfe 1974). Statistically significant reductions were found in the percentage of medium and high BAC drivers sampled at high-risk times (Friday and Saturday nights from 10 p.m. to 3 a.m.). Drivers at or above the illegal BAC of 0.10 decreased from 5.0 percent in 1973 to 3.1 percent in 1986; drivers at or above a BAC of 0.05 decreased from 13.5 percent in 1973 to 8.3 percent in 1986. It should be noted that the breathtest completion rates were 86 percent in 1973 and 92 percent in 1986.

In Vermont, a large-scale roadside research study involving a projected 42,000 nocturnal drivers sampled at high-risk times (Friday and Saturday nights from 10 p.m. to 3 a.m.) is currently being conducted. It is funded by the National Institute on Alcohol Abuse and Alcoholism (NIAAA, Grant AA07876). This 5-year field study is primarily

designed to determine the prevalence of drivers with high alcohol tolerance, and to determine their salient and differentiating characteristics. Since the high alcohol tolerant driver is apparently rare, a large number of motorists (42,000) driving at high-risk times must be stopped and screened for BAC to identify a sufficient number of such people (40 to 60) to be able to conduct a meaningful study. In the process of conducting this field study, a large number of people will be breathtested using both the new passive alcohol sensor and the more traditional hand-held evidentiary devices. Approximately 4,000 of these motorists, sampled across the full distribution of BACs, will participate in extensive personal interviews concerning self-reported background data; drinking, driving, drinking-and-driving, drugs-and-driving information and attitudes; and selected personality characteristics. Data will also be gathered on these motorists' driver records, performance on the most valid field sobriety tests (gaze nystagmus, walk-and-turn, and standing steadiness), and ratings on clinical signs of intoxication. With a test completion rate of 96 percent, the results from the first 650 drivers indicate that 3.7 percent had a BAC of 0.10 or higher, whereas 10.2 percent had a BAC of 0.05 or higher. Although the sample size is still relatively small, these 1988 data show a decrease in distribution of BAC when compared with data obtained in a 1974 Vermont study (Perrine 1976) of 1,663 drivers at high-risk nocturnal times (Thursday, Friday, and Saturday nights between 10:30 p.m. and 3 a.m.): 4.6 percent had a BAC of 0.10 or higher and 14.7 percent had a BAC of 0.05 or higher. Thus, these roadside studies of the high-risk population would seem to show that some progress is being made in the war on drunk driving, if motorists with BACs in excess of the legal standard (0.10) are taken as the criterion.

Enforcement Checkpoints

Police officers conduct sobriety checkpoints at which they stop motorists at random and test them for breath alcohol. Such activities are conducted primarily for enforcement purposes, although they also serve as general deterrence. Although useful data for epidemiologic purposes are available from these enforcement checkpoints, few systematic studies have been conducted to analyze such data. If they were analyzed carefully and properly, these data could provide a valuable source of relatively low-cost information concerning the population-at-risk. In a recent Charlottesville, Virginia study, Voas, Rhodenizer, and Lynn (1985) evaluated the effectiveness of such sobriety checkpoints, especially in comparison with the drivers arrested for DUI by traditional roving patrols. In addition, this study found evidence of police biases in those arrested, whereby both young drivers and women were underrepresented among arrested drivers, while minority and very high BAC drivers were overrepresented. Thus, such studies clearly demonstrate that researchers can avail themselves of enforcement checkpoints as an opportunity to collect valuable data for epidemiologic purposes.

Characteristics of Drunk Drivers

During the past 20 years, numerous statistical and clinical studies have been published on various aspects of the drinking driving problem. However, surprisingly little rigorous research has been published on characteristics of convicted DUI offenders, particularly when contrasted with the vast literature on problem drinkers/alcoholics, and on characteristics of drivers involved in fatal accidents. As suggested by Zylman (1974) and by Moskowitz, Walker, and Gomberg (1979), the population arrested and convicted of DUI offenses is not typical of impaired drivers in general or of drivers involved in alcohol-related accidents. The mean BAC of convicted DUI offenders in California during 1984 was 0.18—a concentration far in excess of the State's 0.10 limit per se, and well beyond the level at which impairment occurs. In one of the few formal statistical studies of differences between alcohol-involved fatal accident drivers and convicted DUI offenders, Fridlund and Hagen (1977) used discriminant function analysis in comparing 146 DUI offenders in Los Angeles County with a sample of 191 alcohol fatalities. The DUI conviction group had significantly more prior DUIs, more prior reckless-driving

convictions, and more prior moving traffic convictions. The differences on the incidence of DUIs and reckless convictions was large, with the DUI group having about three times as many entries during the prior 3-year period.

Moskowitz, Walker, and Gomberg (1979) conducted a detailed review of the literature on DUI offender characteristics. This subsection relies heavily on their monograph for the pre-1979 literature, but concentrates on recent studies and studies not included in the 1979 review for its primary source references. However, a few pre-1979 studies of special importance are reviewed here as primary references even though they are also included in Moskowitz et al. (1979):

Moskowitz, Walker, and Gomberg organized their review by type of offender characteristic (prior driver record, age, etc.), and reached the following conclusions with respect to each domain:

- **Marital status:** DUI convictees are much more likely to be divorced, separated, or widowed than are non-DUI control populations. Some studies have reported five- to sixfold differences in rates compared with control populations.
- **Employment history:** Convicted DUI offenders are more likely to be unemployed, with rate differentials ranging from two- to fourfold higher across various studies.
- **Occupation:** Convicted DUI offenders are more likely to have lower status occupations. DUI offenders in blue collar jobs averaged 65 percent across studies compared with 51 percent for control samples.
- **Income:** Convicted DUI offenders tend to have lower incomes—about 18 percent lower than controls across the reviewed studies.
- **BAC:** The mean BACs for the offenders averaged from 0.18 to 0.28. (Statewide California figures have consistently averaged 0.18.)
- **Drinking behavior:** DUI offenders drink more often and consume more alcohol per sitting than do non-DUI populations. Beer is the preferred beverage of DUI offenders. The findings of the Southern California study by Pollack (1969) are typical. Pollack reported that 18 percent of DUI drivers drank every day compared with 11.5 percent for a control sample. In terms of drinks per sitting, 35.2 percent of the DUI sample typically consumed five or more drinks compared with 5.7 percent of the control sample.
- **Reason for drinking:** Convicted DUIs (and alcoholics) are more likely to drink to release tension and to cope with stress.
- **Problems caused by drinking:** Convicted DUIs are much more likely than controls to exhibit poor health, family disorganization, financial problems, and poor job performance.
- **Prior alcohol treatment history:** Convicted DUIs are more likely than controls to have previously entered some form of alcohol treatment program. The median across 20 studies was 6.0 percent, with a maximum of 42.5 percent. (This characteristic is highly dependent on the institution and delivery systems of a particular region, and would be expected to vary across jurisdictions and over time.)
- **Problem drinking status:** Studies using the Michigan Alcoholism Screening Test (MAST) indicate that 54-74 percent of convicted DUIs fall in the problem-drinking and alcoholic range. Studies using the Mortimer-Filkins test produce slightly lower prevalence figures.
- **Driving after drinking:** Convicted DUIs are much more likely than controls to drive after drinking. Pollack (1969), for example, reported that 49 percent of DUI offenders admitted to driving at least once a week after two drinks compared with 12 percent of a control sample.

- Total prior arrests: Convicted DUI offenders are more likely to have prior arrests for both alcohol and nonalcohol offenses.
- Driving history: Convicted DUI offenders have substantially more driving record entries of all types than do controls (more DUIs, more alcohol and total accidents, more moving traffic violations, and more license actions). The rate increases across studies and variables range from 100 percent to 500 percent. The driving record histories of convicted DUIs are also substantially worse those of medically diagnosed alcoholics.
- Personality traits: Convicted DUIs have a significantly higher prevalence of personality trait disorders. They are more likely than controls to exhibit neuroticism, depression, paranoid ideation, low self-esteem, and to have a lower sense of personal responsibility and control and greater feelings of aggression/hostility.
- Stress: Convicted DUI offenders are more likely to report experiencing stress from family, financial, and job problems.
- Education: Convicted DUI offenders are more likely to be high school dropouts and have fewer years of education.
- Age: Convicted DUI offenders tend to be slightly older than non-DUI controls, with the highest disproportionate concentration in age interval 30-45.
- Race: Most convicted DUI offenders are white, but minority groups (hispanics and blacks) are overrepresented compared with their representation in the population.
- Sex (not covered by Moskowitz): The great majority of convicted DUI offenders are male. The range for females is from 5 to 20 percent, depending on the characteristics of the specific DUI population (first versus repeat offenders), region, and so forth. A large statewide sampling in California indicates that 13 percent of those convicted for a DUI offense in 1982 were female (Tashima and Peck 1986). Among first and second offenders, females accounted for 17 percent and 10 percent, respectively.

Drinking Status

It is clear from the above summary that persons convicted of drunk driving offenses deviate greatly from the general driving population on a wide variety of characteristics. That DUI offenders contain a disproportionate number of problem drinkers would be expected, of course, since the offense of drunk driving is, per se, a problem associated with the consumption of alcohol.

The number of drinks required to produce manifestly detectable impairment in driving and the BACs typically attained by DUI offenders implies a level of alcohol consumption that is statistically deviant. Given the very low probability that any given incident of impaired driving will result in detection (arrest or accident), the percentage of DUI offenders who were simply unlucky, in the sense of getting caught in a rare instance of impaired driving, would be relatively small. One would therefore expect most DUI offenders to be heavy consumers of alcohol.

Most of the empirical literature, and most authorities in the area, agree with this conclusion, although controversy has developed over the percentage of DUI offenders who are alcoholics in the clinical disease context. This controversy stems more from semantic and epistemological complexities than from disagreements over data, and is not pursued here.

Lest the impression be created that opinion and data are unanimous on the drinking status of DUI offenders, the results of a recent California study of first offenders will be summarized in detail. This study was carried out by the Pacific Institute for Research

and Evaluation (PIRE); it was commissioned by the State of California pursuant to Assembly Bill 3405 (Stewart et al. 1987).

The major objective of the PIRE study was to develop a model curriculum and rehabilitation program for use by courts in sentencing first-offender DUI cases. However, this review will only consider that component of the study pertaining to offender characteristics (natural variation component).

Detailed biographical, drinking habit, and arrest-incident information was collected by questionnaire on 5,052 respondents from 26 first-offender treatment programs throughout California. The authors reported the following statistics from an analysis of the questionnaire responses:

- Median number of drinks on day of arrest: 6
- Median BAC upon arrest: 0.16
- Median number of days in past year with four or more drinks: 60
- Median number of days in past year with eight or more drinks: 4
- Percentage who did not feel intoxicated upon arrest: 35 percent
- Median number of previous days in past year driven while impaired: 1
- Percentage with prior DUI arrests: 20 percent

The authors categorized the drinking pattern responses into two typologies for comparison with a statewide general population survey. The more complex of the typologies was a 7-point continuum: abstainers, infrequent drinkers, light monthly, light weekly, moderate weekly, and frequent heavy. Using a probit analysis to adjust for population differences, the authors found no significant differences between the drinking frequency of the two groups after abstainers were removed from the general population sample.

The difference was significant, however, in the frequency of heavy drinking (five or more drinks at least once a week), with substantially more of the DUI offenders falling into that category. Nevertheless, fewer than 30 percent of the first offenders were placed in this category. In commenting on these findings, the authors concluded:

While defining a "typical pattern of drinking for all subjects is difficult, the median frequencies of use conditional upon the level of use at arrest is revealing: 40 percent of the subjects reported having had 8 or more drinks on the day of their arrest. The median frequency of use at this level among these subjects was 14 occasions over the previous year and only one occasion in the preceding 30 days. A pattern of use including drinking 8 or more drinks at least weekly over the previous year was reported by only 20 percent of these subjects. Thus, for the majority of subjects, drinking at the level of use at which they were arrested is relatively infrequent (pp. 27-28)

... first offenders are not unlike the general population of drinkers in California in terms of the typical frequency of use. However, it appears that the incidence of heavier drinking is greater among first offenders (p. 32)

The authors also included a measure of alcohol dependency in their study. Subjects completed a 25-item Alcohol Dependency Scale (Skinner and Allen 1982), and the scores were compared with those of clinically diagnosed alcoholics. Ninety-two percent of the subjects produced scores "indicating a low level of alcohol dependency." The authors went on to conclude "the dramatic differences in these distributions suggest that dependency symptoms among first offenders are quite low, as compared to alcohol treatment groups."

The results and conclusions of the PIRE study are at odds with prevailing opinion and most prior studies in this area. If the findings are accepted at face value, the great

majority of first offenders fall within the bounds of social drinking. Even the percentage characterized as heavy does not seem extreme.

There are several possible explanations. First, the PIRE study was limited to first offenders, and it is known that the percentage of problem drinkers among first offenders is lower than among repeat offenders.

Second, problem drinkers and DUI offenders are known to understate their drinking, sometimes dramatically. Stewart, Epstein, Greenwald, Laurence, and Roth (1987) acknowledge this possibility and recommend caution in interpreting the study findings. Although previous studies are also subject to reporting biases, many have included clinician interviews, psychometric instruments employing lie scales, and a variety of public agency data. No evidence is presented in the PIRE study to indicate that procedural controls were used to minimize the tendency of people to "fake good" or employ various forms of self-denial.

Third, the first-offender survey only involved offenders who were sentenced to an alcohol program and who agreed to cooperate by completing the questionnaire. In California, 23 percent of first offenders are not assigned to programs. Approximately 15 percent of the sample did not return a questionnaire.

There are also inconsistencies in some of the values derived from the self-report. For example, it would have taken more than a median of six drinks to produce a median BAC 0.16. The fact that 35 percent of the subjects did not feel intoxicated when arrested and that only 14 percent acknowledged being definitely intoxicated is cause for further suspicion.

Finally, it is difficult to accept the median estimate of only one incident of driving while impaired in the previous 12 months. The suggestion is that many of the subjects were not being candid in their responses.

The PIRE report also contains a description of first offender biographical and socioeconomic characteristics. The statistics of interest are summarized below:

- Male: 81 percent
- Single: 46 percent
- Divorced, widowed, or separated: 21 percent
- White: 68 percent
- Hispanic: 22 percent
- Black: 3 percent
- High school dropouts: 22 percent
- Median age: 30
- Unemployed or employed part-time: 30 percent
- Median income: \$16,500

These demographic characteristics are reasonably consistent with the portrayal from the Moskowitz review, particularly when allowance is made for differences in time and region. The percentages for ethnic minorities are somewhat lower than would be expected based on California ethnicity composition and prior evidence showing that some minorities (e.g., Hispanics) are overrepresented in DUI populations. It is important to recognize that the PIRE sample is limited to offenders entering first-offender programs and, within this subset, to those who returned the questionnaire. These factors could alter the representativeness of the sample.

Prior Driving Record

It is also clear that DUI offenders have statistically deviant driver records before their

DUI arrest. Although one would expect overinvolvement in previous alcohol-related accidents and convictions, the extent of DUI offender overinvolvement in nonalcohol related incidents is not widely recognized.

Statewide, data from Tashima and Peck (1986) indicate the following pretreatment 30-month rates for representative statewide samples of 29,097 first and 7,797 repeat DUI offenders:

	Mean non-DUI accidents	Mean total accidents	Mean non-DUI related convictions
First offenders	.17	.36	1.3
Second offenders	.18	.45	1.4

The above rates are more than twice the rates expected for a similarly stratified (age and sex) population of non-DUI drivers.

The Tashima and Peck (1986) study and numerous previous California studies indicate that nonsuspended DUI offenders also accumulate worse non-DUI driving records (total accidents, total moving violations, etc.), following conviction for a first or repeat DUI offense (Sadler and Perrine 1984; Hagen et al. 1978; Hagen 1977; Arstein-Kerslake and Peck 1985).

The most detailed analysis was performed by Arstein-Kerslake and Peck, who compared the subsequent 4-year driving records of first and repeat DUI offenders from Sacramento County with a general population group that was similarly age-sex stratified. The first and repeat offenders were grouped into quartiles based on their actual and predicted DUI recidivism. Except for the first quartiles (i.e., lowest 25 percent in terms of recidivism expectancy), all quartiles had substantially worse accident and traffic conviction records. The differences were also highly significant when summed across quartiles.

The above relationship between DUI offenses and driving behavior in general has been addressed by a number of other investigators (Maisto et al. 1979; Raymond 1971; Denberg 1974). Donelson, Beirness, and Mayhew (1985) consider the issue from the impaired problem-driver paradigm addressed in Simpson's (1977) paper. This heuristic paradigm views the convicted DUI population as containing drivers whose drinking is subordinate to a larger problem of high-risk negligent driving. The alcohol impairment can combine, additively or synergistically, with negligent driving to increase risk, but the underlying problem-driving behavior exists independent of alcohol.

Although Donelson, Beirness, and Mayhew stress the hypothetical nature of this paradigm, the premise that impaired drivers who drive aggressively and unlawfully are more likely to be apprehended is in no way hypothetical. It has also been established that DUI offenders with a prior history of moving violations represent substantially greater accident risks than DUI offenders with clean records (Sadler and Perrine 1984; McConnell and Hagen 1980; Peck and Kuan 1983).

The linkage between problem driving and DUI offenses is the very essence of a recent study by Donovan, Umlauf, and Salzberg (in press). These investigators followed the driving records of 254 non-DUI-involved problem drivers over a 3-year period subsequent to initial identification. Approximately 11 percent of the sample had a DUI conviction during that period—a rate five times greater than that of the general male driving population in Washington State. The study was replicated on a sample of 38,695 driver record files. The authors found that drivers with four or more moving violations were greatly overinvolved in subsequent DUI offenses, with 16.9 percent receiving an initial DUI conviction during a 3-year followup period. The DUI rate was particularly pronounced for males under age 30.

DUI Recidivism

How do first offenders compare to repeat offenders on the various characteristics described above? This question is, of course, related to the question of recidivism correlates and is best addressed by longitudinal recidivism studies.

The actual rate of recidivism cannot be determined in any general sense because it is inextricably tied to the length of the followup period, the length of record retention in a given State, the DUI arrest rate of a particular region or State, regional plea reduction practices, and the effectiveness of DUI countermeasures. In California, approximately 35 percent of all DUI convictions each year involve drivers with prior DUIs within the preceding 5 years.

Recidivism prediction was directly addressed by Ellingstad (1974) as part of the evaluation of the South Dakota ASAP. Discriminant analyses, performed separately for problem and nonproblem drinkers, assessed the predictability of a dichotomous DUI recidivism measure using 14 variables related to prior conviction history, demographic characteristics, drinking pattern, and Mortimer-Filkins score. The problem-drinker group yielded the highest level of prediction. For the 1,744 problem-drinker clients, of whom only 12.6 percent were actual recidivists, prediction of subsequent 2-year DUI recidivism was significant at the 0.001 level. However, only 4.4 percent of the variance in recidivism was accounted for by the discriminant function (multiple $R = 0.209$). Of the 14 variables used for the recidivism analysis, only 6 had a significant univariate relationship with recidivism: prior DUI convictions, reckless convictions, total convictions, marital status, drinking pattern, and Mortimer-Filkins score. All relationships were in the expected direction—that is, less favorable values were associated with increased recidivism.

The level of recidivism prediction reported by Ellingstad (1974) was greater than that reported by Burch (1974) in her analysis of the Los Angeles ASAP. A multiple regression analysis was conducted for approximately 1,000 clients with the objective of predicting subsequent 7-month DUI recidivism using treatment, age, accident, and conviction measures as predictor variables. The actual 7-month recidivism rate in the sample was approximately 10 percent. The analysis indicated that 2.4 percent of the variance in recidivism could be accounted for by the seven predictor variables ($R = 0.155$, $p < 0.01$). The relatively low level of prediction reported by Burch results at least in part from the brief 7-month period during which recidivism data were collected.

As part of the evaluation of the El Cajon Drinking Driver Countermeasure Program, Wendling and Kolodij (1977) collected data on driving history, criminal arrest record, probation officers' evaluation of problem-drinking severity, and Mortimer-Filkins diagnostic scores from 1,740 DUI offenders. These measures served as predictors of the yearly rate of recidivism (DUI and reckless-driving convictions). The duration of data collection subsequent to treatment ranged from 0 to 72 months. Stepwise multiple regressions were performed for each half of the sample, and then each equation was applied to the other half of the sample in order to provide a measure of cross-validation. Although Wendling and Kolodij report impressive R s in the range of 0.40, the high levels of classification error upon cross-validation indicate that the construct multiple R s were inflated.

Development of a prediction model to identify likely recidivists among a sample of Los Angeles DUI offenders was one of the main objectives of Pollack, Didenko, McEachern, and Berger (1972). Three models were developed and evaluated: multiple regression, discriminant function, and empirical bayes. The authors reported a high degree of classification accuracy for drivers with extremely high predicted recidivism expectancies. However, since these drivers represented only a small part of the total recidivist population, it could not be concluded that recidivism can be accurately predicted. On the contrary, the data indicated that the classification error would be substantial for drunk drivers with nonextreme recidivism expectancies. Although no

multiple R or overall classification accuracy was cited, the authors reported that the best prediction would achieve an 11-percent increase in predictive accuracy over what would be expected by chance prediction. Increased recidivism was associated with lower education, younger age, and a higher incidence of traffic accidents, traffic violations, and nontraffic arrests.

McGuire (1975) assessed the predictability of accidents and alcohol-related convictions for DUI 2,255 offenders who had participated in the Orange County Alcohol Traffic Safety project. Convicted DUI offenders were assigned to one of a number of alternative countermeasure programs. Driver record recidivism data were collected for 15 months after treatment assignment. McGuire performed stepwise regression analyses of driver record, psychosocial, and psychometric variables to identify covariates significantly related to accidents and alcohol-related convictions. The significant predictors of subsequent accidents were sex, age, court-martial (if in service), number of accidents in last 3 years, and number of traffic tickets in last 3 years, yielding a multiple R of 0.20. Surprisingly, subsequent alcohol-related convictions were slightly less predictable than subsequent accidents ($R = 0.14$). The significant predictors of alcohol-related convictions were marital status, number of full-time jobs in last 5 years, frequency of smoking, number of tattoos, and number of traffic tickets in last 3 years. No cross-validation analysis was performed.

Arstein-Kerslake and Peck (1985) used multiple regression and discriminant function techniques to predict the 4-year DUI rate, subsequent to treatment, of large samples of first- and second-time DUI offenders selected from Sacramento County. The best multiple R was 0.27, which shrank to 0.21 on cross-validation. The regression equations and correlation coefficients indicated that recidivists were more likely to:

- Be younger
- Be single or divorced
- Have more prior DUI offenses
- Have more nonalcohol moving traffic violations
- Be male
- Have blue collar occupations
- Have more nonmoving traffic violations
- Be ethnic minorities
- Have previous alcohol treatment or disulfiram use
- Have exhibited negative attitude ratings during the intake interview
- Have received intake recommendations for more intensive alcohol treatment
- Have higher BAC levels

Most of the above recidivism correlates are intuitively plausible and consistent with the prior literature. Simply put, DUI offenders are more likely to recidivate if their drinking problem is more severe and their driving record reflects numerous non-DUI- and DUI-related violations.

Arstein-Kerslake and Peck (1985) also developed regression models for predicting program compliance – that is, successfully completing the rehabilitation program. Program compliance proved much more predictable than DUI recidivism. In addition, persons with a high likelihood of being noncompliant tended to have extremely high subsequent accident rates.

Multivariate and Taxonomic Studies of DUI Offender Characteristics

One limitation of simple univariate studies is that they fail to consider the inter-

relationship among the set of variables being evaluated to characterize a given sample of DUI offenders. Although regression and discriminant function procedures partial out intercorrelations in producing linear composites that maximally differentiate between groups (e.g., offenders versus nonoffenders), these techniques are focused on the sole objective of discrimination with respect to a single statistical criterion. As a result, they do not provide a portrait of the offender population in terms of the complete array of measurements and the more general dimensions underlying those measures.

In recent years, a number of investigators have attempted to develop multivariate typologies of DUI offenders through factor and cluster analysis procedures (Arstein-Kerslake and Peck 1985; Wells-Parker et al. 1985). These efforts to construct empirically anchored multivariate typologies were preceded by a number of attempts to produce rational typologies through less formalized statistical or clinical methods. A brief summary of this literature follows.

Intuitive and univariate typologies. The concept of distinguishing drinkers on a continuum of severity (social, problem, alcoholic; light, modest, heavy; primary versus secondary alcoholism) has a long history. (Some research on DUI typologies has been referred to above in connection with the literature on univariate characteristics of DUI offenders.)

Cahalan, Cisin, and Crossley (1969) and Jellinek (1960) provide detailed examples of analytic systems, based on a complex of medical, sociopsychological, and drinking-style parameters. Many of the ASAPs developed clinical and statistical taxonomies for classifying convicted drunk drivers. These efforts have been reviewed by Epperson, Harano, and Peck (1975), Ellingstad (1974), and Nichols (1974). Although it is difficult to formulate a coherent generalization about the success of these efforts because of the diversity and limitations of the validation methods, the various systems had some utility in elucidating characteristics of convicted DUI offenders and in differentiating offenders from drivers in general. The following characteristics were often used to create problem-drinking continuums, and each has been found to differentiate convicted DUI offenders from non-DUI populations:

- Scores on psychometric and personality tests, such as the Minnesota Multiphasic Personality Inventory (MMPI)
- Scores on tests specifically designed to detect problem drinkers and alcoholism, such as the Mortimer-Filkins and MAST
- Quantity-frequency index scores
- Blood alcohol levels at time of arrest or accident involvement
- Prior record of DUI offenses and alcohol-involved accidents
- Prior arrests for public drunkenness and alcohol-associated misdemeanors
- Other criminal offenses

Many of these variables were discussed above in connection with the univariate studies.

Nichols and Reis (1974) concluded that number of prior DUI offenses and BAC were among the two most useful indicators for classifying DUI offenders into a problem no-problem dichotomy, and they used this dichotomous system to classify DUI offenders across many of the ASAP sites. A description of the complete classification criteria is presented in table 10.

After 24 months of followup from the point of treatment classification, Nichols and Reiss reported that 15 percent of the problem-drinker group had been rearrested compared to 8 percent of the nonproblem group.

Epperson, Harano, and Peck (1975) regressed the BAC values for a sample of 1,366

Table 10. Department of Transportation problem drinker classification criterion

-
1. Diagnosis as an alcoholic by a competent medical or treatment authority.
- OR*
2. Self admission of alcoholism or problem drinking.
- OR*
3. Two or more of the following:
 - a. A BAC of 0.15 or more at time of arrest
 - b. A record of one or more prior alcohol-related arrests
 - c. A record of previous alcohol-related contacts with medical, social, or community agencies
 - d. Reports of marital, employment, or social problems related to alcohol
 - e. Diagnosis of problem drinker on the basis of approved structured written diagnostic interview instruments (e.g., MAST, Mortimer-Filkins, National Council on Alcoholism (NCA), Johns Hopkins diagnostic tests)
-

DUI arrestees against a pool of several driver record measures obtained on each subject. Higher BAC values were found to be associated with significantly higher ($p < 0.05$) rates of prior alcohol-related accidents and DUI convictions. The authors concluded that a combined criteria of prior offense frequency and BAC should be included in any problem drinker driver taxonomy. In another component of the same study, they reported that two psychometric tests, the Risk Addiction Profile and Mortimer-Filkins, produced significant discrimination between a group of DUI arrestees with BACs in excess of 0.20 and a group of non-alcohol-involved negligent drivers.

A number of authors have commented on the criterion problem in validating problem-drinker taxonomies — a problem that emanates from the difficulties in defining what constitutes problem drinking and alcoholism (Epperson et al. 1975). As a result, different classification schemes and diagnostic procedures can diverge greatly in their respective problem-drinker incidence rates. Table 11 from Filkins, Mortimer, Post, and Chapman (1973) provides an apt illustration of the problem.

These data, based on a sample of 709 DUI offenders from three ASAP sites, nevertheless provide some indication of the percentage of the convicted DUI population whose drinking patterns deviate from social use levels.

Vingiles (1983) reached similar conclusions in her extensive review of the literature on DUI drinking status classification. The DUI offenders classified as problem drinkers ranged from 2 percent to 89 percent across the various studies. Vingilis estimated that 30-50 percent of DUI offenders would most likely be alcoholic.

Sutker, Brantley, and Allain (1980) evaluated the MMPI profiles of 500 DUI offenders, all of whom were found to share mild antisocial tendencies. Four profile patterns were identified and were found to differ significantly on levels of self-reported drinking. Profile groups also differed significantly in race, age, and education. The authors reported a strong association between elevated levels of self-reported drinking and patterns in which indices of depression and social deviance were also elevated. Comparing profile patterns of DUI offenders with those of alcoholics and psychiatric patients revealed only a modest overlap among the groups.

Fine, Scoles, and Mulligan (1975) used clinical rationale to develop a three-group classification typology for 1,500 DUI first offenders. The three groups were differentiated primarily by quantity, frequency, and circumstances of alcohol consumption.

Table 11. Percentages of drivers classified into three drinker categories by various classification methods

Scale	Social drinkers	Excessive drinkers	Problem drinkers
MF questionnaire	.62	.26	.12
MF interview	.71	.06	.22
Total MF	.64	.19	.17
CRIT ¹	.17	.29	.53
Presentence investigation	.52	.30	.18
Psychometrist	.46	.21	.33

* Combined criterion consisting of driver record and medical and social agency records.

Struckman (1975) grouped DUI offenders into four categories: social drinker, problem drinker, serious problem drinker, and chronic alcoholic. This drinker-type diagnosis was based on information from a number of sources, including driving record, criminal arrest record, Mortimer-Filkins test, and interviews. The reliability of this classification strategy was quite good, but no significant recidivism differences were found for control group subjects classified into drinker types.

Homel (1980) developed a typology based on biographic, demographic, driver record, and criminal record data. Homel hypothesized the existence of six operationally anchored groups of convicted DUI offenders: never-convicted-again drivers, minor motoring offenders, serious motoring offenders, dedicated drinking drivers, criminal offenders, and drive-disqualified offenders. The description of group differences based on measures such as marital status, age, occupational status, income, BAC, driver record entries, and response to penalties provided a logical characterization of subtypes within the DUI offender population. No attempt was made to substantiate the hypothesized typology statistically, either by comparison of mean differences for cases classified using this typology, or by cross-validation on an independent sample of DUI offenders.

Formal multivariate taxonomies. Only a small number of DUI-offender studies employing formal methods of factor and cluster analysis have been reported in the literature, and they are of relatively recent origin. Among the earliest was a study by Steer, Fine, and Scoles (1979). These authors applied a hierarchical cluster analysis technique to three indices of drinking status (BAC and quantity-frequency indices) and psychoneuroticism scores collected from 1,500 first and repeat DUI offenders. The analysis produced a number of types, but the resultant hierarchical structure was complex and difficult to interpret. The authors therefore resorted to a simpler procedure of forming 16 clusters from a binary mean split of the four measures ($2^4 = 16$). The seven most predominant subtypes, containing 87.6 percent of the cases, were found to differ significantly on several relevant external variables: ethnicity, number of prior DUIs, prior treatment for alcoholism, prior drug use, and father's alcohol use.

Scoles, Fine, and Steer (1984) classified 124 non-DUI high-risk drivers using the Sixteen Personality Factor Questionnaire (16PF). Through Modal Profile Analysis, 91.1 percent of the drivers were assigned to one of seven types, named on the basis of the largest high score trait: intelligent, shrewd impulsive, shrewd controlled, warmhearted resourceful, warmhearted adventurous, assertive, and resourceful. The authors concluded that the 124 high-risk drivers were easily able to distort their responses on the 16PF in a socially desirable fashion, and that the utility of the 16PF for assessing personality disturbance within the high-risk driver population must be questioned.

Donovan and Marlatt (1982) identified five subtypes through hierarchical cluster analysis of 17 driving-attitudinal, personality, and hostility measures from 172 DUI offenders. These five subtypes were externally validated through comparison on demographic, drinking, and driving-risk variables. Subtypes 2 and 5 were less deviant than the other three subtypes. Subtype 2, in addition to being the largest group, also presented the highest overall level of emotional adjustment. Subtype 2 members had the lowest levels of driving-related aggression, depression, sensation seeking, and overt and covert hostility. Subtype 5 members had slightly higher scores on these dimensions, but the remaining three subtypes expressed much more deviant levels of these risk-enhancing characteristics. Subtypes 1 and 4 were found to have particularly high levels of risk-enhancing traits (e.g., high levels of driving-related aggression and hostility, and low levels of assertiveness, perceived control, and emotional adjustment). The remaining subtype (subtype 3) was characterized by high levels of depression and resentment and low levels of assertiveness and emotional adjustment.

Donovan, Queisser, Umlauf, and Salzberg (1984) continued investigating these personality subtypes through analysis of subsequent 3-year driving records. Subtype membership was not a significant predictor of DUI recidivism or accidents. However, significant differences were found for other violation types.

Wells-Parker, Cosby, and Landrum (1985) used an inverse factor-analytic procedure (Q-mode factor analysis) to develop a typology of 353 DUI offenders who were referred to a probation and rehabilitation program in Mississippi. The variables used in the clustering consisted of 45 measures representing different types of traffic- and criminal-offense information available from driver and criminal record files.

The cluster analysis resulted in five subgroups that the authors characterized as follows: low (overall) offense group, mixed (offense) group, traffic (moving violations) group, public drunkenness group, and license offense (equipment and licensing violations) group. The classification accuracy of the cluster groups was verified through a multiple-discriminant-function procedure. Incorrectly classified individuals were moved to the group indicated by the discriminant function. There was an overall agreement of 84.4 percent between the two classification procedures.

The authors cross-tabulated the typology against several external measures and found statistically significant relationships on the majority of the comparisons. In most instances, the relationships were intuitively plausible. Of particular interest were relationships with BAC, Mortimer-Filkins scores, drinking status, and subsequent 24-month accident and DUI recidivism rates. The public drunkenness and license groups had the highest percentage of offenders with Mortimer-Filkins scores in the problem drinker range (24 percent versus 5 percent for all groups combined). The public drunkenness group also had the highest BAC levels, and by far the highest rate of subsequent accidents. The license group and public drunkenness groups had the highest DUI recidivism rates. The low offense, mixed, and traffic groups had comparatively lower proportions of problem drinkers, and lower rates of recidivism. The low offense and mixed groups also had the lowest accident rates, in contrast to the traffic group, which had the second highest accident rate of the five types. These three groups were substantially younger than the other two, and the traffic group was youngest of the five (mean = 33.1 versus 42.8 for groups 4 and 5 combined).

The authors compared the characteristics of their typologies with those of Steer, Fine, and Scoles (1979) and Donovan and Marlatt (1982). Although the resulting typologies reflect a number of dissimilarities, all three exhibited types that varied in terms of problem-drinker status (severity), age, and the extent to which the driving record reflects a general disregard for traffic laws (elevated moving violation and accident rates).

Sacramento DUI Offender Typology Study. Probably the largest multivariate typol-

ogy study of DUI offenders was that of Arstein-Kerslake and Peck (1985). The primary objectives of this study were to:

1. develop and cross-validate DUI offender typologies based on psychometric and nonpsychometric variables and
2. assess the extent to which DUI recidivism and DUI treatment-program compliance can be predicted from traffic safety, criminal record, demographic, and psychometric variables.

These analyses were performed on data from 7,316 DUI offenders initially collected during the operation of the California Driving Under the Influence (CDUI) project in Sacramento, California, from September 1977 through January 1981 (Reis 1982*a, b*). The Reis analyses focused on the question of the relative effectiveness of various randomly assigned countermeasures and did not address the data from classification or prediction perspectives.

Two sets of variables were used as scores in constructing first-offender, repeat-offender, and total sample typologies: the psychometric domain and the descriptive (nonpsychometric) domain.

The psychometric variables were:

- Conforming compliance/acting-out aggressiveness
- Extroversion/introversion
- Sanguine, self-confident/anxious, depressed
- Moralistic, conservative/nontraditional, unconstrained
- Paranoid-suspicious/naive trust
- Residential stability
- Alcohol consumption/quantity-frequency
- Alcohol problems
- Physical health problems
- Treatment receptiveness
- Financial status, employment situation
- Familial interaction, living situation
- Social interaction and involvement

The descriptive variables were:

- Age
- Average BAC at arrest
- Intake diagnosis – a clinical rating of drinking problem severities
- Client attitude at intake
- Average monthly income
- Educational level
- Marital status
- Number of marriages
- Number of dependants
- Occupational socioeconomic status
- Intake test score – standardized or modified Mortimer-Filkins test
- Traffic conviction record – moving and nonmoving
- Traffic accident record

Alcohol-related accidents and convictions**Criminal record entries**

The psychometric variables are scales on the Life Activity Inventory (LAI) and were selected because their factorial structure and psychometric properties have been well-established (Reis 1982a, b). Both the psychometric and descriptive variables were standardized before performing the cluster analysis.

It should be noted that the descriptive domain variables were available for the entire sample, whereas the measures in the psychometric LAI domain were only obtained on the subsample of 2,889 assigned to followup interview conditions in the Reis study.

A K-means cluster program identified nine clusters from analysis of the psychometric variable domain. These DUI offender types were characterized on the basis of their average scores on both psychometric and nonpsychometric variables. Descriptions of the nine clusters follow.

- **Negligent Operator (cluster 1):** Members express behaviors commonly associated with negligent operators (youthfulness, acting-out aggressiveness, etc.). Levels of social interaction are high, and levels of residential stability and financial status are low. This group had the highest rate of alcohol-related and total accidents and the second highest rate of moving traffic violations. They also had the highest rate of drug arrests and the lowest rate of program compliance.
- **Pre-DUI Alcoholic I (cluster 2):** This has a strong, alcohol-related component, but not as extreme as cluster 3. This group had high level of mistrust, higher than average conservatism and depression, and high levels of aggressiveness. It also had a very high percentage of minorities (55 percent) and the highest rate of moving, nonmoving, and reckless driving convictions. The group was predominantly composed of first offenders (63 percent).
- **DUI-Alcoholic (cluster 3):** A number of measures indicate an extreme alcohol problem and a high traffic-safety risk. This group had the highest levels of anxiety-depression, and aggressiveness, and the highest quantity frequency index. It also had high levels of health problems.
- **Pre-DUI Alcoholic II (cluster 4):** This cluster is descriptively similar to cluster 2, although these two cluster groups do differ with respect to psychometric measures. Cluster 4 expressed high levels of introversion and isolation and high levels of lack of constraint.
- **“Mid-Life Crisis” Problem Drinker (cluster 5):** Members report high levels of stress in interpersonal relationships, high levels of physical health problems, high unemployment, and high average age. A relatively large number perceived alcohol as a problem in their lives despite having the lowest Q-F index.
- **Deceptive Problem Drinker (cluster 6):** Levels of socially desirable attributes were surprisingly high, and levels of improbable response were very high as measured by the “lie” scale.
- **White-Collar Controlled Problem Drinker (cluster 7):** A relatively high percentage of persons employed in white collar occupations appear to be controlling their drinking and pose a relatively low traffic safety risk. This cluster exhibited high levels of conforming-compliance, self-confidence, and trust, and a comparatively low Q-F index.
- **Blue Collar Controlled Problem Drinker (cluster 8):** Members possess attributes similar to cluster 7, except for their generally lower level of socioeconomic status.
- **Social-Normative Problem Drinker (cluster 9):** Age distribution is similar to clusters 2 and 4, but cluster 9 members express much higher levels of

socioeconomic status and socially desirable attributes. It may well be that these persons tend to consume excessive amounts of alcohol in settings in which such behavior may not be considered deviant (i.e., socially normative).

Statistically significant differences in subsequent 4-year accident rate, traffic conviction rate, and DUI recidivism were found among the nine psychometric clusters.

A separate K-means cluster analysis was performed on nonpsychometric variables (driver record, criminal record, and intake interview). Descriptions of the 10 clusters follow:

- Cluster 1: Lowest average age (22.0 years); lowest average BAC at arrest; one-fourth without high school diploma; high percentage of males (92 percent); relatively low percentage of persons married or cohabitating; highest number of moving and nonmoving violations; 67 percent first offenders.
- Cluster 2: Average age 24.0 years; relatively high levels of educational attainment and white collar employment; lowest average income; average levels of acting-out aggressiveness; exclusively unmarried; 82 percent male; 74 percent first offenders.
- Cluster 3: Average age 24.2 years; one-fourth without high school diploma; 91 percent male; highest average score on accident composite measure and drug-alcohol composite measure; high levels of alcohol problems and treatment receptivity; 58 percent multiple offenders.
- Cluster 4: Average age 30.4 years; highest percentage of females (32 percent); no never-marrieds; 78 percent either separated, divorced, or widowed; highest percentage of first offenders (78 percent).
- Cluster 5: Average age 33.2 years; smallest descriptive cluster; above-average incidence of accident and convictions; high percentage of minorities (36 percent); very high levels of hostility and suspicion as judged by diagnostic counselor; 56 percent first offenders.
- Cluster 6: Average age 34.6 years; above average income; high percentage of blue-collar workers; highest number of dependents; highest percentage currently married (84 percent); highest percentage of minority members (37 percent); 61 percent first offenders.
- Cluster 7: Average age 35.1 years; above-average incidence of accident and convictions; very high levels of criminal record entries; contains all persons who refused the BAC test associated with entry arrest (approximately 50 percent of cluster 7 members); highest proportion unemployed (42 percent); largest descriptive cluster; 59 percent multiple offenders.
- Cluster 8: Average age 35.7 years; very high score on alcohol problem severity on psychometric inventory administered at intake (refers to standardized score on Mortimer-Filkins or CDUI scale—both tests were used at different times during the operation of the CDUI project); high levels of acting-out aggressiveness and depression; high levels of perceived alcohol problems and physical health problems; high levels of treatment receptivity; lowest level of satisfaction in marriage or marriagelike relationship; highest percentage of multiple offenders (71 percent).
- Cluster 9: Average age 38.6 years; highest occupational status (83 percent white-collar—professional/technical, management/administration, sales); high levels of educational attainment (41 percent 4 or more years of college); high levels of marital stability and familial and social interaction; low levels of acting-out aggressiveness; 62 percent first offenders.
- Cluster 10: Average age 53.0 years; no members under 30 years old; 95 percent of members over 40 years old; relatively high unemployment (39 percent);

relatively low average income; lowest levels of educational attainment (49 percent with fewer than 12 years education); high percentage of females (24 percent) and minorities (30 percent); 50 percent married more than once; 46 percent currently divorced or widowed; lowest levels of acting-out aggressiveness; high levels of introversion and physical health problems; low levels of familial and social interaction; 64 percent multiple offenders.

Comparisons of the descriptive clusters on subsequent 4-year driver record indicated statistically significant differences in fatal accident rates, accidents involving alcohol, moving traffic convictions, and DUI recidivism. Clusters 1, 3, 5, and 7 tended to have the poorest records, whereas cluster 9 consistently had the lowest number of driver record entries.

Both the psychometric and descriptive (nonpsychometric) solutions were cross-validated using a 25-percent subsample not used during the information of the cluster solution. In addition, the cluster solutions were submitted to discriminant function analysis. In each case, differences among clusters based on relevant clustering variables were substantial, resulting in 89.9 percent correct classification for members of the psychometric cross-validation subsample and 67.6 percent correct classification for members of the descriptive cross-validation subsample. For the psychometric cluster solution, 86.8 percent of the variance in cluster membership was explained by five discriminant functions. For the descriptive cluster solution, five functions accounted for 80.2 percent of the variance in cluster membership.

Since Arstein-Kerslake and Peck performed separate cluster analyses within each domain, the resultant typologies did not constitute a single integrated system. They were able, however, to investigate the structural relationship between the two by cross tabulating the two systems. The end product of this analysis was a contingency table showing how membership in the psychometric domain clusters were distributed across each category of the descriptive variable typology. The results are summarized in table 12.

Although the relationship between the two typologies was significant, the association was quite low (Cramer's $v=0.22$, $p<0.001$). Thus, the two systems are much more independent than they are overlapping.

It would be possible to view table 12 as a two-dimensional taxonomic system if one of the dimensions can be viewed as subordinate to the other. For example, if one considers the psychometric typology to have logical precedence over the descriptive taxonomy, then one could view the groups of the former as types and those of the latter as subtypes. To illustrate from table 12, consider the DUI alcoholic type (type 3). We find that 64 percent of this group "maps" into descriptive subtypes 7 and 8. Hence, these combinations could be numerically coded as 3.7 and 3.8. Both subtypes 7 and 8 clearly reflect serious alcohol problems and the psychosocial manifestation of alcoholism. Therefore, they corroborate the psychometric taxonomy (DUI alcoholic) but provide some additional differentiation. Subtype 7 manifests more antisocial traits (criminal record), resistance to authority (implied consent chemical test refusal), bad driving record (accidents, moving violations, prior DUIs), and high unemployment. Subtype 8 appears to have the most acute alcohol problem but the members appear more receptive to treatment and to be aware of their problems.

Arstein-Kerslake and Peck point out that the clusters vary greatly in terms of their similarity/dissimilarity and that many of the clusters would not be fixed in time. Intuitively, one would expect flux with persons changing clusters as they age and experience deterioration or improvement in their drinking status and its relation to driving. For example, it is known that some young people pass through a period of excessive drinking and use of alcohol in conjunction with driving. Such people might not be labeled social drinkers, even though many will eventually leave the drinking-driver population and never progress to alcoholism. A longitudinal repeated-measures factorial study would be required to validate the hypothesized transitions empirically.

Table 12. Cross tabulations of correspondence between psychometric cluster membership and descriptive cluster membership

Count	Psychometric clusters									Row total
	1	2	3	4	5	6	7	8	9	
Row percent										
Column percent	1	2	3	4	5	6	7	8	9	
1	37	25	10	27	3	21	9	6	39	177
	20.9	14.1	5.6	15.3	1.7	11.9	5.1	3.4	22.0	1.1
	10.6	13.7	3.2	7.2	1.4	5.4	2.6	2.4	8.5	
2	86	29	21	74	16	54	8	3	115	406
	21.2	7.1	5.2	18.2	3.9	13.3	2.0	0.7	28.3	14.1
	24.7	15.8	6.7	19.7	7.3	13.8	2.3	1.2	25.2	
3	48	9	26	47	14	13	14	8	39	218
	22.0	4.1	11.9	21.6	6.4	6.0	6.4	3.7	17.9	7.5
	13.8	4.9	8.3	12.5	6.4	3.3	4.0	3.2	8.5	
4	39	25	16	41	19	57	20	11	76	304
	12.8	8.2	5.3	13.5	6.3	18.8	6.6	3.6	25.0	10.5
	11.2	13.7	5.1	10.9	8.6	14.5	5.7	4.4	16.6	
5	9	7	5	13	8	9	13	7	13	84
	10.7	8.3	6.0	15.5	9.5	10.7	15.5	8.3	15.5	2.9
	2.6	3.8	1.6	3.5	3.6	2.3	3.7	2.8	2.8	
6	9	9	15	12	8	39	85	63	9	249
	3.6	3.6	6.0	4.8	3.2	15.7	34.1	25.3	3.6	8.6
	2.6	4.9	4.8	3.2	3.6	9.9	24.4	25.3	2.0	
7	96	45	111	94	77	95	71	65	81	735
	13.1	6.1	15.1	12.8	10.5	12.9	9.7	8.8	11.0	25.5
	27.6	24.6	35.2	25.1	35.0	24.2	20.3	26.1	17.7	
8	16	18	89	19	28	5	20	36	23	254
	6.3	7.1	35.0	7.5	11.0	2.0	7.9	14.2	9.1	8.8
	4.6	9.8	28.3	5.1	12.7	1.8	5.7	14.5	5.0	
9	2	3	15	14	4	42	100	29	49	259
	1.2	1.2	5.8	5.4	1.5	16.2	38.6	11.2	18.9	9.0
	0.9	1.6	4.8	3.7	1.8	10.7	28.7	11.6	10.7	
10	5	13	7	34	43	57	9	21	13	202
	2.5	6.4	3.5	16.8	21.3	28.2	4.5	10.4	6.4	7.0
	1.4	7.1	2.2	9.1	19.5	14.5	2.6	8.4	2.8	
Column total	348	183	315	375	220	392	349	249	457	2,888
	12.0	6.3	10.9	13.0	7.6	13.6	12.1	8.6	15.8	100.0

Chi-square = 1162.3 with 72 *df.* significance = 0.0000

Eta (descriptive cluster dependent) = 0.35

Cramer's lambda = 0.22

It is instructive to note that Arstein-Kerslake and Peck failed to uncover any group labeled social drinkers. The following quotation illustrates their reasoning.

“Hapless social drinker” does not constitute a sizeable enough portion of the DUI offender population to be identified as a separate subtype. In an intuitive sense, there are three dimensions which seem to characterize the differences between the nine psychometric clusters: (1) consumption of alcohol (moderate to excessive), (2) problem drinker predisposition (transient to chronic), and (3) negligent operator characteristics (none too many). Different weightings on these dimensions for each cluster contribute to the differential accident/conviction levels among clusters. Even those clusters with low accident/conviction levels (e.g., very low negligent operator characteristics) have high enough levels on other dimensions (e.g., problem drinker predisposition) to preclude their being classified as “social drinkers.”

The above conclusion requires clarification and tempering. Each cluster is really an aggregation of people into averages, and some of the clusters imply relatively moderate levels of alcohol consumption. Individual variation may be substantial within groups and latent subtypes that were too small in number to emerge as a distinct type. Obviously some of those among convicted DUI offenders could be characterized as social drinkers. However, as Stewart, Epstein, Gruenewald, Laurence, and Roth (1987) point out, the very term “social drinker” is imprecise and of dubious scientific value. It can be more meaningful to talk about the amount, frequency, and pattern of alcohol consumption, and about points on this continuum where problems are likely to occur.

Discussions and Conclusions

The preceding review of the literature on DUI offender characteristics indicates that convicted offenders differ from the general driving population on a wide range of variables. Although they share some of the same characteristics as problem (negligent) drivers, alcohol-involved accident drivers, and alcoholics, the overlaps are not large with any of the three in an absolute statistical sense. The convicted DUI offender represents a combination of the traits of all three, plus a substantial amount of unique DUI-offender characteristics.

The research on multivariate typologies and other taxonomic systems indicates that the DUI-offender population contains some distinct subgroups, or types, and there is some consistency across studies in the structure of the taxonomies and the subgroups resulting from them. These classification systems may be useful in providing insight concerning etiology of problem drinking (driving) and in suggesting potentially effective modes of treatment.

The concept of the impaired problem driver has merit and is consistent with some of the typologies described above. To a limited extent, DUI recidivism can be predicted, and the characteristics of recidivists clearly indicate a profile of persons with progressively increasing drinking problems and negligent-driving problems. Nevertheless, the results of Arstein-Kerslake and Peck (1985) suggest that the majority of first offenders are statistically indistinguishable from repeat offenders and represent equally high accident risks. This finding suggests that most first offenders are problem-drinker drivers who have simply not yet had their second DUI offense.

Current Issues and Problems

The major problems and questions in this area are identified and briefly discussed in this section. Extensive discussion of these topics is unnecessary since they follow immediately from the literature review presented above. In addition to the major headings

used in the literature review, a subsection focused on the data management aspects of the problem is included below.

Alcohol Involvement in Crashes

The most fundamental problem in establishing alcohol involvement in highway crashes stems from the incomplete testing and reporting of BAC data. Enormous progress has been made during the past decade in obtaining BAC data from fatal crashes through FARS, by means of which the States are expected to report all relevant information to NHTSA. Although a few States report BAC data for all fatal crashes within their borders and approximately one-third of the States report the BAC in at least 85 percent of their fatal crashes, most States fall far short of acceptable reporting standards for this crucial bit of information from each fatal crash. Overall, BAC data are now reported to FARS for 74 percent of fatally injured drivers, but for only 45 percent of the surviving drivers involved in fatal crashes. Thus, the shortfall of data for this latter category of driver represents another major problem.

Far fewer BAC data are available for surviving drivers injured in highway crashes, primarily because American hospitals generally will not release such information. Consequently, estimates of the legally impaired drivers injured in highway crashes range from 20 percent to 40 percent, with the best estimate being around 25 percent. This question is currently being addressed in Ontario, Canada, in a research project funded by NIAAA (principal investigator: Evelyn Vingilis).

Data on BAC are especially scarce for crashes with property damage only, i.e., those collisions involving reportable damage to property but none to humans. Although these crashes are of less importance for epidemiologic research than the two previous categories involving human injury, it would nevertheless be useful to obtain BAC data across the full continuum of reportable crashes for the sake of fully explicating the relation of alcohol amount to the relative seriousness of the crash.

Alcohol and Noncrash Drivers

The traffic safety community is experiencing a shortfall of up-to-date information concerning the population-at-risk, i.e., drivers who are not involved in crashes. Although BAC data are the most important, it is also necessary to obtain additional information concerning age, gender, purpose of trip, perceived risk of being stopped at an enforcement checkpoint, perceived risk of being arrested for drunk driving, and so forth. Such data are crucial for evaluating the progress and current status of both public health and public safety programs. As noted above, NIAAA is currently supporting a research project focused on alcohol tolerance among drinking drivers that is obtaining substantial information about the nocturnal population at risk (principal investigator: M.W. Perrine). Data from this 5-year roadside survey of 42,000 drivers will be reported as obtained over the course of the next 4 years of field activity.

Characteristics of Drunk Drivers

The present state of research knowledge already permits differentiation within the category of drunk driver. Indeed, recent research provides for an increasing number of differentiations not only among drunk drivers, but also among drinking drivers, as described by Perrine (1987). However, further increases, refinements, and validations of such differentiations among drinking drivers are necessary in order to address the major problems in this area more effectively. The specific shorter term goals for such efforts should be:

- early identification of potential DUI offenders through increased differentiation among drinking drivers,

- more accurately targeted sanctions for convicted DUI offenders,
- more accurately individualized referrals of DUI offenders from the courts to selected treatment programs available in the locality,
- more individually customized counseling and treatment programs for DUI offenders,
- increased success rates in terms of alcohol treatment program compliance and completion, and
- lower recidivism rates.

Although these goals are focused initially on specific deterrence and the convicted DUI offender, the broad longer term goals involve aspects of both general deterrence and public education (Perrine 1987).

The NIAAA is currently supporting a research program designed to address the above goals through grants concerned with the probabilities of drunk driving among the U.S. public and among convicted DUIs (AA06774 and AA06926, principal investigator: M.W. Perrine). This research program is based upon 15 concurrent, interrelated projects that focus on five different but interdependent segments of the American drinking and driving public: the general driving population, the nocturnal driving population, the convicted DUI first-offender population, the convicted DUI multiple-offender population, and those arrested for DUI, but not convicted. The basic rationale for this approach derives from analyzing the known characteristics of those in these interrelated populations to determine the similarities among those who "get into trouble with alcohol," as well as the differences between those who do and those who do not (Perrine 1987). The results of this ongoing research program should enable developing much more specific—and thus much more effective—means for prevention and intervention in this major public health problem area.

Data Sources and Management

Much epidemiologic research on drunk driving (as in many other areas) depends on data collected by third parties and available in the form of official records. Thus, the adequacy, utility, and validity of such research are seriously constrained by the accuracy and completeness of the data themselves, as well as by the data collecting and data reporting. The systems for DUI processing (from the point of arrest through the monitoring of adherence to the imposed sanctions) vary greatly from State to State, but apparently all such systems are prone to loopholes and failures. Indeed, it is necessary to analyze the individual State DUI processing systems carefully, not only to understand their functioning, but especially to identify points for dropouts and other failures. Only by so doing can the accuracy and completeness of the resulting DUI data be assessed.

An extensive evaluation of the drunk-driving countermeasure system in the State of California has recently been completed, funded by the NHTSA. The first of the eight-volume series is concerned with an analysis of DUI processing from arrest through postconviction countermeasures (Perrine 1984). The objectives of the project were to develop process flow charts and a description for the whole DUI system, as well as to identify sources of system inefficiency or modes of circumvention of specific provisions of the laws and the system. The interorganizational task force formed to accomplish these objectives represented all major constituencies in the DUI countermeasure system: law enforcement agencies; prosecutors; municipal, superior, and juvenile courts; program/service providers; State and county alcohol-program administrators; probation officers; and the Department of Motor Vehicles (DMV).

A subsequent study was conducted to identify deficiencies in the California DUI countermeasure system and to evaluate empirically the frequency with which DUI offenders avoid timely processing or circumvent system countermeasures owing to these

deficiencies (Helander 1986). To accomplish these objectives, a sample of DUI offenders was tracked all the way through the system in order to describe and analyze the flow of the system.

A total of 3,959 DUI offenders arrested by 44 law enforcement agencies in seven sample counties was tracked through the DUI system from the point of arrest through postconviction countermeasures. A separate sample of 701 convicted DUI offenders referred to alcohol education/treatment programs in the seven sample counties was identified from program provider records and tracked through DMV, court, and program records. The principal results were:

- Probability of conviction for a DUI offender varied widely, depending on the county and court in which the offense was adjudicated. The use of sanctions also varied widely by county and court.
- Most alcohol education/treatment program dropouts were not reported to the DMV by the courts, and a substantial percentage of DUI offenders avoided license suspension as a result.
- Nine percent of drivers arrested for DUI were under license suspension or revocation at the time of arrest. Only 20 percent of these drivers were convicted for the offense of driving while license was suspended or revoked.
- A surprisingly large percentage of DUI offenders was unlicensed or had more than one driver record, that is, they had multiple licenses under different names or errors in the files (e.g., wrong name or date of birth) created additional records that were not charged to the driver.¹

Based on the study findings, Helander (1986) concluded that:

- The probability of punishment for DUI offenses must be increased in order to produce any large-scale impact on the problem of drinking and driving.
- The citation and conviction rates of those who drive while suspended or revoked must be improved if license suspension is to remain an effective and credible traffic safety countermeasure.
- If the DUI countermeasure system is to function as a true system, goals and objectives must be developed along with a management information system to assess the achievement of those goals and objectives.
- Improvement is needed in the accuracy of records in the DUI countermeasure system.

The final volume in this series evaluating the California drunk driving countermeasure system consists of an overview of study findings and policy recommendations prepared by Peck (1987). Among many other important findings, Peck emphasized the need to improve the management information system and monitor its quality control through periodic process evaluations. For example, it is necessary to monitor:

- time lags in the processing system;
- characteristics of the plea bargaining process, as well the plea bargaining rate;
- the rate of dismissal of prior DUI convictions;

¹ In California, all traffic convictions for moving traffic violations and for major violations, such as drunk driving, are reported to the DVM and placed on the driver's driving record file. The driving record also includes fatal and injury accidents and property damage accidents involving more than \$50 to a vehicle. The driver record entries are retained from 3 to 10 years, depending on the nature of the offense. Other States have similar file systems, although the specific provisions and retention periods will vary from State to State.

- the rate of compliance with imposed sanctions;
- the rate of completing the sanctions (especially the treatment/education programs);
- the incidence of jury trials; and
- the incidence of implied consent refusals to submit to a breathtest.

Some of the more serious shortfalls identified in the data system are (Peck 1987):

- accurate reporting of the BAC at the time of arrest;
- accurate determination of the offense status (whether a first, second, third, or more DUI offense);
- determining whether a jail sentence was imposed, but more important, determining whether it was actually served to completion;
- determining whether community services were actually performed
- determining positively through affirmative evidence that the alcohol treatment program had actually been completed by the DUI offender.

Research Questions

In 1987, as part of a continuing effort by NIAAA to assess research opportunities and needs in the field, a series of meetings focused on issues in alcohol research on safety and trauma. A series of papers provided solicited advice on extramural research priorities (these papers are published in a special issue of *Contemporary Drug Problems*, Spring 1988). In addressing the research issues, needs, and opportunities in the area of alcohol, trauma, and traffic safety, Perrine (1988) formulated a number of specific questions that should be addressed through epidemiologic and field studies. These questions are also appropriate to consider in the present context.

- How frequently does driving actually occur after drinking among the U.S. motoring public?
- How firm is the linkage between social drinking activities and subsequent driving activities?
- Why are some drivers involved in crashes after drinking, whereas others are not—even at the same BACs?
- To what extent do fatally injured drivers with high BACs differ from other high BAC drivers who crash but are not fatally injured, or are not injured at all, or who are not even involved in a crash?
- To what extent is alcohol involved in crashes, and to what extent is alcohol responsible for crashes?

A number of research questions and issues were also formulated concerning idiosyncratic characteristics of drinking drivers (Perrine 1988), namely;

- What characteristics can be identified to distinguish among the various groups/types of individuals across the spectrum of drinking drivers?
- To what extent is it possible to differentiate drinking drivers who avoid detection, accidents, and conviction of DUI from drinking drivers who are arrested and convicted of DUI?
- To what extent is it possible to identify future DUI offenders in advance, that is, before the fact? At what point or stage of development is such identification possible?
- To what extent is it possible to identify potential DUI reoffenders or recidivists in advance, for example, after the first DUI offense but before the second? At what point or stage of development is such identification possible?

- To what extent do such advance indicators of DUI consist of stable, persistent characteristics, as opposed to more temporary and transitional aspects? In other words, to what extent does a person have a "predisposition" to become a DUI offender?
- To what extent do factors other than alcohol contribute to high-risk drinking and driving and ultimately to alcohol-involved crashes?
- Is a drinking driver a potential DUI offender when actually alcohol-impaired, or simply when the BAC is 0.10 or higher?

These questions may prove valuable in designing new research projects to investigate further the role of alcohol and traffic safety.

Recommendations

A number of recommendations emerge clearly from the foregoing literature review and examination of current issues and problems. The most important of these recommendations are listed below without further comment.

- Develop policies and procedures to ensure that uniform and consistent alcohol data are obtained for all highway crashes.
- Develop policies and procedures to ensure that accurate alcohol data are obtained for commercial motor-vehicle operators using the highways.
- Determine feasibility of gathering accurate data on drivers under 0.10 BAC at enforcement checkpoints.
- Develop more effective roadside survey policies and techniques to collect increasingly valid data on drunk driving (e.g., incidence and prevalence, changes in distribution of alcohol concentration).
- Develop a central monitoring, record keeping, and reporting capability for drunk driving data.
- Develop and test a valid, cost-effective surrogate for roadside surveys in order to evaluate countermeasure programs and to monitor public awareness and perception of risk.
- Determine more accurately the characteristics of drunk drivers to facilitate early identification and counseling, to encourage more accurately targeted sanctions for convicted DUI offenders, to encourage more customized counseling and treatment programs for DUI offenders, and thereby, it is hoped, to obtain increased success rates in terms of alcohol treatment compliance and completion, as well as lower recidivism rates.

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Education

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

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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.

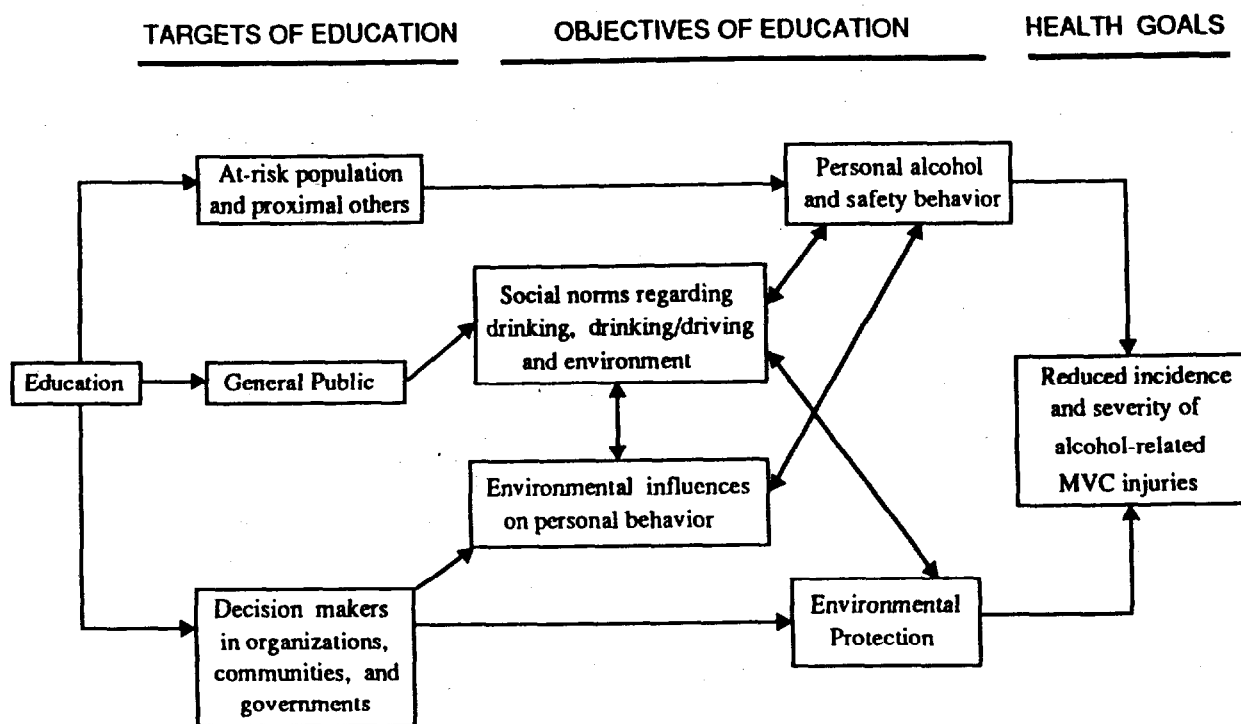


Figure 1. The role of education in reducing motor vehicle crash injury due to drinking and driving.

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.

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Judicial and Administrative Processes

The Effectiveness of Legal Sanctions in Dealing with Drinking Drivers

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Introduction

Legal sanctions, whether administered by the courts or by State licensing agencies, are central to deterrence-based policies for reducing alcohol-impaired driving. They are the punishments threatened in support of the law's mandate. Examples are fines, license actions such as suspension and revocation, jail sentences, and alternatives such as community service. Deterrence theory posits that sanctions will be effective in modifying behavior to the extent that they are perceived as being *certain, swiftly applied, and severe*. These three primary characteristics of penalties, if appropriately perceived, have the potential to reduce drunk driving.

In determining public policy, we would like to know if the different kinds of sanctions, when applied with equal severity, certainty, and swiftness, produce different results. In addition, we would like to know if differences in the swiftness, certainty, or severity of a particular type of sanction produce different results. Our review finds that license actions appear to be more effective than others, and the certainty and swiftness of punishment appear to increase impact to a greater extent than severity.

The Objectives of Sanctions

Criminal sanctions may have several objectives, including general deterrence, specific deterrence, rehabilitation, incapacitation, and retribution. Restitution and program financing may also be objectives of sanctions. By *general deterrence*, we refer to the effect of punishing law violators on the drinking and driving behavior of those not sanctioned, but who are presumably aware of the punishability of the behavior in question. By *specific deterrence*, we refer to the deterrent effect of sanctioning on the specific offenders being punished. Their experience and the fear of future punishment is expected to reduce their drinking and driving behavior. *Rehabilitation* refers to changing the violator's motivation through the experience of the sanction, not through fear of being sanctioned in the future. The rehabilitated driving while intoxicated (DWI) offender no longer wants to drive drunk, whereas the deterred person refrains from such behavior out of fear of consequences. *Incapacitation* refers to denying the offender the opportunity to repeat the DWI offense. Imprisonment accomplishes this during the period of confinement; license withdrawal attempts to do this without confinement.

Specific deterrence, incapacitation, and rehabilitation effects are frequently interwoven and difficult to separate. Their combined impact, which we refer to as *individual reform*, is reflected in *changes in recidivism* of the offenders sanctioned. Recidivism is usually measured in terms of subsequent DWI offenses or crash involvement.

This review concentrates on determining both the general deterrent and individual reform (i.e. change in recidivism) impacts that occur as a result of the imposition of various sanctions.

General Deterrence Versus Individual Reform

The impact of any sanctioning policy on the general driving public is much more important than its impact on the offenders who are punished. Programs that result in reduced recidivism by those who are punished are worthwhile to the extent that they reduce impaired driving by these drivers and perhaps improve their general well-being. However, without having some impact on the total population of drinking drivers – particularly those who are not caught – such programs cannot have a major impact on drunk driving and its consequences.

In any one year, it is estimated that fewer than 5 percent of alcohol-related fatal crashes involve a driver who was apprehended for DWI the previous year. Thus, even if the sanctions applied to offenders over a 1-year period were 100-percent effective in eliminating recidivism among those drivers, the next year's fatal, alcohol-related crashes would be reduced by less than 5 percent (Nichols and Gundersheimer 1974; Sterling-Smith 1976). Further, a Minnesota study suggests that if the elimination of recidivism by known offenders were continued for 8 years, three-fourths of alcohol-related fatal crashes – those involving drinking drivers not previously known to authorities – would continue to occur (Lewis 1985). Thus, sanction policies that have a general deterrent impact are essential for reducing such crashes. The major hope for reducing alcohol-related fatal crashes lies in policies that affect the total driving population.

Categories of Sanctions

We examine three primary categories of sanctions: confinement in jails, prisons, or special facilities; license revocation or suspension; and fines. In addition, some evidence is reviewed regarding the effectiveness of community service.

In the United States, *confinement* for drunk drivers is traditionally in jails. However, use of alternative confinement sites, including the offender's home, is increasing. This is due in large part to the inability of jails to handle large numbers of drinking drivers.

License actions include both suspension and revocation of the driving permit. Suspensions and revocations can be "hard," prohibiting all driving, or "soft," permitting driving for limited purposes such as commuting to work. They range in duration from brief periods (e.g., 30 days) to long periods (e.g., 1 to 5 years) to permanent actions. Suspended licenses are automatically reinstated at the termination of the suspension, whereas revoked licenses must be replaced through renewed applications, after the revocation period has expired.

We group *fines* with other officially determined financial penalties such as court costs, but exclude fees charged for services, such as mandated education, or incidental costs, such as increased insurance premiums. We do this even though such costs may dwarf traditional fines. The effects of costs beyond legal penalties are worthy of study and possible embodiment in the social response to drunk driving, but we do not think of them as criminal penalties.

Criminal Versus Administrative Sanctions

The judicial or administrative process by which sanctions are imposed is also important from a deterrence perspective because it has important implications for all three characteristics—swiftness, certainty, and severity—of penalties imposed. Traditionally, sanctions have been exclusively applied in courts, using *criminal* procedures. Here, the application of penalties depends on conviction for an offense following formal charging and pleading and is contingent upon a finding of proof beyond a reasonable doubt that a crime (drunk driving) was committed. This traditional process is often lengthy and, because of the stringent standards of proof involved, likely to err in the direction of leniency. In contrast, the *administrative* process requires only that the balance of evidence favor the conclusion that a sanction is merited. It is unconcerned with determining criminal guilt. The administrative process can thus be relatively swift and certain in applying sanctions.

In practice, the distinctions between these two processes have often been eroded. Criminal guilt is most frequently based on a routine plea, rather than on a trial with its safeguards, delays, and uncertainty. On the other hand, the administrative process can be slowed and rendered less efficient as those subjected to it demand hearings that may, in some respects, resemble trials. However, the administrative process generally remains a swifter and more certain process for applying sanctions, particularly license actions.

The administrative process is employed in the many States that have adopted “administrative per se” laws. In these States, administrative license actions are applied to drivers refusing or failing alcohol breath tests. Refusing or failing the test, not the crime of drunk driving, is sanctioned in this manner, and offenders may still be subject to a separate criminal process leading to additional penalties. In those States without administrative license laws, license suspension and revocation are usually invoked by judges in their sentences. Even in States where administrative penalties are used, additional suspensions or revocations can be invoked by judges following criminal convictions.

Thus, license actions can be applied both administratively and criminally. The administrative process fits license sanctions especially well, because licenses are administratively granted in the first place. Although fines are administratively applied in some areas of the law, this has not yet occurred with regard to drunk driving. The more drastic nature of confinement and community service appears to limit their application to the criminal process.

The recent increase in the acceptability and use of administrative license actions has provided a kind of punishment that fits the demands of swiftness and certainty required for both specific and general deterrence. The significant increase in the certainty and swiftness of punishment resulting from the use of administrative process has opened a new opportunity for controlling alcohol-impaired driving and its consequences.

Evaluation of Sanctions

The bulk of this chapter is concerned with evaluations of various types and amounts of sanctions. These evaluations generally compare different types or severities of sanctions. They do not compare sanction alternatives or variations with no sanctions at all. Thus, evaluations of sanctions for drunk drivers concern the effects of marginal changes in punishment, rather than absolute deterrence. If an increase in the standard fine from \$100 to \$500 has little effect, this does not imply that a reduction to zero would yield similar results, or that fines are worthless in controlling drunk driving. Practically speaking, these evaluations of marginal changes are sufficient, as there are no serious political proposals for abandoning sanctions.

It is desirable to determine the relative effectiveness of the various categories of penalties. In addition, within each of the primary sanction categories, it is desirable to distinguish between penalties of greater or lesser severity, certainty, or swiftness of application. However, comparisons between categories present both theoretical and empirical problems. For example, a judgment of comparative severity between a \$1,000 fine and 24 hours in jail would be hard to make and defend. Even comparisons within sanction categories are difficult to make. While a fine of \$1,000 is clearly more severe than one of \$100, it is likely to be much more severe to a person of modest means than to a person of substantial wealth. As a result of these problems, it is often difficult to provide more than qualitative (i.e., positive or negative) evidence for the effectiveness of various sanctions.

Recent concern with the seriousness of the impaired driving problem in the United States has resulted in numerous sanction-based interventions that, when evaluated, could ideally enlighten our knowledge and improve practical policy. A major impediment to this ideal has been that the changes often take the form of complex packages of interventions. In these circumstances, it is generally impossible to determine which components may be accounting for positive outcomes. In this chapter, we do the best we can with available data, characterizing the sanction packages in terms of what we perceive to be their main thrusts.

Confinement: Jail and Prison Sentences and Their Alternatives

The use of jail or prison sentences as sanctions for drinking drivers has been an integral part of Scandinavian law for more than 50 years. In the United States, it has been used much less frequently, but interest in the use of such penalties has increased since 1980. Some theorists have assumed that the severe prison sanctions used in Scandinavia provide the ultimate weapon for deterring repeat offender, drinking drivers. In addition, some have suggested that such penalties may provide needed "shock value" for first-time offenders.

It has also been suggested that jail or prison sanctions result in a long-term learning process whereby the driving public comes to see drunk driving as a serious and undesirable behavior because of the penalties associated with it. The review that follows presents available research to establish the basis for claiming individual reform and general deterrent effects resulting from jail or prison sentences.

Individual Reform: Do Offenders Receiving Jail or Prison Sentences Have Lower Recidivism Than Those Who Do Not?

Reductions in recidivism are often referred to as specific deterrent effects. However, such reductions may also result from rehabilitation or incapacitation. Therefore, we refer to reduced recidivism as an indicator of *individual reform*. Regardless of the terminology used, the primary concern is whether the sanction in question reduces recidivism rates among offenders who receive it.

Voas (1986) reviewed several relevant foreign (Buikhuisen 1972; Dijksterhuis 1974; Homel 1979, 1981) as well as U.S. studies (Blumenthal and Ross 1973, 1985a, 1986; Tashima and Peck 1986). He found little evidence of any reduction in recidivism resulting from jail or prison sentences, particularly in the foreign research.

Three U.S. studies were reviewed that found only negative results. Blumenthal and Ross (1973) investigated the impact of jail sentences on first-offense drunk drivers in Colorado and found no less recidivism for those receiving jail sentences compared to other sentencing alternatives.

In Washington State, Salzberg and Paulsrude (1983a) and Klingberg, O'Connell, Salzberg, Chadwick, and Paulsrude (1984) evaluated the effects of a 1980 law that

mandated jail sentences for both first and repeat offenders convicted of DWI. They reported that people convicted under the new law had higher subsequent crash and DWI offense rates than people convicted under the previous law and that the mandatory jail sentence failed to deter subsequent drunk driving.

In California, Tashima and Peck (1986) studied first offenders receiving five different types of sanctions: license suspensions; jail and probation; jail, probation, and education; license restrictions only; and license restrictions and education. Offenders receiving jail and probation had among the worst subsequent conviction and crash records of the five groups. License suspensions and license suspensions with education were the most effective sanctions for first-time offenders.

In Ohio, Siegal (1985) evaluated three sentencing alternatives: traditional jail plus probation, a weekend residential intervention program, and a diverse group of "other" sanctions. The weekend residential intervention produced the lowest recidivism rates for multiple offenders, but not for first offenders. The recidivism rates for the jail plus probation group were not significantly lower than for the diverse other group. This study provided evidence that confinement in a special facility, combined with assessment and referral, can have a positive impact on multiple offenders.

Reduced recidivism rates following mandatory 48-hour jail sentences for first-time offenders were first reported by Compton (1986) and more recently by Jones, Joksch, Lacey, and Schmidt (1987). They evaluated the effects of a 1982 Tennessee law by comparing DWI reconviction rates for offenders convicted in the 3 years after the law was implemented with those convicted in the 3 years prior to the law. The initial report by Compton indicated a 40-percent reduction in 24-month rearrest rates following implementation of the law. The final report (Jones et al. 1987) concluded that the reduction in recidivism was 11 percent, rather than 40 percent, and that the effect was temporary, lasting for approximately 3 years. Unlike Siegal's (1985) work, this study found that the effect of confinement appeared to be greater for first offenders than for repeat offenders, and greater for older (over age 25) than for younger offenders.

In conclusion, our review of the effect of confinement on recidivism rates found five studies that reported no reductions in recidivism (Buikhuisen 1972; Homel 1979, 1981; Blumenthal and Ross 1973; Tashima and Peck 1986); one that reported no significant difference in effect between a special facility and traditional prison (Dijksterhuis 1974); one that found no effect for traditional confinement but did report reduced recidivism for multiple offenders confined to a special facility for assessment and referral (Siegal 1985); and one study that found reduced recidivism for first time offenders (Compton 1986; Jones et al. 1987).

General Deterrence: Does Confinement Deter Drivers Who Are Not Caught?

It is important to know whether jail penalties deter drinking drivers who have no previous arrest or conviction on their record, because they are involved in the majority of alcohol-related fatal crashes. General deterrent impact is usually measured by surveys that show changes in drinking and driving behavior or by data analyses that show changes in alcohol-related fatal crashes or nighttime fatal crashes.

The Scandinavian countries have used jail or prison sentences for more than 50 years. In Sweden, such penalties have generally not been applied to offenders at lower alcohol concentrations, and they have been applied with varying degrees of consistency to more extreme offenders (Voas 1982; Ross et al. 1984). Still, confinement has been used more commonly in Scandinavia than in the United States, and it has been a more visible part of their deterrent effort.

In a critical review entitled "The Scandinavian Myth: The Effectiveness of Drinking and Driving Legislation in Sweden and Norway," Ross (1975) challenged the assumption that Scandinavia's tough approach for dealing with drinking drivers was responsible for

a low rate of alcohol-related fatal crashes. Using time-series analyses, Ross found no changes in traffic deaths in either Sweden or Norway immediately after drunk driving penalties were increased in those two countries. Ross reiterated his findings and his conclusions in subsequent papers (e.g., Ross 1978, 1982) and recommended to the parliaments of both Norway and Sweden that a reduction in the severity of penalties would not provide a less effective deterrent. He also evaluated a 1950 Finnish law that increased prison penalties for drinking drivers involved in injury crashes (Ross 1982). Although he found a reduction in total and injury crashes following implementation of the law, Ross rejected the hypothesis that it was due to the law. This was because injury crashes showed a greater reduction than fatal crashes, which are more highly correlated with the use of alcohol.

Ross' reviews and evaluations resulted in considerable debate over the impact of laws modeled on those of Scandinavia, particularly on the use of jail penalties. As a result, much additional research was conducted and published regarding the impact of such laws on a variety of variables such as incidence of drinking and driving, rate of apprehension for drinking drivers, alcohol concentration levels of apprehended and fatally injured drivers, public knowledge and acceptance of the laws and penalties, and social costs of penalties as well as reductions in fatal and injury crashes (e.g., Andenaes 1978; Votey 1978; Klette 1978, 1983; Votey and Shapiro 1983, 1985; Snortum 1984; Snortum et al. 1986). In many cases, Scandinavian data were compared with similar U.S. data to assess the circumstantial evidence for concluding that such laws have a deterrent impact.

Reviews of such studies by Snortum (1984) and by Voas (1982) found convincing evidence that, compared with the United States and most other western nations, Scandinavian countries had a lower proportion of fatally injured drivers with high alcohol concentrations; an even lower incidence of drivers on the roadway who had high alcohol concentrations; and a higher proportion of drivers who were aware of and supported the laws and the associated penalties.

Applying econometric analyses to the Swedish and Norwegian data, Votey (1978) found that fatalities were negatively correlated with convictions for drunk driving and license withdrawals in Norway and with length of jail sentences in Sweden. Subsequent analyses by Votey and Shapiro (1983, 1985) supported the effectiveness of all three types of sanctions in use in Sweden (i.e., jail, license withdrawal, and fines). Because of the stronger negative correlation of fines and license actions with fatal crashes, they suggested that increased reliance be placed on fines and license actions in the future. These authors found, as did Ross in his 1982 evaluation of the impact of the Finnish law, that jail sentences were more negatively associated with serious injury crashes than with fatal crashes, an unexplained paradox.

Ross (1982, 1985) acknowledged the low rates of drunk driving in Scandinavia but rejected both the procedures of Votey and Shapiro and the conclusion that imprisonment is necessary for deterrence. In his book, Ross (1982) stated that a variety of facts were consistent with the possibility that the Scandinavian countries had achieved some marginal deterrence over the long run. However, he maintained, the same deterrent effect could have been obtained with laws that were less punitive and costly.

In spite of their differences, Ross and Votey and Shapiro agreed on the wisdom of placing more reliance on licensing and fines. In addition, Klette (1985) concluded that while the Scandinavian laws had been effective, the use of jail sentences should be reduced.

As we suggested earlier, in addition to a simple deterrent effect, severe penalties may be long-term components of general prevention. While simple deterrence results from the public's fear of a sanction, the longer term, educational component involves the gradual development of a social norm that drunk driving is wrong, as demonstrated by the sanctions associated with it. In Scandinavia, jail sentences have been shown to have some long-term effect. But some evidence implies that emphasis on other penalties

would have had as great an effect. Further, a clear trend toward reduced emphasis on sanction severity is indicated by both fewer jail sentences and shorter jail terms. This is true, to some extent, for all of the Scandinavian nations. In Sweden, Denmark, and Finland, significantly more emphasis is being placed on the adoption of illegal per se laws, roadside breath testing, and roadside sobriety checkpoints (Voas 1982). In all three nations, continuing emphasis is being placed on license withdrawals (primarily administrative) and fines based on income levels.

In the United States, as of 1988, 14 States mandated jail sentences (or community service) for first offenders, and 42 States mandated such penalties for repeat offenders. Sentences for first offenders were often for minimal periods such as 2 days. Sentences for repeat offenders were usually longer but not as long as those traditionally used in Scandinavia. Because of factors such as suspended sentences, diversionary programs, and plea bargaining, many offenders sentenced to jail were never actually confined.

Early evaluations of the general deterrent value of jail sentences in Chicago (Robertson et al. 1973); in Yakima, Washington (Grube and Kearney 1980), and in Phoenix, Arizona (Voas 1975) involved laws or policies that were never fully implemented (Voas 1982). No general deterrent effects were reported in these studies, perhaps as a result of incomplete implementation. Voas (1975) and Ross (1976) pointed out that the effects of severe sanctions, such as jail, were often "neutralized" by factors such as reduced arrests, increased not-guilty pleas, increased requests for jury trials, decreased conviction rates, and increased court backlogs. These have been demonstrated to be very real handicaps to the use of severe sanctions. However, such factors may not be as overwhelming when officials or the public have a strong commitment to making such sanctions work.

Two recent studies were conducted in jurisdictions where jail sentences were regularly administered. In both cases, first offenders were the primary targets of the law. Falkowski (1984) reported on the efforts of judges in Hennepin County, Minnesota, who voluntarily implemented a policy of providing 2-day jail sentences for first-time DWI offenders. Initially, the sentences were imposed on 93 percent of convicted offenders. Even after 2 years, 80 percent of such offenders received jail sentences. Falkowski found a statistically significant (20 percent) reduction in nighttime fatal crashes after the policy had been in effect for 2 months. (It is not clear if such a lag was anticipated. If not, it raises some questions regarding the interpretation of the results of the time-series analysis.) Falkowski also reported a marked increase in enforcement coincident with the policy and suggested that the jail policy might not have been successful without the increase in arrests. However, her analyses suggested that the change in sentencing policy was the primary cause of the fatality reduction.

In neighboring Ramsey County, which did not implement the jail policy, there was a similar increase in arrests and a (smaller) decrease in nighttime fatalities. However, the decrease in fatalities in Ramsey County was not coincident with the implementation of the policy in Hennepin County.

Subsequent analyses by Cleary and Rodgers (1986) supported Falkowski's findings. Even though arrest rates and other program efforts increased significantly throughout the State, and even though these efforts were accompanied by statewide reductions in fatal crashes, the reductions observed in Hennepin County were greater (25 percent) than for the remainder of the State (16 percent). Although there is some question regarding how the time lag in observed results should be interpreted, the Hennepin County experience suggested that the 2-day jail sentence policy likely had an impact on fatal crashes.

The most recent study of the general deterrent effect of jail sentences involved the mandatory 2-day jail sentence legislation in Tennessee. This legislation was implemented in July of 1982 and evaluated by Jones et al. (1987). Nighttime, single vehicle, fatal crashes showed an upward trend until shortly after implementation of the law. This upward trend

was followed by a decline in such crashes, which continued for 24 months. This decline occurred at the same time as daytime crashes were increasing. Taken at face value, and considering Tennessee alone, the study suggested that "... a reduction in alcohol-related fatal crashes of up to 15 percent could be attributed to the mandatory jail law." As in Hennepin County, there was a time lag before the reversal in crash trends occurred. The evaluators also worried that their findings were tempered by the fact that similar reductions occurred in two adjoining States, Alabama and Kentucky, that did not implement mandatory jail sentences. However, they overlooked the fact that both Alabama and Kentucky implemented DWI legislation and other significant counter-measures immediately preceding the reductions in nighttime, single vehicle, fatal crashes in those States.

In a recent study by the Insurance Institute for Highway Safety (IIHS), Zador, Lund, Fields, and Weinberg (1988) evaluated the effectiveness of three different types of laws: illegal per se, administrative licensing, and mandatory jail or community service laws. They found that all three kinds of laws reduced fatalities and that administrative licensing laws had the greatest impact. Laws mandating jail or community service for first offenders resulted in an estimated 6-percent reduction in late-night fatal crashes, which are most commonly associated with alcohol. This study supported the idea of a general deterrent effect for brief mandatory jail sentences for first-time offenders. It covered a number of States across the Nation.

Can Problem Drinkers Be Deterred?

With regard to individual reform (i.e., reduced recidivism), we have already provided evidence that suggests that multiple offenders who receive jail sentences do not appear to be affected by them, but first offenders may be at least temporarily affected. An issue that has frequently been raised involves the extent to which heavy or "problem" drinkers who are not caught can be deterred by severe penalties. Generally, theorists have speculated that moderate or "social" drinkers are most affected by penalties of any kind and that problem drinkers are unable to modify their behavior. In support of this theory, Voas (1982) showed that six times as many drivers had low to moderate BAC levels on U.S. roadways as on Swedish roadways, but that only three times as many crash-involved drivers had these moderate levels. The implication was that Sweden, in comparison with the United States, had significantly reduced the number of social drinking drivers on the road but not the riskier problem-drinking drivers.

However, Snortum et al. (1986) reported survey results compatible with the idea that problem drivers had been deterred by jail sentences in Norway. The researchers found that, while Americans showed only slight inclinations not to drive home after drinking, Norwegians showed substantial inclinations not to drive. This was true for persons from high as well as low baseline levels of alcohol consumption.

Data from NHTSA's Fatal Accident Reporting System (FARS) have suggested that since "tougher" sanctions (including but not limited to jail) were implemented in the United States, drivers with high BACs have been less frequently involved in fatal crashes (Nichols 1988). Roadside surveys conducted in Minnesota (Palmer and Tix 1986; Tix and Palmer 1987) and across the Nation (IIHS 1987a, b) have supported this suggestion.

Thus, while conventional wisdom and some data suggest that, in Scandinavia, primarily social drinkers have been deterred by laws involving the use of prison sentences, evidence has also shown that drivers with high alcohol concentrations, presumably problem drinkers, have been deterred in both Scandinavia and the United States. Snortum et al. (1986) suggested that although many heavy drinkers in Norway may not have changed their drinking habits, they have found ways to avoid driving after drinking.

Summary of Confinement Effects

The National Institute of Justice (1984) reviewed jail sentencing practices in several

U.S. jurisdictions and concluded that implementation of mandatory jail sentences would be likely to produce the following results:

- Drunk driving arrests would increase.
- Court workloads would increase.
- More defendants would challenge, postpone, or avoid compliance with court procedures and decisions.
- Effects on subsequent recidivism rates would vary from one site to another.
- Incarceration rates would increase.
- Strains would be placed on the correctional system.
- A variety of special programs and facilities would be required.
- Traffic fatalities might decline.

This report also indicated that legislative enactment is not necessary and that adverse effects can be minimized or eliminated.

In our review, we found only slight evidence that jail sentences reduce recidivism among offenders who receive them. One study supported the proposition that the use of special facilities with referral to treatment may reduce recidivism for multiple offenders (Siegal 1985). One U.S. study showed that brief, mandatory jail sentences may temporarily reduce recidivism for first-time offenders (Jones et al. 1987).

With regard to the much more important general deterrent effects, some evidence has been provided for a long-term benefit associated with the use of jail sentences in Scandinavia (Voas 1982; Snortum 1984). However, such benefit might well have been as great with less severe sanctions (Ross 1982; Votey and Shapiro 1985). Scandinavian nations are modifying their approach to be less dependent on jail sentences and more dependent upon fines, license actions, and random roadside testing procedures. Jail sentences have not been eliminated, but they have been reduced in duration and their use has been directed more to persons with higher alcohol concentration levels (Voas 1982; Ross et al. 1984). Treatment is also being more frequently considered as an adjunct to jail sentences (Winsten 1987).

In the United States, jail sentences have frequently resulted in a high cost to the judicial and correctional systems. In some locations where jail sentences were used, they produced more innocent pleas and requests for jury trials, fewer convictions, and greater court backlogs (Voas 1975; Ross 1976). The experience in Hennepin County, Minnesota provided an example of the difference judicial commitment can make. The courts in Hennepin County did not become backlogged, jail facilities were not generally overburdened, jury trials did not increase, and fatal crashes did decrease following implementation of the sanction policy (Falkowski 1984).

Recently, the use of brief, 2-day jail sentences has increased in the United States. Four studies that we reviewed (Falkowski 1984; Cleary and Rodgers 1986; Jones et al. 1987; and Zador et al. 1988) found a general deterrent effect of these jail sentences for first offenders. Several studies have suggested that license withdrawal and substantial fines may be more effective than mandatory jail sentences (Klette 1985; Votey and Shapiro 1985; Zador et al. 1988). These findings do not necessarily mean that jail should be eliminated as a sanction. They do suggest that fines and license actions should receive greater emphasis.

Alternatives to Jail Sentences

In addition to traditional license withdrawals and fines, a number of sanctions are used specifically as alternatives to jail sentences. Most common among these alternatives have been community service, residential treatment, and house arrest. While residential

treatment has had an impact on recidivism (Siegal 1985), such programs have not been shown to have a general deterrent effect.

Similarly, there is little evidence that community service or house arrest, when applied to large numbers of offenders, has deterrent impact. The Presidential Commission on Drunk Driving recommended the use of 48-hour jail or 10-day community service sentences for second-offense drunk drivers. Since then, many community service programs have come into existence. One evaluation of these programs (Stenzel et al. 1987) was conducted in Baton Rouge, Louisiana where, beginning in 1983, virtually all DWI offenders were sentenced to community service. This program was accompanied by a public information campaign that appeared to be successful in increasing public awareness of the program. However, both self-reports and crash data failed to provide any statistically significant evidence of reduced recidivism for offenders who received this sanction in 1984, compared with offenders in 1982 who did not.

With regard to general deterrence, analyses of several surrogate measures produced mixed results, but single vehicle, fatal and injury crashes were somewhat lower following implementation of the program. It appeared that the percentage of drivers involved in fatal and serious injury crashes who had been drinking was reduced.

Clearly, more attention should be paid to some of these alternatives to jail, particularly those that combine restrictions of freedom with treatment for alcohol-related problems. Even where treatment is not part of the program, the general deterrent impact of house arrest and special confinement facilities for drunk drivers should be investigated more thoroughly.

License Suspensions and Revocations

License actions would seem to be an integral and essential part of removing drunk drivers from the roadway. However, such actions have been applied with extreme variation from one jurisdiction to another, even within the United States. Recently, increasing emphasis has been placed on license actions as drunk driving sanctions, both in foreign countries and in the United States.

In examining the effects of license actions, we came upon a number of important comparisons, including: discretionary versus mandatory actions; fully imposed versus suspended, stayed, or conditional actions; license withdrawal versus education or treatment; immediately imposed versus delayed actions; short versus long sentences; and criminal versus administrative processes. While adequate research on all of these issues does not exist, most have received some attention, primarily with regard to reductions in recidivism.

Individual Reform: Do License Actions Result in Reduced Recidivism?

As with jail sentences, deterrent, rehabilitation, and incapacitation effects are somewhat confounded in evaluating license suspensions. In this review, we continue to use the term "individual reform" to refer to reductions in the recidivism rates of offenders who receive these sanctions, regardless of which component is responsible for the reductions.

Evidence of individual reform as a consequence of license actions comes primarily from studies conducted in the United States. In most cases, these evaluations involved judicially imposed license sanctions. The most recent and complete review of such studies was conducted by Peck, Sadler, and Perrine (1985) who concluded that

there is no question that license suspensions have a significant effect in reducing the accident and drunk driving frequency of convicted DUI offenders . . . the overall consistency of the results from different investigators, using different quasi-experimental designs, precludes any other conclusion.

An important issue frequently encountered in these studies is that many offenders continue to drive during periods of suspension or revocation. The proportion of suspended drivers who continue to drive has been estimated by various studies to range from 25 to 75 percent (e.g., Hagen 1977; Hagen et al. 1980; Salzberg et al. 1981; Peck et al. 1985; Ross and Gonzales 1988). This high rate of subsequent driving is related to the fact that the perceived risk of being identified and prosecuted for driving while suspended is extremely low. In spite of the large number of suspended or revoked drivers who continue to drive, their crash and violation records during revocation or suspension are significantly better than those of nonsuspended drivers. This suggests that they drive fewer miles and more cautiously. Moreover, the low rates of crashes and violations are maintained after the license actions expire.

The study of *discretionary versus mandatory* license withdrawal actions provides an evaluation of the importance of certainty in the administration of such sanctions. Hagen (1977) reviewed studies conducted in Oregon (Kaestner and Speight 1974) and in Washington (Paulsruide and Klingberg 1975). These studies were not limited to alcohol-related offenders. They included persons who had a sufficient number of violations that driver improvement actions were invoked. Based on these studies, Hagen concluded that the traffic safety effectiveness of the discretionary use of license suspension was "less than startling." He contrasted these findings with those of a California study (Epperson et al. 1975) where the effectiveness of imposing mandatory license suspensions for multiple driving under the influence (DUI) offenders was "strongly evidenced."

Hagen then examined 6 years of postconviction driving records for multiple DUI offenders who received mandatory license withdrawals and compared them with the records of a matched group of offenders not receiving the mandated action because of dismissals of prior convictions. He found that a significantly smaller proportion of the license-action group was involved in a subsequent DUI arrest or crash. This effect lasted for approximately 4 years and was greater for older than for younger offenders.

Blomberg, Preusser, and Ulmer (1987) provided convincing evidence of the importance of certainty of license actions in reducing recidivism. They evaluated a 1982 Wisconsin law which mandated that all persons convicted of operating while intoxicated (OWI) would receive 3- to 6-month license suspensions. If a person was convicted of OWI and did not have such a penalty imposed by the court, the law required that the Bureau of Driver Licensing impose such a penalty. Virtually 100 percent of first-time OWI offenders in 1983 had their licenses suspended, compared with 45 percent in the year prior to the law. These researchers found that the new law group had a 1-year, OWI recidivism rate of 5.4 percent compared with a rate of 7.8 percent for the old law group, a reduction of 30 percent. A control group of moving violation offenders also showed reduced recidivism after the law was passed, but it was a smaller reduction. After controlling for the magnitude of this reduction, the differences in recidivism between the OWI groups were still significant.

In summary, the research suggests that mandatory license actions are more effective than discretionary sanctions in reducing recidivism. Certainty of the license action is likely to be a major factor in producing this effect.

Several studies have evaluated *license withdrawals compared with education and treatment sanctions*. When people are given education or treatment sanctions, license withdrawal actions are often stayed or suspended pending completion of the program. Thus, these studies also provide an evaluation of fully imposed sanctions compared with stayed or suspended license actions.

A series of California studies provided the most comprehensive information regarding license actions compared with education and treatment alternatives. Hagen (1977) and Hagen, Williams, McConnell, and Fleming (1978) evaluated the effectiveness of California alcohol treatment programs as an alternative to license actions. They found

that drivers with mandated loss of license had significantly fewer subsequent crashes and violations than those who attended rehabilitation programs in lieu of license actions.

A followup study by Sadler and Perrine (1984) compared 4-year subsequent driving records of these offenders. They found that offenders who received mandated license suspensions had significantly fewer subsequent arrests and violations than offenders who did not receive such sanctions. Offenders who received education or treatment alternatives may have had fewer subsequent alcohol-related violations. Overall, they concluded that license suspensions were more effective than any known form of alcohol education or rehabilitation.

Tashima and Peck (1986) found similar results for both first and multiple offenders. For second-time offenders, license suspension reduced the crash risk to nearly that of the average driver. The treatment group with a restricted license had a mean crash rate that was 91 percent higher than that of the suspended group.

Similar results have been found in other States. In North Carolina, a study by Popkin, Li, Lacey, Stewart, and Waller (1983) found that first-time DUI offenders who attended an alcohol/drug education program in lieu of receiving license suspensions had significantly higher subsequent DUI conviction and crash rates than those whose licenses were suspended.

In the State of Washington, Salzberg, Hauser, and Klingberg (1981) compared 5-year driving records of habitual offenders whose licenses were revoked, offenders whose revocations were stayed as a result of participation in an alcohol treatment program, and a control group whose cases were dismissed. Although the groups showed no differences in subsequent DWI arrests, adjusted data indicated that offenders receiving license revocations had approximately half as many subsequent moving violations and crashes as either offenders whose sentences were stayed or offenders whose cases were dismissed. Neither drivers whose license revocations were stayed nor drivers who avoided sanctions via dismissal of their charges appeared to have modified their driving behavior.

Following more than a decade of evaluations of the effectiveness of various programs related to the Alcohol Safety Action Projects implemented by the National Highway Traffic Safety Administration, Nichols et al. (1978*a, b*) and Nichols, Ellingstad, and Reis (1980) concluded that the majority of education and treatment programs showed little impact on reducing subsequent alcohol-related arrests or crashes, whereas license actions had been generally effective. Thus, they recommended that education and treatment programs should not be used in lieu of license actions, but should be continued as adjuncts to licensing actions. Mann, Leigh, Vingilis, and DeGenova (1983) reiterated the concerns of Nichols et al. (1978*a, b*, 1980) regarding the diversion of drunk drivers to rehabilitation programs in lieu of license actions.

Our review found that persons with stayed or suspended license actions had more subsequent violations and crashes than persons whose licenses were actually withdrawn, and that education or treatment programs did not counteract this negative effect. If education and treatment programs are to be considered (and they should be), their use should be in addition to license withdrawal.

Relative to the issue of *length of license withdrawal*, a study in New South Wales, Australia (Homel 1981) found that license withdrawal longer than 2 months was not associated with lower DUI reconversion rates. However, among drivers who were not rearrested for DUI (i.e., good risk drivers), longer periods of disqualification were associated with fewer non-alcohol-related violations. These reduced violations continued for up to 18 months after the license was restored. Homel suggested that 12- to 18-month disqualification periods were optimal.

In California, Sadler and Perrine (1984) provided further evidence that longer sentences reduce recidivism to a greater extent than shorter sentences. They found that

offenders who received 3-year license revocations had fewer subsequent total crashes and convictions than those who received 1-year suspensions. This was particularly true for younger offenders.

Looking only at very brief sentences in the State of Washington, Salzberg and Paulsrude (1983b) found that first-time offenders who received 30-day license suspensions (in addition to other penalties mandated by law) had fewer subsequent moving violations (though more alcohol-related violations) than first offenders who received the other penalties but who avoided the suspension. No impact was apparent on crash involvement. Their results suggested that short-term suspensions may be ineffective in reducing DWI recidivism.

The findings of Stewart, Gruenewald, and Roth (1988) were consistent with those of Salzberg and Paulsrude. These researchers investigated the recidivism rates of offenders receiving 30-day administrative license suspensions in Louisiana and Mississippi. While the brief administrative license sanctions appeared to have made drivers more cautious, they did not decrease DUI recidivism rates.

Our review found no studies that specifically evaluated the effect of *immediate versus delayed license actions*. Generally, license actions imposed by the courts take place 4 to 6 months after an arrest for DWI whereas administrative sanctions occur within 1 to 2 months following arrest. Evaluation of the effectiveness of license actions resulting from judicially imposed license actions compared to administratively imposed actions would be helpful in guiding States currently pursuing administrative licensing laws.

In summary, license actions of reasonable duration have been found to be effective in reducing crash and violation recidivism rates among offenders who receive them. Within reason, longer sanctions appear to be more effective than shorter sentences. The ability of license actions to reduce recidivism has been demonstrated for first offenders in California, North Carolina, and Wisconsin and for multiple offenders in Washington and California.

Generally, license actions are superior to remedial education or treatment. Some characteristics of license actions that appear to increase their effectiveness in reducing recidivism include making them mandatory, increasing their certainty of application, not offering remedial programs in lieu of license actions, and providing for suspensions of reasonable duration, such as 3 months or more. It is also believed, but not yet demonstrated, that minimizing the time from arrest to license withdrawal adds to its effectiveness.

General Deterrence: Do License Actions Reduce Drunk Driving and Alcohol-Related Crashes Among Drivers Who Are Not Caught?

As with jail sentences, it is most important to determine whether the general public is deterred from drinking and driving by license sanctions. Here, the studies by Votey and Shapiro (1983, 1985) are again relevant. Application of their econometric models to Sweden's fatality and injury data indicated that, among all sanctions, including jail, license actions were most highly associated with reductions in fatal crashes.

Few studies have measured the general deterrent impact of judicially imposed license actions in the United States. This is perhaps due to the irregularity with which such sanctions are applied. Recently, however, there has been more opportunity to observe the impact of significant increases in the certainty of license withdrawal actions because a number of States have begun imposing administrative sanctions. These sanctions have generally been brief-to-moderate in duration (i.e., 30-90 days), compared with the maximum duration allowable in criminal law (i.e., 1 year or more).

As of 1988, 23 States had administrative licensing laws, most implemented since 1982. The most frequently reported evidence regarding the general deterrent effect of these

laws has not come from formal evaluation studies. Rather, such evidence has come from observations and reports of significant increases in the number of license actions imposed, followed by significant (10-15 percent) reductions in night-time or alcohol-related fatal crashes. Such trends have been observed in several States that have passed administrative license laws (Illinois 1986; Minnesota 1987; Nevada 1986; New Mexico 1988).

Some of these laws have not been adequately evaluated, because they were enacted as components of comprehensive legislative packages. In Minnesota, Cleary and Rodgers (1986) determined the overall impact of a legislative package implemented in 1982 and found significant reductions in several fatal crash measures. Improvements in a previously implemented administrative licensing law constituted a major component of the legislation evaluated.

Similarly, in North Carolina, Lacey (1987, 1988; Lacey et al. 1984) evaluated the impact of a legislative package that included administrative license suspension as a primary component and found significant reductions in several alcohol-related crash measures, particularly for young drivers.

In Wisconsin, Blomberg et al. (1987) provided more specific evidence for the general deterrent effect of a combination of judicially and administratively imposed license sanctions for first-offense drinking drivers. The 1982 law they evaluated provided that any driver convicted of OWI who did not receive a license suspension or revocation by the court would have his license suspended administratively. Time-series analyses found that implementation of the law was associated with a 25-percent decrease in single-vehicle nighttime crashes, which are likely to be alcohol-related.

One of the evaluations most specific to the general deterrent effects of administrative licensing actions was conducted by Ross (1987). He evaluated the effectiveness of a New Mexico administrative licensing law using telephone surveys and time-series analyses of alcohol-related crash fatalities. Following implementation of the law, telephone surveys indicated that the perception of risk of apprehension and conviction rose slightly, though insignificantly; the perception of risk of license withdrawal, if convicted, rose considerably and significantly, and there was a temporary reduction in the proportion of persons who admitted to drinking and driving. More importantly, an interrupted time-series analysis of a 6-year, monthly series of fatality data indicated a reduction in the alcohol-related proportion of fatalities from 66 percent prior to the law to 56 percent following the law, a 15-percent reduction. Because of the absence of effects in some related data series, Ross urged caution in interpreting the results. Still, the New Mexico experience supports the wisdom of wider adoption of administrative license withdrawal for drunk driving.

In New Mexico as in Minnesota, surveys were conducted to measure changes in perceived risk of apprehension and sanctioning (Rodgers and Cleary 1983). One of the findings of these surveys was that respondents felt license suspensions would discourage drinking and driving more than any other sanction.

More recently, the Insurance Institute for Highway Safety (Zador et al. 1988) evaluated the effectiveness of three different types of laws: illegal per se, administrative per se, and mandatory jail (or community service) laws. This study found that all three types of laws affected fatalities, but that the administrative licensing laws had the greatest impact. This is consistent with the findings in Sweden by Votey and Shapiro (1983, 1985). Zador et al. estimated that administrative licensing laws reduced driver involvement in late-night fatal crashes by approximately 9 percent. This study provided support for a general deterrent effect of administrative license laws in several States.

In summary, while most of the evidence for reductions in recidivism comes from studies of criminally imposed license actions, evidence for a general deterrent effect of licensing actions comes primarily from studies where such actions have been administra-

tively imposed. Administrative license laws have generally been followed by significant increases in the number of offenders receiving license actions and by small but significant reductions in alcohol-related fatal crashes (Minnesota 1987; Lacey 1987, 1988; Nevada 1986; Ross 1987; Blomberg et al. 1987; etc.).

Throughout our review, we found evidence that, compared with other sanctions, license actions have the greatest individual and general deterrent potential (e.g., Homel 1981; Votey and Shapiro 1985; Tashima and Peck 1986; Zador et al. 1988). Regardless of the type of sanction, certainty of action appears to be an important component for deterrence, particularly general deterrence (e.g., Falkowski 1984; Epperson et al. 1975; Jones et al. 1987; Ross 1987; Blomberg et al. 1988; Zador et al. 1988).

With regard to administrative license actions, swiftness of action may also be an important component since administrative license withdrawals are usually imposed in a fraction of the time required for criminal sanctions. However, we found no studies that specifically evaluated this matter.

Fines

Fines have not been well evaluated for their impact on recidivism or their general deterrent effect despite the fact that such actions are a common element in most sanction combinations. The substantial fines imposed by the Scandinavians were associated with reductions in fatal crashes by Votey and Shapiro (1983, 1985). In Australia, Homel (1979, 1981) found that fines and "good behavior bonds," forfeited upon a repeat offense, were effective in reducing recidivism among DWI offenders. Homel (1981) reported that neither long nor short periods of imprisonment were any more effective in reducing recidivism than were fines or good behavior bonds. He also found that higher fines (\$300 or more) were more effective than lower fines in reducing recidivism.

In Sweden, violators receive "day fines." One day fine is one-tenth of 1 percent of the offender's annual income. The amount of the fine assessed is also associated with the seriousness of the offense (e.g., the offender's alcohol level). At the upper levels of severity, the fine can be as high as 80 day fines, which is more than 1 month's income (Winsten 1987). It would be useful to know if fines based on income levels, such as those used in Scandinavia, would produce greater general deterrent effects than the fines commonly used in the United States.

While we do not generally include costs such as insurance premiums as fines, it is worth noting that in New Jersey, heavy fines combined with substantial insurance assessments and license reinstatement fees have been credited by State safety officials with producing a significant reduction in alcohol-related fatal crashes. To date, however, no research evidence supports that claim.

In addition to their potential for reducing recidivism and alcohol-related crashes, fines serve another important function in some jurisdictions. They provide a source of funds for maintaining DWI countermeasure efforts. The State of New York has one of the most comprehensive program-financing systems in the United States. This system is based on the use of mandatory minimum fines, which are deposited in a specially designated DWI program account and redistributed to the counties in response to their program plans. The redistributed funds help pay for various components of the DWI control system such as enforcement, prosecution and adjudication, education, and public information. New York has credited this self-financing system, based on mandatory minimum fines, with significant reductions in alcohol-related fatal crashes since 1981 (McCartt and Dowling 1985).

Whether the observed reductions in New York can properly be attributed to the self-financing system is debatable. Nevertheless, this type of system is important from several perspectives. First, fines have been shown to have both specific and general

deterrent effects. Second, fines provide a mechanism for funding DWI countermeasure programs. Third, the process of redistributing funds from fines provides a mechanism for controlling programs and for encouraging activities that have the greatest potential for reducing alcohol-related crashes.

Conclusions and Recommendations

Based on our review, we conclude that while all sanctions have some potential for reducing drunk driving and alcohol-related crashes, some have more potential than others. While it is desirable and beneficial to modify the behavior of the small proportion of drinking drivers who are caught, the most important function a DWI sanction can have is to effectively deter the many drinking drivers who will never be apprehended. We feel that swift and sure license actions provide the greatest potential on both counts. While the limited number of studies conducted in the United States suggests that brief jail sentences for first offenders can also have a general deterrent effect, such actions are more costly to implement than license actions.

Fines can also be effective deterrents, particularly the heavier fines used in Scandinavia. This potential, combined with the fact that fines can provide needed income for DWI countermeasure efforts, suggests that more emphasis should be placed on the use of fines. Some consideration should also be given to fines based on income levels.

Overall, we would propose a model sanctioning system that would provide income to fund the program, maximum general deterrence for drinking drivers who have not been apprehended, and significantly increased emphasis on keeping multiple offenders off the roadways, at least until there is evidence that their drinking problems have been effectively addressed.

For first offenders, our model system would provide for mandatory minimum fines or fines based on income and mandatory minimum hard license suspensions of no less than 90 days, followed by a probationary or restricted license period. Following the hard suspension period, incentives would be provided to engage in alcohol education, assessment, and referral programs.

To make license actions more effective, greater emphasis would be placed on keeping suspended and revoked drivers from driving during their license withdrawal period. More extensive use of license plate confiscation for persons found driving while suspended would make such violations more visible and thus more enforceable. Repeat offenders would receive mandatory minimum hard license suspensions of 1 year. These actions failing, emphasis would be shifted to vehicle confiscation and confinement.

Incarceration would be used primarily for the most extreme offenders. It would involve special facilities and would include in-house efforts to assess and refer offenders to residential treatment programs. Driving privileges would not be restored to such offenders without medical evidence that their drinking problems had been effectively addressed.

Significant public information efforts would be directed toward keeping the public aware of sanctioning efforts and of the certainty of their application.

While much research on sanctions has already been conducted, several issues deserve additional research attention. These include the deterrent effect of swiftness in applying sanctions; hard suspensions compared with soft suspensions; mandatory minimum fines and fines based on the income level of the offender; alternatives to jail such as special facilities, house arrest, or community service; adding assessment and treatment to incarceration for multiple offenders; administrative licensing laws; and the effect of

license plate and vehicle confiscation in reducing the number of offenders who drive while their licenses are suspended or revoked.

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Judicial and Administrative Processes

Prosecution, Adjudication, and Sanctioning: A Process Evaluation of Post-1980 Activities

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Any serious program to reduce alcohol-related crashes must seek to accomplish two objectives: (1) reduce the recidivism of apprehended offenders by deterring, incapacitating, or rehabilitating them and (2) deter the general population from driving while intoxicated (DWI) or impaired. Of these two objectives, the latter is much more important than the former. The majority of alcohol-related fatal and serious injury crashes involves drinking drivers who have *not* been previously apprehended for DWI. According to the most complete and objective estimates available, nearly 75 percent of all alcohol-related fatal crashes involve drivers who have never before refused or failed a chemical test for alcohol (Lewis 1985).

If all the DWI offenders arrested this year were incapacitated, fewer than 5 percent of next year's alcohol-related fatal crashes would be reduced (Nichols 1988a; Sterling-Smith 1976). This being the case, a 40-percent reduction in recidivism applied to *everyone* arrested for DWI would result in a reduction in next year's alcohol-related fatal crashes of about 2 percent. This is not an insignificant number. Applied nationally, it would account for an annual reduction of nearly 500 fatalities. Furthermore, many of the repeat DWIs involved in alcohol-related crashes are chronic offenders who show a complete disregard for the law and must be dealt with in an effective manner.

However, there is a more important reason to deal with all arrested offenders. What happens to these people provides the basis for deterring the much greater number of offenders who have not been caught. On any given weekend night, even in a high enforcement area, fewer than 1 in 500 drunk drivers are arrested for DWI. In most jurisdictions, fewer than 1 in 1,000 are apprehended. Over a full year, only about 1 in 20 persons who regularly drive while intoxicated are apprehended. Unless something is done to deter offenders who have not been arrested, they will continue to drive impaired and will be involved in approximately 18,000 alcohol-related fatalities each year.

The foundation for deterring these drivers depends on *their* perception of the likelihood of being apprehended and on *their* perception of what will happen to them if they are apprehended. They have only the past, publicized performance of the enforcement, judicial, and licensing systems on which to base their perceptions. That is why the prosecution, adjudication, and sanctioning components of the driver control system are so essential to reducing alcohol-related fatal crashes. Not only do they constitute a

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mechanism for changing the behavior of known offenders, they also provide a basis for establishing effective general deterrence.

In the past, the judicial and administrative systems have not worked well, individually or together, in providing effective and efficient processing and sanctioning of DWI offenders. There has been very little consistency from one court to another in dealing with DWI offenders. Prosecutors have had excessive caseloads and little training. Judges have been overwhelmed and, at least occasionally, disinterested in the DWI problem. Attorneys have specialized in defending DWI offenders and have created many obstacles to efficient prosecution, adjudication, and sanctioning. During this decade, the public has become much more interested in the DWI problem than ever before. In fact, for a short time, driving while intoxicated was one of the more publicized social problems. In addition to generating media interest in drunk driving, citizen activist groups such as Mothers Against Drunk Driving (MADD) and Remove Intoxicated Drivers (RID) demanded the prosecution and sanctioning of drunk drivers to the fullest extent of the law. As a result, State legislatures passed a myriad of laws, many of which have not been implemented as intended (Quinlan 1987).

Legislative Changes Since 1980

Some progress was made during the 1980s to deal more effectively with drinking drivers. Most of the legislative changes are documented in a series of legislative digests developed by the National Highway Traffic Safety Administration (NHTSA). The most recent of these digests covers legislation passed through December 1987 (Hatos 1988). Thousands of DWI bills were considered by the States and hundreds were enacted. Legislation focused on issues such as reducing or eliminating plea bargaining, increasing the certainty of license suspensions, encouraging "hard" suspension of driving privileges, mandating jail or community service, and providing enhanced penalties for repeat offenders and for those causing injury or death.

By the end of 1987, 25 States had a mandated minimum license suspension period for a first DWI conviction; 43 States and the District of Columbia mandated license suspension after a second DWI conviction (usually for a longer period), and 45 States mandated suspensions for third or subsequent convictions (Hatos 1988). To counteract the many delays and inconsistencies that had characterized the courts during the 1970s, nearly half the States passed laws permitting administrative license withdrawal for drivers who failed a chemical test for alcohol. Even with these "administrative per se" laws, however, many States still used restricted and probationary licenses, thus softening the impact of license sanctions.

In 1982, Congress passed the Alcohol Safety Incentive Grant Program, commonly called the "Section 408 program". This program provided additional funds to States that mandated prompt and minimum "hard" suspension periods for all offenders, had illegal per se laws, mandated 48 consecutive hours of jail or community service for repeat offenders, and provided evidence of increased enforcement and public information efforts.

By October 1988, 21 States had adopted such provisions and were qualified for Section 408 grant funding. Fatalities involving an intoxicated driver declined to a greater extent (and more rapidly) in the first 10 of these States, compared with nonqualified States. A second group of 6 qualified States showed somewhat smaller decreases than the first 10, but still showed lower levels than the nonqualified States (Levy 1987).

The increased seriousness with which the alcohol-impaired offense was being perceived by the legislatures was reflected in the introduction of mandatory minimum jail sentences for first offenders. By the end of 1987, 14 States mandated minimum jail

sentences for first-time DWI convictions, and 42 States mandated jail for second convictions (Hatos 1988).

Generally, changes in sanctions resulted in progressively more severe sanctions for more frequent offenders. This reflected some tolerance for first offenders but less tolerance for second and subsequent offenders. By 1988, 23 States had habitual offender laws (Hatos 1988).

Impact of Legislative and Other Program Changes Since 1980

Most States increased DWI arrests from 1980 to 1983, with concomitant increases in the number and proportion of offenders who were prosecuted, convicted, and sanctioned. A significant increase in public and media attention to the problem was evident through 1983, as well. After 1983, arrests, convictions, sanctions imposed, and media attention declined. Meanwhile, however, *most* States experienced reductions in the alcohol-related proportion of their fatal crashes until 1985 or 1986, when the proportion of such crashes began to level-off or rise again (Nichols 1988a). Following are experiences from two States.

Florida

The State of Florida provides an example of how public interest in drunk driving resulted in legislation and significant increases in enforcement, prosecution, conviction, and sanctioning of offenders. An evaluation of the Florida experience (Sotter 1986) indicated that traffic fatalities in Florida increased from 1978 through 1981 along with a steadily growing public concern over drunken driving. The public perceived that sentences for driving under the influence (DUI) were too light and lacked uniformity and that a number of loopholes existed. As a result, legislation was passed in 1982 that increased mandatory minimum fines and license suspension periods for both first and repeat DWI offenders. In addition, the new law mandated 50 hours of community service for first-time offenders.

According to the 1986 report, the 1982 legislation (and the debate that preceded it) were accompanied by an increase in arrests, convictions, and license actions for DUI. The average number of days of license revocation for DUI increased from approximately 150 prior to the law to more than 500 by November 1982. The number of permanent revocations also increased dramatically. Although the provisions of the new law were not intended to increase the use of confinement, the number of jail sentences increased by 55 percent from 1981 to 1983.

Repeat offender convictions increased by approximately 20 percent over that same period. Requests for jury trials remained at less than 3 percent in all counties. Although chemical test refusals were low, they were higher for repeat offenders than for first offenders, and conviction rates were lower for repeat offenders who refused such tests.

Following the increases in arrests, convictions, and sanctions, nighttime fatalities began to drop, reaching a low in 1983. It was speculated that the reduction in fatalities would not have occurred without the significant increase in enforcement by the Florida Highway Patrol. However, most officials felt that the increased number of convictions, license actions, and other sanctions contributed to this reduction as well.

Further examination of the Florida experience suggest that the reductions in nighttime fatal crashes have been maintained. Data from the Fatal Accident Reporting System (FARS) show that the nighttime proportion of all fatal crashes declined from 63

percent in 1982 to 59 percent in 1984 and has remained at approximately that level through 1987. The proportion of fatal crashes that were single-vehicle, nighttime crashes dropped from 41 percent in 1982 to 36 percent in 1987 (Nichols 1988b).

As in Florida, several States (e.g., New York, New Jersey, Kentucky, Colorado, Utah) had initial increases in arrests, prosecutions, and convictions, followed by reductions in alcohol-related fatal crashes. In most cases, the increases in arrests and convictions were temporary, although 10- to 15-percent reductions in the alcohol-related proportion of fatal crashes were usually maintained.

North Carolina

North Carolina provides a somewhat different example in that the number of arrests and convictions actually decreased. In addition, North Carolina is 1 of more than 20 States that passed administrative license suspension laws to increase the certainty and swiftness of license sanctions. In June 1983, the legislature enacted the "Safe Roads Act" (SRA), which made major revisions to the State's drunk driving law. North Carolina already had a high DWI arrest rate but a very low conviction rate. The legislature intended to further deter driving while intoxicated by imposing more certain and uniformly severe sanctions. The new law included short-term (administrative) license suspension for a chemical test refusal or failure; mandatory jail for multiple offenders and those involved in more serious cases; strict sentencing guidelines; elimination of lesser included offenses which had been alternatives for plea bargaining; and several provisions designed to deter young drinking drivers.

A series of reports have described the impact of the North Carolina Safe Roads Act (Lacey et al. 1984; Lacey 1987, 1988). In contrast to the Florida experience, the number of DWI arrests and the total number of convictions declined following implementation of the law. However, the proportion of arrested drivers who were convicted increased significantly (from 59 percent in 1982 to 68 percent in 1986), particularly at BACs of 0.10 and above (from 72 percent in 1982 to 91 percent in 1986).

The courts appeared to follow the intent of the law by nearly always sentencing persons convicted of more serious levels of DWI (e.g., higher BACs, multiple offenses) to jail and less serious levels to community service. The number of persons receiving license suspensions also increased significantly. The administrative suspension law resulted in immediate (10-day) license suspensions for virtually all persons refusing or failing a chemical test. In short, drinking drivers faced a greater certainty of receiving some sanction once arrested.

Some problems surfaced following implementation of the new procedures. Because the mandatory jail terms were usually served on weekends, jail overcrowding during these periods became a problem. In addition, the more complex and lengthy paperwork associated with processing cases through the court system taxed the manpower resources of the courts.

In spite of these problems and the reduction in arrests, North Carolina apparently did achieve some additional certainty in the conviction and sanctioning of arrested drunk drivers. More importantly, the changes in the way of handling drunk drivers were followed by a significant decline in the alcohol-related percentage of serious and fatal crashes, particularly for youthful drivers. Data from North Carolina (and from FARS) indicated that both the alcohol-related and nighttime proportions of fatal crashes declined through 1985, after which they remained essentially level. The declines were somewhat greater than in Florida, ranging from 10-15 percent for nighttime fatal crashes to 25-35 percent for the alcohol-related proportion of drivers killed.

In North Carolina, the administrative license suspension law, lower BAC levels for drivers under age 21, provisional licensing for drivers under age 18, raising the minimum

drinking age, and law enforcement efforts aimed at reducing the purchase of alcohol by minors deserve special mention. This combination appears to have provided a comprehensive set of deterrence measures aimed at youthful drivers and centered around the loss of driving privileges. Most importantly, these measures were accompanied by 50- to 60-percent reductions in the alcohol-related proportion of crashes involving young drivers. These reductions are of a magnitude not frequently experienced and, according to the most recent analysis (Lacey 1988), the reductions have been sustained.

Other States Enacting Administrative Per Se Laws

As in North Carolina, most States that enacted administrative per se laws were able to show reductions in alcohol-related fatal crashes following their implementation. Many have also increased their emphasis on judicially imposed sanctions. Although the majority of these States also experienced increases in arrest rates (e.g., Oklahoma, Nevada, Colorado, and Utah), a few did not. North Carolina, Wisconsin, Oregon, and Indiana provided evidence that, even without increases in arrests, increases in license actions were accompanied by decreases in the alcohol-related and nighttime proportions of fatal crashes. Media and public attention were undoubtedly major factors as well.

In some States with administrative per se laws (e.g., Maine, North Carolina, Oregon, and Wisconsin), the decline in the alcohol-related (or nighttime) proportions of fatal crashes has leveled out but appears not to have reversed. In other administrative per se States (e.g., Colorado, Indiana, Mississippi, Missouri, Nevada, Oklahoma, and West Virginia), initial declines in these indices were followed by slight increases around 1985 or 1986 but by further declines in 1987. In still other such States (e.g., Iowa, Louisiana, and Utah), initial declines in the alcohol-related or nighttime proportions of fatal crashes were followed by recent increases that have not been reversed. Finally, in some States (e.g., Alaska and Wyoming) the enactment of administrative per se laws was followed by variable patterns in these indices (Nichols 1988b). Overall, a study by Zador, Lund, Fields, and Weinberg (1988) found that the adoption of administrative per se laws by 18 States resulted in approximately 9 percent fewer alcohol-related fatalities.

Changes in Caseload, Convictions, and Sanctioning

Just how much increase in judicial caseload accompanied the legislative emphasis of the 1980s? Surprisingly, it does not appear that the increases in arrests, filings, and convictions were dramatic. In most States, increases in arrests preceded major legislation. On a national basis, for example, DWI arrests increased by about 13 percent from 1978 to 1980 and by 27 percent from 1980 to 1983. Arrests then declined by about 2 percent from 1983 to 1986 (FBI 1987). While most States passed DWI legislation throughout the 1980-87 period, the greatest activity for major legislative packages appears to have been from 1981 to 1983.

A review of DWI arrests from the reports available indicated that, during the years immediately surrounding major legislation in the various States, changes in the numbers of drivers arrested for DWI varied from 30-percent decreases (e.g., North Carolina) to 50- to 60-percent increases (e.g., Florida and Minnesota). Using 1980 as a baseline, increases of 20 to 30 percent in the numbers arrested were typical (e.g., New York, New Jersey, Utah, Colorado, and California). Arrests began to level off or decline in most States by 1984.

Changes in the *numbers* of offenders convicted of DWI varied from 20-percent decreases to increases of 50 percent (e.g., Kentucky) over baseline levels. Most of the States appear to have increased the number of convictions by 20-40 percent. Estimated

conviction rates generally varied from 70 percent to 90 percent, usually with initial increases followed by decreases to near baseline levels.

Following is a sampling of States, from east to west, for which arrest, conviction, or sanctioning information was found. These data provide an idea of the magnitude and timing of arrest and caseload changes that occurred after 1980, as well as changes in sanctioning policies.

Maine implemented major legislation in 1981. Arrests increased 29 percent from 1978 to 1981 (prior to the law) but only 7 percent from 1981 to 1983 (after the law). Arrest rates returned to prelaw levels by 1984. Over the 6-year period surrounding the legislation, conviction rates increased from 66 percent to 90 percent of those arrested (Hingson et al. 1987).

Massachusetts implemented major legislation in 1982. Hingson et al. (1987) found that arrests increased by 20 percent in the 3 years prior to the 1982 law and 29 percent after the law became effective. Convictions increased by 31 percent. The use of jail increased dramatically from 1980 to 1983 (Massachusetts Senate Report 1984, 1986).

New York implemented its "STOP-DWI" legislation in 1981. Arrests increased for 3 successive years following the legislation, then declined slightly. In 1985, there were still 32 percent more arrests and 42 percent more convictions than in 1980. The conviction rate increased from approximately 82 percent in 1980 to 89 percent in 1985. The use of jail sentences increased by 56 percent (New York DMV 1985, 1986).

In *New Jersey*, DWI arrests increased by 33 percent from 1980 to 1982, then began to decline. Convictions showed a similar trend. By 1985, DWI arrests were 15 percent above their 1980 level. Convictions were only 6-percent higher, having decreased significantly after 1983. The annual conviction rate varied between 79 and 90 percent of those arrested, with an average of 85 percent over this period (New Jersey Department of Law and Public Safety 1986).

Kentucky passed major legislation in 1984. DWI arrests increased the first year following the law, then declined. By 1986, arrests were only 3 percent above the 1983 level, but convictions were still 56 percent higher than in 1983. The conviction rate increased from 49 percent in 1983 to 72 percent in 1986 (Kentucky Division of Driver Licensing, personal communication 1988).

Indiana implemented major legislation in 1982 and 1983. Arrests remained level, but the number convictions increased by 18 percent after the 1983 legislation. The conviction rate increased from 63 percent to 77 percent. When no BAC information was available, the conviction rate was only 48 percent. In contrast, the conviction rate for the more serious felony DUI charge was 95 percent. The proportion of convicted offenders receiving license suspensions in Indiana increased from 50 percent before the 1983 law to 70 percent after the law, but *all* convicted offenders should have received a court-ordered license suspension. Similarly, according to Foley et al. (1986), all offenders should have received an administrative license suspension following the filing of an affidavit by the arresting officer, but in 20 percent of the arrests, no affidavit was filed. Approximately 90 percent of the offenders received fines. The proportion of convicted recidivists who received a jail or community service sentence increased from 70 percent to 75 percent. The majority of fines and license suspensions was served as sentenced, but approximately two-thirds of the jail sentences were never served (Foley et al. 1986; Automotive Transportation Center 1986; Indiana Governor's Task Force 1987).

Wisconsin implemented new legislation in mid-1982. Arrests decreased by 17 percent from 1980 to 1982 (prior to the law) and remained approximately level from 1982 to 1983. However, license suspensions increased by 50 percent from 1980 to 1982 and by another 40 percent in 1983. In 1983, virtually all offenders arrested for Operating While Intoxi-

cated (OWI) lost their driving privileges through a *combination* of judicial and administrative sanctions (Blomberg et al. 1987).

In *Minnesota*, comprehensive legislation was passed in 1982. DWI arrests increased each year from 1981 through 1984, then declined slightly through 1986. In 1986, arrests were still 60 percent above their 1980 level. Information on convictions was not available, but license revocations increased by 40 percent. However, while the number of administratively imposed license actions increased by 180 percent, the number of court-imposed license revocations decreased by 65 percent (Minnesota Department of Public Safety 1987). As in North Carolina, this suggested that the administratively imposed license actions may have been substituted for judicially imposed license actions. In Minnesota, officials have indicated that most first offenders who receive administrative license revocations are granted restricted driving privileges rather than hard license suspensions.

Missouri legislation was implemented in 1982 and 1983. DWI arrests increased by 14 percent from 1981 to 1983, decreased by 19 percent from 1983 to 1985 and increased again by 17 percent in 1986, when they were 7 percent above the 1981 level (Bruce and Bruce 1988).

Colorado implemented major legislation in 1983. DWI arrests increased by 44 percent from 1980 to 1984, then decreased from 1984 to 1986. Arrests were 21 percent higher in 1986 than in 1980. Convictions for DWI increased by 38 percent from 1981 to 1983 (Colorado Division of Highway Safety 1984, personal communication 1987).

Washington implemented major legislation in 1979. City and county police increased their DWI arrest activity. Washington State Police first decreased their DWI arrests from 1978 to 1980, then increased such arrests from 1980 to 1981. This pattern is very different from that in most States such as New York, Florida, Arizona, and California where State police agencies produced the initial increases in DWI arrests.

After the legislation was implemented in Washington, convictions for DWI increased by 50 percent and convictions on all alcohol-related driving offenses increased by 21 percent. Overall, a conviction rate of just over 80 percent of those adjudicated was maintained. A significant shift away from plea bargaining occurred. The mean daily population of persons incarcerated for DWI offenses increased by approximately 96 percent from mid-1981 to mid-1983, but there was an increasing tendency for courts to recommend "no license suspension" for first DWI offenders. By 1982, nearly half of the first offenders avoided license suspension (Klingberg et al. 1984).

A More Detailed Look at Changes in DWI Processing

The examples described above give an overview of the types of statewide changes in caseload and sanctioning policies that the courts experienced during the 1980s. However, these examples do not provide an adequate view of the effects of legislation on court processing parameters such as prosecution policies, court congestion, delay of dispositions, records available, and enforcement of sanctions. To get a better idea of these effects, the California experience is described in more detail, using information from studies of Los Angeles County (Bloch and Aizenberg 1985), Alameda County (Hepperle and Klein 1985), Santa Clara County (Lang 1986), and the State as a whole (Perrine 1984; Helander 1986; Stewart and Laurence 1987). Many of the problems that were identified by these reports were characteristic of the problems experienced by other States.

Summary of California Legislation

The new laws that became effective in 1982 in California were very similar to laws

passed in other States. They provided for (a) an illegal per se offense at 0.10 alcohol concentration; (b) an attempt to limit judicial discretion; (c) increased fines; (d) potential jail terms for all offenders and mandatory jail terms for repeat offenders; (e) increased use of license restrictions; and (f) restricted plea bargaining (Stewart and Laurence 1987). California did not pass an administrative per se licensing law.

Statewide, DUI arrests increased by 18 percent from 1979 to 1981 (prelaw) and by another 6 percent from 1981 to 1983, but then declined by approximately 2 percent from 1983 to 1985 (Hepperle and Klein 1985; Lang 1986). The conviction rate for persons arrested for driving while under the influence increased from 61 percent in 1981 to 68 percent in 1982, an increase of 11 percent. An additional 4 percent of offenders were convicted of alcohol-related reckless driving (Perrine 1984).

Alameda County

The report by Hepperle and Klein (1985) reviewed the effects of the 1982 law in Alameda County. It indicated that court processing of DUIs became more complex and lengthy because of the 1982 law. This finding is parallel to findings in Los Angeles County and in Florida.

The average time to close a DUI case increased from 48 days (in 1981) to 86 days (in 1983-84), an increase of nearly 80 percent. This occurred because more defendants had attorneys and waited longer in the process (usually until the pretrial hearing) before pleading guilty. Before the law, over half pleaded guilty or no contest at arraignment. By 1983-84, only 38 percent did so. The percentage of "same day dispositions" declined from 32 percent (in 1980-81) to 23 percent (in 1983-84), a decrease of 28 percent. Still, as in most other States, more than 80 percent of the offenders eventually pleaded guilty. It simply took more court time and effort.

Little evidence was found of plea bargaining, although approximately 16 percent of arrests failed to result in the filing of a DUI charge. These cases usually involved a BAC less than 0.13 percent or (as in other States) a test refusal. Only 4 percent of the sampled cases went to trial, and more than 80 percent of these trials resulted in convictions, compared with 73 percent in 1980.

Relative to sentencing, the law resulted in higher fines, longer terms of probation, and frequent use of mandatory DUI school and driver's license restrictions (not full suspensions or revocations). Jail and license suspensions were generally reserved for second or third offenders, and "straight jail" was less often imposed than "weekend work" and work furlough. Seventy percent of those sentenced received fines of \$500 to \$700, not including the cost of school, treatment, or weekend work. Ninety-five percent of all sentences included probation, usually with minimal supervision. The use of 90-day license restrictions increased, but these restrictions seldom resulted in the total loss of driving privileges. In over half the cases, no license action was taken at all.

Approximately half of all defendants received jail sentences, but less than a third of them actually served such sentences. Most did weekend work. This was similar to the Florida experience, where two-thirds of those sentenced to jail never served their sentences. In Alameda County, 55 percent of the defendants were repeat offenders. This is a high proportion, compared with the average of 20-30 percent reported in most States. An estimated 25 percent of those convicted of DUI were rearrested within 2 years. The report recommended wider use of licensing suspensions (including administrative actions), vehicle confiscation, and individual treatment.

Los Angeles County

In southern California, Bloch and Aizenberg (1985) evaluated the effects of the 1982 law on the Los Angeles County courts, which processed more than a third of all the DUIs

in the State. They found that the number of guilty pleas had been rising prior to the law, but not as rapidly as the number of filings. Thus, a slow but steady decrease occurred in the proportion of cases resolved by a guilty plea.

After the 1982 law, the number of guilty pleas dropped significantly, while the number of filings continued to increase, thus lowering the conviction rate even more. Then, in 1983, while the number of guilty pleas remained constant, the number of filings dropped. As a result of these variations, the conviction rate first decreased from 77 percent in 1981 to 68 percent in 1982, then increased to 73 percent in 1983. Overall, the conviction rate decreased by 6 percent from 1981 to 1983.

Acquittals and dismissed cases increased by 68 percent and 78 percent, respectively. However, they constituted less than 4 percent of the dispositions of all filings. Similarly, while jury and bench trials increased by 55 percent and 7 percent, respectively, they constituted less than 2 percent of all filings. This was comparable to the 4 percent of filings resulting in trials in Alameda County and 3 percent in Florida.

Efforts to delay or avoid the effects of sanctions became much more common after the 1982 law. Continuances, transfers, and failures to appear increased by 78 percent, 200 percent, and 23 percent, respectively. As a result, court backlogs increased. The rate of dispositions to arrests went from 79 percent in 1981 to 72 percent in 1982 and back up to 77 percent in 1983. In spite of the increase in overall congestion, the report indicated that the courts were able to function *without* large-scale disruption or distortion.

A review of FARS data showed significant reductions in both alcohol-related and nighttime proportions of fatal crashes from 1982 through 1986 (Nichols 1988b). Similarly, a review of studies by Bloch and Aizenberg indicated reductions in alcohol-related crashes following the implementation of the law (Bloch 1983, 1984; Bloch and Aizenberg 1984; Peck 1983, 1984), although Hilton (1983) cast some doubt that such reductions were caused by the law. Bloch and Aizenberg speculated that the California law might have been more successful had it paid more attention to increasing the *certainty* of punishment. They also pointed out that no long-term, statewide effort was undertaken to assist the courts in dealing with their congestion problems.

Statewide California Studies

In 1987, Stewart and Laurence completed a statewide study of the California experience. These researchers provided several additional insights. First, they pointed out that a survey of prosecutors in 12 counties indicated that nearly all felt that the new illegal per se law helped reduce plea bargaining and aided in the prosecution of DUI cases. Still, 90 percent of the convictions were under the older, "presumptive" DUI statute, and only 5 percent were under the per se statute. An additional 5 percent of convictions were under both statutes. In addition to the per se law, the practice of plea bargaining was further restricted by the new law. DUI charges could no longer be reduced to simple reckless driving, but could be reduced to alcohol-related reckless driving. The latter charge would be counted as a prior DUI if the offender was rearrested within 5 years. Prior to the law, the conviction rate was higher for repeat than for first offenders. After the law, the conviction rates for the two groups were approximately equal.

Despite the public outrage over DUI crashes that resulted in death or injury, felony DUI cases apparently were not vigorously prosecuted. The Department of Motor Vehicles (DMV) reported a conviction rate of only 27 percent on felony DUI charges, compared with a conviction rate of 69 percent for misdemeanor DUI charges (Perrine 1984). This was opposite to the findings in Indiana. Still another study (Helander 1986) found that less than 20 percent of DUI offenders involved in a fatal or injury crash were arrested for felony DUI and fewer than 20 percent of those arrested were convicted. In fact, 35 percent of those arrested for felony DUI showed no record of conviction on any

charge. Helander indicated that while the law had resulted in an increased conviction rate for first offenders, it led to a decreased conviction rate for repeat offenders.

The problem with felony DUI cases apparently involved several aspects of processing, including the transferring and recording of information. In a study of more than 5,000 convicted first offenders who were enrolled in education or treatment programs, 400 reported that their arrests had involved an injury crash, and 99 reported that their arrests had involved a fatal crash. A review of DMV records for 245 of the offenders involved in injury crashes and 60 involved in fatal crashes found that 14-18 percent had no alcohol-related convictions of any kind on their record. Of the 60 records of drivers who reported having been involved in a fatal crash, not one showed a fatal crash associated with DUI or reckless driving.

In most counties, the courts had no information about the number of offenders at various processing stages in the system. Most counties had no fully computerized recordkeeping systems. Thus, the court's records were often incomplete, difficult to decipher, or irretrievable. In addition, problems were found with the accuracy and completeness of DMV records. Sixty-two percent of first offenders, reported as dropouts by treatment programs, were recorded by DMV as having completed the program. Twenty-three percent did not show a DUI conviction on their records.

Eighty-one percent of repeat offender dropouts were not recorded as such by DMV (Helander 1986). The failure of agencies, primarily the courts, to transfer information to the DMV prevented the imposition of mandatory license actions that should have followed dropout from treatment. Stewart and Laurence pointed to the importance of the recommendation of the Presidential Commission on Drunk Driving regarding the need for a comprehensive, statewide tracking and reporting system.

The 1982 law also resulted in more DUI offenders ordered to jail, to treatment, and to pay higher fines. More license actions were imposed, but they were usually license restrictions, not actual suspensions or revocations. More offenders received probation and for longer periods, but few received any official supervision. First offenders who received probation generally avoided mandatory license actions. In 1984, the typical first or second offender sanction combination was a fine, probation, a restricted license, and referral to a treatment program. Another frequent pattern for first offenders was a fine, probation, treatment, and a 2-day jail sentence in lieu of a license restriction. Second offenders often received a higher fine, probation, and a longer jail sentence than first offenders (Helander 1986). There was a clear hesitancy to impose any form of hard license suspension or revocation. This is ironic, since more evidence for the effectiveness of license sanctions comes from the California DMV than from any other single source (e.g., Hagen 1977; Peck et al. 1985; Tashima and Peck 1986).

Some of the most important findings covered the enforcement of sanctions. The most common violation of probation for first offenders was failure to pay the fine (15 percent of first offenders studied). Because of jail overcrowding, fewer than half the offenders sentenced to jail actually spent time incarcerated. Often months passed before space was available for an offender to serve even a 2-day sentence. Weekend sentences made the problem even more severe. Sometimes offenders would register and be sent home because the jail was full. Some jurisdictions allowed offenders to participate in supervised work programs.

Enforcement of license actions was particularly weak. The 1982 legislation increased the mandatory penalties for convicted DUI offenders who drove while suspended or revoked. However, the conviction rate for such offenders fell substantially after the new law took effect, from 46 percent in 1981 to 26 percent in 1982. Stewart and Laurence speculated that prosecutors and the courts were resisting the enforcement of licensing sanctions.

In summary of their statewide review, Stewart and Laurence suggested that while the

certainty of some punishment for first offenders occurred as a result of the 1982 law, the certainty of punishment for repeat offenders actually decreased following implementation of the new law. As in Florida, the swiftness of punishment decreased following the new law in California. Furthermore, and perhaps most importantly, license actions were applied unevenly and enforced weakly. In spite of the convincing evidence for the effectiveness of license actions in reducing recidivism and in creating general deterrence, actual suspensions or revocations were most often traded off for treatment, restricted licenses or, in some cases, 2-day jail sentences. In addition, very little emphasis was placed on enforcing license actions when they were applied. These problems have been reported in a number of other States (e.g., Massachusetts, North Carolina, and Washington).

Summary of Changes and Impacts

What can we conclude from the information reported by these States? Did the tougher laws of the early 1980s make prosecution and adjudication more efficient or more difficult? Information from several States suggested that illegal per se, improved implied consent, and perhaps administrative per se laws facilitated prosecution and adjudication.

On the other hand, more severe and mandatory sentences and anti-plea bargaining laws often increased the difficulty of processing cases. This increased difficulty led to more frequent use of defense lawyers, longer periods from arrest to case disposition and, in some cases, an increased number of trials requested (although trials accounted for a very small percentage of all dispositions in most jurisdictions). Furthermore, mandatory sentences were generally viewed unfavorably by judges who frequently found ways to circumvent them, particularly with regard to license actions and jail sentences.

Has legislation resulted in greater or lesser certainty of conviction and punishment? In most cases, the certainty of conviction increased, at least temporarily. Most States reported increased numbers of persons convicted (largely due to increased arrests) and increased proportions of those arrested who were convicted. Administrative per se laws have increased the certainty of at least one punishment. In addition, restrictions on plea-bargaining made it more likely that offenders would be convicted on an alcohol-related charge. A 1986 NHTSA study indicated that anti-plea bargaining laws were effective, but that judicial cooperation was essential.

Some sites experienced sharp increases in conviction rates and, in other sites, already high conviction rates were maintained. In Fort Smith, Arkansas, a study by Surla, Voas, Koons, and Reiner (1987) found that the elimination of plea bargaining resulted in a conviction rate increase from 72 percent (prelaw) to 88 percent (postlaw).

It also appears that more offenders received at least some sanctions, including fines, license actions, jail, and community service. While this was true of license actions as well as the other sanctions, many courts (and administrative agencies) appeared to have made an effort to avoid the use of hard license suspensions.

Was the severity of sanctions increased? While severity varied somewhat, most States reported increased levels of fines, use of jail sentences (even for first offenders), and use of community service. Again, with license actions, the answer was less clear. While more offenders received some form of license action, this was frequently accomplished by administrative license actions that were less severe (e.g., 90 days) than the maximum criminal sanctions (e.g., 1 year) that could have been imposed by the courts. In several States, courts did not impose license sanctions if they were already being imposed administratively. Even in States without administrative per se laws, efforts were made to avoid using hard license suspensions.

Have the existing procedures and laws deterred the drinking driver? Fewer drinking drivers are on the road today than in the 1970s (IIHS 1987; Palmer and Tix, 1986; Tix and Palmer, 1987). Also, fewer drivers are at the higher alcohol concentrations. Most importantly, nearly every index of alcohol-related crashes has shown 10- to 15-percent reductions in the problem since 1982. Greater reductions have occurred among young drinking drivers. Many factors have combined to cause these reductions. Among them are increased enforcement, publicity, and public interest. However, the evidence regarding the effectiveness of sanctions, combined with the increased application of sanctions in the 1980s, suggests that the increased prosecution, adjudication, and sanctioning activities have contributed to these reductions.

What are the most effective sanctions? For the deterrence of first offenders and would-be offenders (i.e., general deterrent effect), the swift and sure application of license suspensions has been more effective than any other measure (Nichols and Ross, this volume). Evidence also shows that significantly higher fines have had both specific and general deterrent effects for first-time offenders (Homel 1981; Tashima and Peck 1986; Votey and Shapiro 1985). In addition, mandatory minimum fines can be used, as they are in New York State, to provide a funding mechanism for supplying the police, prosecutors, and the courts with the resources they need to sustain a deterrent effort. Also, 2-day jail sentences for first offenders can evidently have both specific and general deterrent effects (Falkowski 1984; Cleary and Rogers 1986; Zador et al. 1988; Jones et al. 1988). However, the use of a jail sanction is considerably more costly than other sanctions and causes more disruption of the courts.

Finally, for more severe repeat offenders, particularly chronic offenders, neither existing sanctions nor rehabilitation programs alone have had any significant effect. Confinement in special facilities, with provisions for assessment and referral, can have some impact (Siegal 1985). Clearly, more emphasis must be placed on keeping such offenders off the highways until some medical evidence is provided that their drinking problems have been addressed.

Has progress been made in deterring repeat offenders or suspended drivers from continuing to drive? For repeat offenders and those who continue to drive after license suspensions, there is growing interest in more severe license sanctions, license plate confiscation, vehicle impoundment or confiscation, and surveillance by special patrols. However, such actions have been inadequately applied and evaluated. This area deserves much more attention than it has received.

How can we solve the existing DWI adjudication problems of the judiciary? If we take advantage of what we have learned from our past experiences and find more effective ways to communicate these findings to prosecutors, judges, legislators, and other officials, we should be able to increase the *effectiveness* of prosecution and judicial actions.

The remaining problem will then be *efficiency*. Effective prosecution and sanctioning efforts will likely continue to have adverse effects on the efficiency of the courts because of resistance by defendants and defense lawyers. One recourse is to provide the courts with adequate resources so they can continue to function, taking whatever time is proper and necessary to carry out their duties. The courts can provide more certainty to the conviction and sanctioning process given adequate time and resources to do so.

Remaining Issues and Problems in Processing Apprehended DWIs

In the wake of the legislative changes of the 1980s and the increased arrests that accompanied these changes in many States, court overload and backlogs have presented

continued obstacles to effective and efficient prosecution and adjudication of DWI offenders. While legislation (e.g., illegal per se laws) has been passed to facilitate prosecution, more severe penalties have frequently resulted in fewer guilty pleas (at least early in the process) and more involvement by defense lawyers. The result has often been longer periods from arrest to disposition.

In addition to case overload, inadequate training of persons who are assigned DWI cases remains a major problem. Prosecutors, judges, probation officers, and other professionals in the adjudication system frequently have limited understanding of the drunk driving problem and its complexities. Chief prosecutors consider most law school graduates inadequately prepared in procedural and trial advocacy skills. Usually no formal entry training, other than a brief orientation, is provided for newly appointed assistants. In addition, most lower court judges receive little or no training prior to their election or appointment to the bench. A few States require continuing education programs for sitting traffic court judges during their tenure on the bench (Quinlan 1987).

The problems of court overload and inadequate training, combined with the inherent independence of the judiciary, frequently result in the imposition of either inadequate or inappropriate sanctions. Little knowledge or consensus exists about sanctioning policies that would be proper and effective. Knowledge about the effectiveness of various sanctions has less often been taken into account than have operational impacts. The result has been a failure to more effectively change the behavior of those offenders who are apprehended and to more effectively deter offenders who are not caught.

In summary, the problems that remain in the processing of DWI offenders include the following.

- Overload and backlogs
- Inadequate training for prosecutors and judges
- Inadequate resources to avoid disruption of the system and distortion of sanctions imposed
- Plea bargaining (especially to a non-alcohol-related offense)
- Excessive delays between arrest and disposition
- Offenders not prosecuted or convicted on DWI charge
- Lack of consensus regarding effective sanctioning policies
- Excessive and inappropriate exceptions to sanctions
- Diversion into education or treatment in lieu of, rather than in addition to, other sanctions
- Failure to deal with offenders who violate terms of sentences
- Failure to more effectively reduce recidivism
- Failure to more effectively deter offenders who are not caught
- Failure to effectively track offenders from arrest to completion of sanctions

Many of the reports reviewed for this chapter, as well as a review of the literature on the effectiveness of sanctions (Nichols and Ross, this volume), emphasized the importance of swift and sure license suspensions in reducing alcohol-related crashes. In addition, several studies pointed to the need for followup to ensure that suspensions were not violated. The use of surveillance patrols, more severe suspensions, license plate confiscation, vehicle impoundment or confiscation, and confinement have frequently been proposed for dealing with suspended offenders who continue to drive.

A consensus appears to be growing that every reasonable effort should be made to impose meaningful, hard license sanctions and to ensure that such penalties are fulfilled. A review of Missouri's experience with DWI legislation in the 1980s (Bruce and Bruce

1988) pointed out that "nothing seems to be as important to the American driver as that plastic card evidencing the right to drive upon the public highways. Defense attorneys will readily admit that their primary responsibility, and the reason they are retained by their clients, is to make sure their client keeps his or her license." Polls conducted in Minnesota (Rodgers and Cleary 1983) and other States indicated that the loss of license was the most feared penalty among drivers who had not been arrested for DWI. A problem of driving while suspended does exist. However, additional emphasis should be placed on resolving that problem, rather than abandoning or circumventing the most effective sanction known.

A report on Ohio's DWI experience by Katz and Sweeney (1984) suggested that convicted drunk drivers who continue to drive after their licenses have been suspended constitute a significant threat to the safety of others and must be dealt with more severely than in the past. These authors further suggested that "the mandatory surrender of license plates during suspension periods should be required if the offender is the holder of plates and consideration should be given to requiring the surrender of license plates if a vehicle owner permits an unlicensed driver to operate his vehicle."

Many judges have claimed that the use of hardship or occupational licenses is necessary to avoid loss of employment by the offender. However, studies conducted in Delaware (Johnson 1986) and in Mississippi (Wells-Parker and Cosby 1987) indicated that very few offenders lost employment because of lost driving privileges.

NHTSA Recommendations

In 1987, NHTSA implemented a series of State workshops to review the status of the DWI problem and to explore ways to reduce it. A manual was developed to provide background in the various areas of DWI prevention and control. In the adjudication section, recommendations were made regarding the prosecution, adjudication, and sanctioning of DWI offenders (Quinlan 1987). Following is a summary of those recommendations, many of which dealt with the problem of establishing adequate training and communication programs.

Prosecution

1. Establish through the District Attorney's training office or the Attorney General's office, a DWI prosecution assistance center.
2. Develop a State DWI trial manual, or adapt the NHTSA manual.
3. Develop a DWI prosecutor seminar and self-instruction program.
4. Conduct specialized training for junior prosecutors.
5. Develop case-tracking and prosecutor performance systems.
6. Pilot test the elimination of plea bargaining in DWI cases.
7. Develop a DWI section to a prosecutors newsletter.

Adjudication

1. Through the State judicial education officer, develop a DWI adjudication support program for judges.
2. Develop a State DWI bench book (or use the NHTSA bench book).
3. Develop a DWI seminar and self-instructional training program.

4. Encourage judges to participate in specialized training of DWI adjudication.
5. Develop/implement a DWI case-tracking system at the lowest court level for use in that court and community. Integrate with a statewide tracking system.
6. Use a standardized psychometric test as the basis for drinker classification and referral to treatment. Ensure that personnel using the test are adequately trained.

Sanctions

1. Enact and implement administrative per se legislation.
2. Conduct a review of sanctions which can be applied to DWI offenders.
3. Develop a State sanctioning policy and grid (or matrix) to aid the courts in developing packages of sanctions appropriate to DWI offenders.
4. Implement jail/treatment combinations for multiple offenders in conjunction with long-term outpatient aftercare and support.
5. Implement community service programs as an alternative to jail, when jail crowding is a problem or for certain populations (e.g., youthful offenders).
6. Provide long-term probation as a means of ensuring compliance with sanctions and participation in treatment programs or for certain populations (e.g., youthful offenders).
7. Eliminate diversion programs.

Status of Recommendations by the Presidential Commission on Drunk Driving

In November 1983, the Presidential Commission on Drunk Driving issued its final report. This report contained a number of recommendations that have direct relevance to the prosecution, adjudication, and sanctioning of DWI/DUI offenders. Since the Commission spent considerable time and effort developing its recommendations, it is appropriate to review them and the status of State programs that relate to them, before making additional recommendations.

The Commission made recommendations regarding driving while under the influence in 10 major areas: public awareness, public education, private sector, alcoholic beverage regulation, systems support, enforcement, prosecution, adjudication, licensing administration, and education and treatment (Presidential Commission 1983). Following are the recommendations most relevant to the purposes of this review. Included with the recommendations is available information on the status of legislation and/or programs related to these recommendations. This information was not part of the Commission's recommendations. Much of it comes from NHTSA's Legislative Digest (Hatos 1988) and was current as of January 1988.

Systems Support

Program Financing

Legislation should be enacted at State and local levels that creates a dedicated funding source including offender fines and fees for increased efforts in the

enforcement, adjudication, sanctioning, education, and treatment of DUI offenders.

The National Commission Against Drunk Driving (NCADD) indicated that in 1988 approximately 40 States had user funding for at least some of the components of their DUI control system. New York provides the best example of such a system.

The availability of adequate resources for the courts to process DWI cases is essential for an effective deterrent effort. More cases and more severe penalties, combined with less plea bargaining and fewer exceptions to sanctions, will result in significantly greater demands on the court. However, the courts can withstand these pressures if adequate resources are provided.

Citizen and Public Support

Grassroots citizen advocacy groups should be encouraged to continue fostering awareness of the DUI problem, and to cooperate with government officials, prosecutors and judges to deal more effectively with the alcohol-related crash problem.

In 1988, these groups were active in nearly every State, but a Catholic University Study (McCarthy et al. 1987) suggested that the number of new chapters has been declining since 1983. These groups provided the impetus for the progress made in the 1980s. Without active citizen concern for this issue, it is unlikely that further progress can be made.

State and local governments should create task forces of governmental and nongovernmental leaders to increase public awareness of the problem and should apply more effectively DUI laws.

By 1984, more than 40 States had such task forces. Very few were known to be in existence in 1988. This is unfortunate, since they provided the blueprints for State action in the beginning of the decade.

Criminal Justice System Support

Police, prosecutors and courts should publicly assign a high priority to enforcing DUI statutes.

Most States increased their priority on DUI enforcement, prosecution, and adjudication in the 1980s. Since 1985, emphasis appears to have waned.

Police, prosecutors, judges, and other related justice system personnel should participate in entry level and annual inservice training programs established to improve the detection, prosecution, and adjudication of DUI offenders.

An estimated 36 States had ongoing programs for prosecutors and judges in 1988. Still, the majority of prosecutors and judges have apparently never received training or attended seminars regarding the DWI issue.

Prosecutors should provide local enforcement agencies and courts with periodic legal updates on developments and/or changes in the DUI laws.

No additional information available

The Chief Justice or highest appellate judge in each State should convene an annual meeting of all components of the legal system to review the progress and problems relating to DUI offenses.

No additional information available.

Tracking and Reporting Systems

Police prosecutors and courts should collect and report DUI apprehension, charging, and sentencing information to the State licensing authority. Convictions on military and Federal lands, including Indian tribal lands, should also be reported. The State licensing authority must maintain a traffic records system capable of tracking offenders from arrest to conviction, including sanctions imposed by judicial and licensing authorities.

From the reports reviewed, it appears that most courts do not have automated systems. Only a handful of States have attempted to develop a statewide *data* system and no known statewide *tracking* systems exist. Some community-level tracking systems exist but are not integrated into State systems. This is an important deficiency that should receive additional emphasis.

Enforcement

Chemical Testing

Each State should establish an "implied consent" statute which provides that all drivers licensed in the State are deemed to have given their consent to tests of blood, breath, or urine to determine their alcohol or drug concentration.

As of January 1988, all 50 States had implied consent laws in some form. In 31 States and the District of Columbia, such laws applied to other drugs as well. If properly formulated, these laws provide an important incentive for drivers to provide alcohol concentration information. Such information, in turn, plays a major role in the ability to successfully prosecute and convict drinking drivers.

One of the most important provisions of an implied consent law is that the *penalties for refusing must be greater than those for either a DWI or an illegal per se conviction*. In 1988, it was estimated that approximately half the States had implied consent penalties that were more severe than penalties for a conviction of DUI or illegal per se.

Other important provisions of an implied consent law are:

(a) that a test refusal can be introduced at a DUI trial as evidence of consciousness of guilt; (b) that offenders who are unconscious or otherwise incapable of refusal are deemed to have given their consent to a test, the results of which are admissible in any trial or proceeding; (c) that an individual's right to consult his attorney may not be permitted to unreasonably delay administration of the test; (d) that results of preliminary breath test devices be admissible in the DUI trial proceedings, and (e) that refusals in sister States shall result in license suspensions in the State of driver residence.

Prosecution

Plea Bargaining

Prosecutors and courts should not reduce DUI charges.

As of January 1988, 13 States either prohibited or limited plea bargaining. While many prosecutors feel that plea bargaining is essential, it undermines attempts to create general deterrence. Proven sanctions such as license suspensions often cannot be imposed if the offense is plea bargained.

Definition of BAC

States should enact a definition of breath alcohol concentration and make it

illegal to drive or be in control of a motor vehicle with a breath alcohol concentration above that level.

As of January 1988, 14 States plus the District of Columbia defined illegal alcohol concentrations in terms of breath alcohol (BRAC) as well as blood alcohol (BAC) concentrations.

Illegal Per Se at 0.10 Alcohol Concentration

Legislation should be enacted making it illegal per se for a person with an alcohol concentration of 0.10 or higher within 3 hours of arrest to drive or be in actual physical control of a motor vehicle.

As of January 1988, 44 States plus Puerto Rico had illegal per se laws.

Appellate Action

Prosecutors should initiate appropriate appellate actions to ensure judicial compliance with statutory mandates governing DUI cases. . . . courts frequently ignore mandatory sentencing requirements in DUI cases. Unless the prosecutor is willing to seek an appellate remedy, the practice will continue unchecked.

Adjudication

Mandatory Sentencing

The sentences recommended upon conviction of driving under the influence should be mandatory and not subject to suspension or probation. Specifically, the recommendations are that:

All States establish substantial mandatory minimum fines for DUI offenders, with correspondingly higher mandatory fines for repeat offenders.

As of January 1988, 16 States had mandatory minimum fines for first offenders.

Any person convicted of a first violation of driving under the influence should receive a mandatory license suspension for a period of not less than 90 days, plus assignment of 100 hours of community service or a minimum jail sentence of 48 consecutive hours.

As of January 1988, 24 States had mandatory minimum license suspension for first-time offenders; 7 States mandated jail or community service for first offenders, and an additional 7 States mandated jail without any provisions for community service.

Any person convicted of a second violation of driving under the influence within 5 years should receive a mandatory minimum jail sentence of 10 days and license revocation for not less than 1 year.

As of January 1988, 14 States mandated some period of jail or community service, and an additional 28 States mandated jail without any provision for community service for second-time offenders; 43 States and the District of Columbia mandated license suspensions or revocations for second offenders.

Any person convicted of a third or subsequent DUI violation within 5 years should receive a mandatory minimum jail sentence of 120 days and license revocation for not less than 3 years.

As of January 1988, 39 States mandated jail for a third offense. Nearly all States mandated license suspension for a third offense.

Sentencing of Suspended Drivers Who Continue to Drive

States should enact a statute requiring a mandatory sentence of at least 30 days for any person convicted of driving with a suspended or revoked license or in violation of a restriction due to a DUI conviction.

Few States have effectively implemented such sanctions, although some appear interested. Some States have also been considering attacking the problem of driving while suspended by confiscating the license plates or the vehicles of such offenders. The license plate confiscation approach is intended to make driving while suspended a more visible offense. It has the added advantage of little or no cost.

Felony DUI

Causing death or serious injury to others while driving under the influence should be classified as a felony.

In 1988, 44 States and the District of Columbia had death-related offenses, often called vehicular homicide. In 38 States and the District of Columbia, this constituted a felony charge, and in 6 States it was a misdemeanor.

Court Administration

Speedy trial: DUI cases at the trial level should be concluded within 60 days of arrest. Sentencing should be accomplished within 30 days. The appellate process should be expedited and concluded within 90 days.

From information reviewed, it appears that few courts have achieved this.

Preconviction Diversion

Preconviction diversion to alcohol education or alcohol treatment programs should be eliminated. A finding on the charge should be rendered and participation in education or treatment programs should then become a condition of sentencing.

Although most States have eliminated statewide diversion programs, a few States and courts in several States still regularly divert offenders from sanctions into education or treatment. Often in such systems, no conviction and no record of an alcohol-related offense exists.

Presentence Investigation

Before sentencing, a court should obtain and consider a presentence investigation report detailing the defendant's driving and criminal record, and, where possible, an alcohol problem assessment report. In all cases, an alcohol problem assessment report should be completed by qualified personnel prior to the determination of an education or treatment plan.

NCADD estimated that 23 States complied as of 1988.

Victim Programs

Any person convicted of driving under the influence who causes personal injury or property damage should pay restitution.

As of 1988, NCADD estimated that 42 States complied.

The U.S. Congress should enact legislation that eliminates the possibility that a drunk driver, judged civilly liable, will be able to escape the penalties of civil action by filing for bankruptcy.

No additional information available.

State and local governments or courts by rule should require victim impact statements (including oral or written statements by victims or survivors) prior to sentencing in all cases where death or serious injury results from a DUI offense.

Licensing Administration

Administrative Per Se License Suspension

States should enact legislation to require prompt suspension of the license of drivers charged with DUI upon a finding that the driver had a BAC of 0.10 in a legally requested and properly administered test. The prompt suspension should also extend to those who refuse the test (i.e., implied consent), as well as those who are driving in violation of a restricted license.

As of the end of 1988, 24 States plus the District of Columbia had administrative per se laws, with many variations in the provisions of these laws.

Restricted Licenses

Each State driver's licensing authority should review its practice of issuing occupational hardship driver's licenses following suspension or revocation and establish strict uniform standards relative to issuance and control of such limited driving privileges. These licenses should be issued only in exceptional cases. In no event should this be done for repeat offenders.

In fact, most States with mandatory license revocation, whether by the court or by the administrative process, make extensive use of restricted, occupational, and probationary licenses. Only about 21 States (i.e., those qualified for 408 incentive grant funds) have mandatory, minimum hard license periods during which restricted licenses are not to be issued.

Provisional License for Young Drivers

States should adopt laws providing a provisional license for young beginner drivers which would be withdrawn for a DUI conviction or an implied consent refusal.

Education and Treatment

Assignment Process

Rehabilitation and education programs for individuals convicted of DUI should be provided as a supplement to other sanctions and not as a replacement for those sanctions.

Although most States appear to have moved away from diversion programs, some still make extensive use of them and allow sentencing to treatment programs in lieu of a conviction or a license or jail sanction.

Presentence investigations, including alcohol assessments conducted by qualified personnel, should be available to all courts in order to appropriately classify the defendant's problem with alcohol. Repeat offenders should be required to undergo medical screening for alcoholism by a physician trained in alcoholism, an alcoholism counselor, or by an approved treatment facility.

NCADD estimates that only 23 States require a presentence or a postsentence investigation. Fewer specify the type of personnel required to administer such tests.

Alcohol education programs should be used only for those first offenders who have had no previous exposure to such programs. Problem drinkers and repeat offenders should be referred to more intensive rehabilitation programs.

No additional information available.

Alcohol treatment and rehabilitation programs should be available for individuals judged to need such services. The programs should be tailored to the individual's needs and the individual should be assigned to such programs for a length of time determined by treatment personnel and enforced by court probation.

Most States use existing treatment facilities. It is not known how many programs include treatment tailored to the specific needs of the offenders.

Compliance

When assignments are not complied with, the courts or the administrative licensing agency must take steps to impose further restrictions on driving privileges or to assess further penalties as spelled out in the original sentence.

Evidence from the States suggests that this remains an important problem to be resolved.

A records reporting system should be available to assure that individual offenders assigned to education or treatment services do in fact comply with the assignments and to make information on compliance available to motor vehicle administration officials at the time of appearance for relicensing.

Tracking of individual offenders from arrest through completion of sanctions remains a goal to be achieved. Software has been developed to aid community-level tracking systems.

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Law Enforcement

Issues in the Enforcement of Impaired Driving Laws in the United States

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In our best year, 1983, 1.9 million drivers were arrested for driving while impaired (DWI) in the United States. This number represented approximately 1 percent of the Nation's total licensed drivers. This was a significant increase over the 1970s, when only about one-half of 1 percent of licensed drivers were arrested for DWI each year. Still, it is not enough. Speaking a decade ago, Borkenstein (1975) noted that

Roadside surveys of the occurrence of alcohol in the driving public have shown that when enforcement is at the current level of 2 arrests per officer per year, and with automobile density what it is in the average congested city today, there are about 2,000 violations for each arrest. A "violation" is a trip from one point to another with a blood alcohol concentration of .10 percent or higher; thus, in a typical community of 1 million population, with 1,000 patrol officers making two arrests per man per year, there will be 2,000 arrests and 4 million violations.

Since Borkenstein made that statement, the percentage of licensed drivers arrested for DWI has doubled and, therefore, the ratio of violations to arrests may now be down to 1,000 to one. Indeed, two studies suggested that where intensive enforcement is applied, the violation-to-arrest ratio can be reduced to approximately 300 to one (Beitel et al. 1975; Hause et al. 1982). These higher arrest rates, which are not typical of the enforcement level of the country as a whole, have been shown to produce small reductions in alcohol-related accidents (Voas and Hause 1987).

DWI arrests nationally rose significantly from 1979 to 1983; the proportion of highway fatalities that were alcohol-related dropped 10 to 15 percent from 1982 to 1986. The extent to which this increase in arrests contributed to the subsequent decrease in alcohol-related fatalities is difficult to determine. The increase probably contributed as one element in a larger complex of factors that included citizen activist programs, new alcohol legislation, and increased public interest in health and safety (Howland 1988). Regardless, a doubling of the total number of arrests has had, at best, a modest effect on the alcohol-related casualty rate.

Luckily, deterrence of drunk driving is not determined by the absolute number of arrests but by the public's perception of the probability of being arrested (Ross 1984). While it may be generally true that the more arrests made, the more the public will be deterred, there is no precise relationship between the number of arrests and the extent of deterrence. In some cases, highly publicized programs result in a higher perceived

level of enforcement than is produced by simply raising the number of arrests without publicity.

An example of this phenomenon was reported by Williams and Lund (1984). These researchers conducted a telephone survey of drivers in Fairfax County, Virginia and Montgomery County, Maryland. Fairfax County consistently had the highest arrest rate per licensed driver, but Montgomery County police regularly used roadside sobriety checkpoints. Citizens of both Fairfax and Montgomery counties stated that they were more likely to be arrested in Montgomery County, apparently because of the higher visible use of checkpoints.

The extent to which an enforcement program succeeds in convincing potential drinking drivers that their probability of apprehension is high is important. Highly visible enforcement offers the possibility that programs can be implemented that, while not greatly increasing the total number of DWI arrests, will reduce alcohol-related crashes.

Development of the Traditional Behavioral Enforcement System in the United States

The drunk driving problem was first recognized in scientific literature in 1904, approximately 5 years after the first highway safety fatality in the United States. The United States and Norway were among the first industrialized nations to make impaired driving a criminal offense. In 1910, New York adopted an impaired driving law, and in 1911, the State of California followed suit. This early criminalization of drunk driving set it apart from other traffic infractions. For example, higher penalties were provided for the offense, including incarceration and substantial periods of license suspension. By 1924, the State of Connecticut was jailing 254 drivers per year for DWI. Thus, from the early years of this century, the United States has treated this offense as seriously as any nation in the world. The system of enforcement that emerged can be described by the four-step process outlined in figure 1.

The first step in this process is to identify vehicles in the traffic flow that are being driven by impaired operators. This is done based on either the vehicle being involved in a crash or the officer on patrol observing unusual, aberrant, or illegal behavior. Once stopped, the second step is performed. The driver is interviewed to determine whether he or she has been drinking and shows signs of intoxication. Common symptoms used for this purpose are bloodshot eyes, flushed appearance, slurred speech, odor of alcohol, and so forth. If this initial interview indicates that the individual may be impaired, the officer normally takes a third step, which is to invite the driver out of the vehicle to perform a set of sobriety tests (e.g., walking a straight line, touching the nose with eyes closed) which, along with the aberrant driving, become the basis of the officer's testimony to support the charge of "driving while impaired".

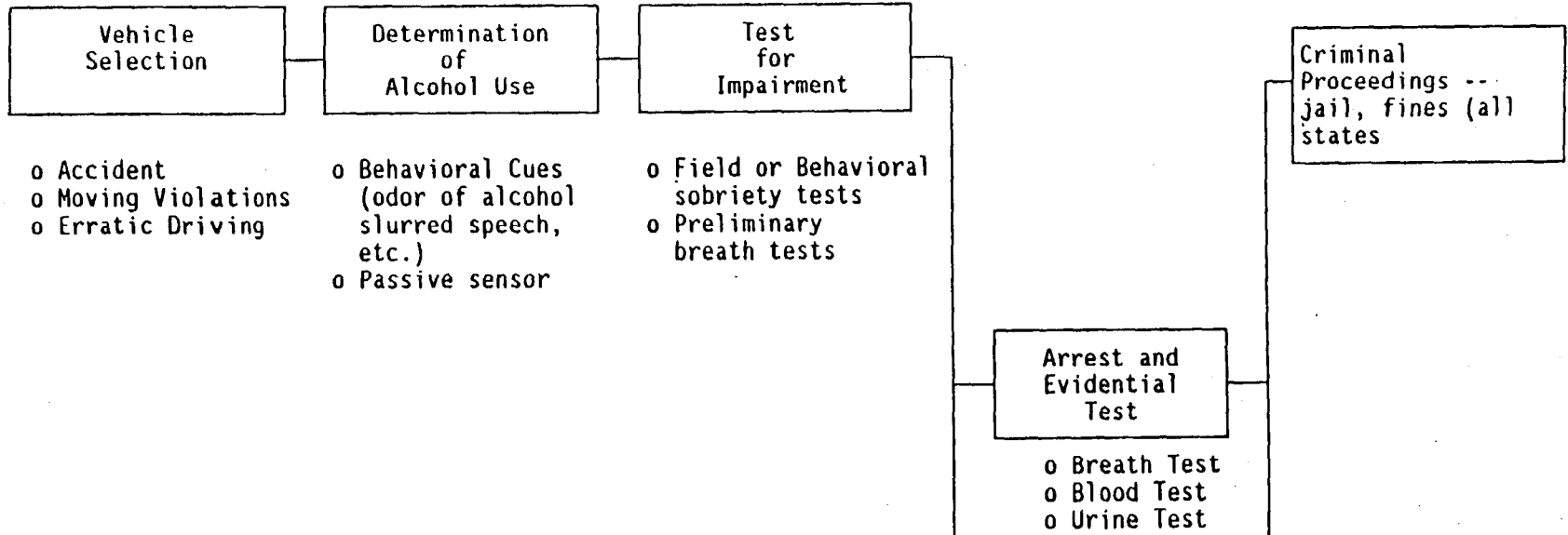
The term "drunk driving" presented considerable problems in adjudicating the DWI offense because of its lack of objective definition. The popular conception of a drunk individual involved highly aberrant behavior (e.g., staggering gait, incoherence). However, it soon became evident that individuals could be at increased risk of crash involvement without displaying such symptoms. Efforts were made to strengthen initial legislation by substituting such terms as "under the influence of alcohol" and, more recently, "impaired by alcohol." However, with no objective measure of driving skill available for testing individuals charged with drunk driving, much was left to the interpretation of the jury, which was prone to find that the behaviors described were similar to their own party behaviors and were not commonly accepted as being risky.

Just before the Second World War, a new factor was added to the enforcement

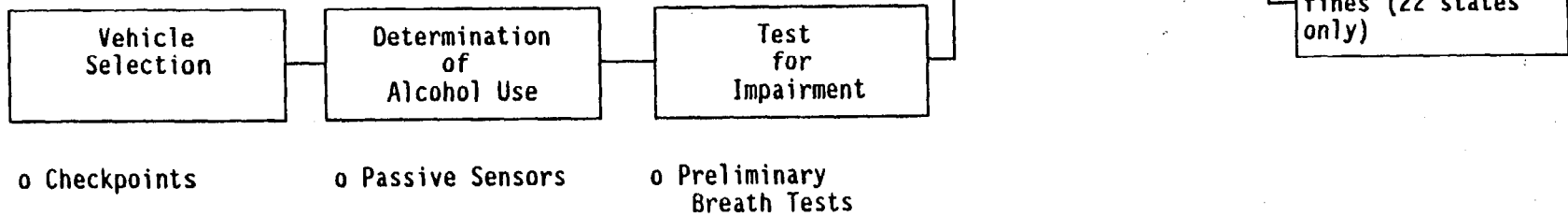
FIGURE 1

STAGES IN THE DWI ENFORCEMENT PROCESS

A. TRADITIONAL U.S. "BEHAVIORAL BASED" ENFORCEMENT



B. SCANDINAVIAN "CHEMISTRY BASED" ENFORCEMENT



process—the use of chemical tests for alcohol to determine impairment. Initially, these test results were added to the total evidence presented to support the testimony of the police officer. Once the courts began to accept this new scientific evidence, State legislatures moved to enact laws that specifically provided for chemical testing. In 1939, Indiana became the first State to provide for a chemical test; Maine, New York, and Oregon soon followed.

This legislation was significant in that it established the principal that chemical test data provided competent evidence of impairment. In addition, these laws established specific alcohol concentrations (AC) as presumptive evidence of intoxication. Establishing such a presumption required the defense to provide other competent evidence to rebut the chemical test data or lose its case. The initially prescribed levels followed the recommendations of the American Medical Association (AMA), which proposed that an individual with an AC of 0.15 or greater was presumed to be under the influence, while an AC between 0.05 and 0.15 was competent evidence of impairment when supported by other, verbal testimony. Finally, the AMA recommendation held that an AC below 0.05 was presumptive evidence that the individual was not under the influence.

Since the Second World War, most States have lowered this presumptive level to 0.10, and several States have lowered it to 0.08. Recently, the National Safety Council Committee on Alcohol and Drugs recommended that the presumption that an individual is not impaired when the AC is below 0.05 be stricken from DWI legislation, since recent evidence shows that the performance of a substantial number of individuals is impaired at ACs below 0.05 (Moskowitz and Robinson 1988).

Thus, with the passage of these laws, a fourth step was added to the enforcement system illustrated in figure 1. Once police officers obtain sufficient evidence from sobriety tests to convince them that individuals are impaired under the State's DWI law, they will charge the drivers with the offense, take the individuals into custody, and transport them to the police station for a chemical test.

Robert Borkenstein's development of an inexpensive breath test device, the *Breathalyzer*[™], provided a means for police departments to rapidly test individuals for their AC. The use of breath testing in the United States avoided many of the problems experienced in the foreign countries that continued to rely on blood tests that required a police surgeon to come to the station and draw blood. The Borkenstein *Breathalyzer*[™] and those breath test instruments that succeeded it have provided a reliable means of collecting highly accurate breath test data. States have established control systems for approving and calibrating these units and for training and supervising breath test operators in each police department.

The success of the chemical test in achieving convictions for impaired driving raised the issue of whether the State could require drivers to submit to this test. In a landmark decision, the Supreme Court decided in *Schmerber v California* that the police had the authority to take a blood sample forcibly, under limited circumstances. The Court held with respect to the Fifth Amendment that this did not constitute self-incrimination, since the evidence gathered was not testimonial but physical in character. Secondly, the Court determined that the forcible taking of a blood sample did not violate the Fourth Amendment prohibition against unreasonable searches and seizures since there was full probable cause to suspect the driver of driving under the influence (see Laurence 1988 for a discussion of constitutional issues related to DWI enforcement and adjudication.)

This decision opened the way for States to pass laws providing for the forcible taking of blood samples from arrested drivers. However, neither police departments nor legislatures wanted a system in which people would be held down and needles inserted in their arms as part of the arrest process. Therefore, a compromise was developed under which the State passed legislation providing that operating a vehicle on the State's highways implied consent for giving a sample for a chemical test in the event of a DWI arrest. If the driver, having been arrested, refused to provide a sample, then the Motor

Vehicle Administrator was empowered to suspend the driver's permit for a some stated period.

It required almost two decades for all States to adopt this implied consent procedure. To achieve adoption by the final hold-out States, it was necessary to increase the safeguards in the breath testing process. As the breath test became a more important element in the drunk driving litigation process and as implied consent statutes gave less opportunity for the driver to refuse testing, States added legislation to require that breath test devices be equipped with safeguards that would prevent the operator from making errors in the testing process. As a result, units were developed that automatically stepped through the process of calibrating and checking the instrument, collecting a breath sample, and providing printed output so that the possibility of error was minimized.

The four-step process provides a reasonably effective enforcement system. However, the seriousness of the drunk driving offense, with its potential for a jail sentence and a lengthy driving suspension, resulted in a number of pressures being applied to the lower courts that reduced their overall effectiveness with DWI offenses. Those charged with DWI hired lawyers to argue their cases, increasing the procedural paperwork for police officers. Each step of the enforcement process had to be documented to demonstrate probable cause for the stop and the DWI charge and to show that the breath test was conducted according to State regulations by qualified personnel. The bureaucratic procedures became very onerous for the police, frequently requiring 2 to 4 hours for each arrest and thereby discouraging DWI enforcement.

Because of the serious penalties, many offenders insisted upon full legal recourse, and court dockets frequently became overloaded. Significant backlogs were created, particularly when defendants demanded jury trials. The court and the prosecution were often motivated to seek plea bargains in which the individual charged with DWI pleaded to a lesser offense in return for having the drunk driving charge dropped. When the police saw this, some were discouraged from making DWI arrests.

The traditional behavioral enforcement system provides wide discretion to the individual officer in determining which vehicles to stop and, once the vehicle is stopped, whether to proceed with the investigation of the DWI offense. Thus, the officers' attitudes, detection skills, and motivation are extremely important to effective enforcement. In studies of police officers' attitudes toward DWI enforcement, most officers admitted to occasions when they did not pursue investigations where they were fairly sure the driver was impaired. One of the primary reasons given for failure to follow through was the length and bureaucratic nature of the paperwork involved. Arrests were less likely to be made toward the end of an officer's daily tour because completing the arrest would require staying overtime.

Officers were also likely to consider the significance of drunk driving compared with the fairness of penalties for this offense in making their arrest decision. Where they believed the penalties were inappropriately severe, they were more prone not to pursue arrests of marginally impaired drivers. Arrests were frequently avoided by allowing a passenger to take over the driving or, in the case of teenaged drivers, driving the individual home (Oates 1974).

With the founding of the Department of Transportation, the new Highway Safety Bureau (soon to be the National Highway Traffic Safety Administration) attempted to overcome some of these problems by establishing 35 demonstration programs called Alcohol Safety Action Projects (ASAPs). These projects were designed to provide an integrated approach to the drinking/driving problem (NHTSA 1979). Courts, prosecutors, and the police received additional funds and participated in a coordinated program to increase DWI arrests by simplifying police paperwork and by increasing the speed of prosecution and adjudication.

These projects generally succeeded in increasing (usually doubling) the number of

arrests for DWI (Levy et al. 1978). Within the enforcement activity, the arrest increases were primarily achieved through special DWI-emphasis patrols that operated on weekend evenings. These patrols usually consisted of 2 to 10 vehicles, depending on the size of the community. They normally made as many arrests in a year, on the two or three weekend evenings when they were active, as the full police force had made annually prior to the ASAP programs. While the ASAP programs came to an end by 1975, this dedicated patrol procedure has continued to be a feature of most communities in which DWI enforcement is emphasized.

Aside from sponsoring the ASAP demonstrations, the Federal Government attempted to assist DWI law enforcement by developing more scientific and objective procedures for identifying drinking drivers. A program to determine which vehicle maneuvers were most likely to indicate an intoxicated driver was funded by NHTSA and resulted in a set of driving "symptoms" graded by the probability that the driver would be at 0.10 AC or greater (Harris et al. 1979). A second research effort was directed at developing a standardized set of field sobriety tests for use by police officers. The sobriety tests commonly in use, up until the last decade, were highly influenced by individual officers' preferences. NHTSA sponsored a review of the literature and the development of a standardized set of three tests: lateral gaze nystagmus, body sway, and divided attention. The availability of these tests, particularly the gaze nystagmus test, has increased the capability of police officers to estimate the probable alcohol content of the suspected driver (Tharp et al. 1981).

By the latter part of the 1970s, the traditional behavioral system for detecting and apprehending drinking drivers had been significantly improved. This was evidenced by the fact that close to 1 million drivers were being arrested each year for this offense. It is probable that even more arrests would have been made had it been possible for the courts to handle the increase in case load.

The Chemistry-Based Enforcement System

The behavioral system of enforcement just described, which developed in the United States, was fairly typical of most industrialized nations. The U.S. system had some advantage in that it was based on breath rather than blood alcohol measurement. This simplified the enforcement process by not requiring the presence of a physician to collect blood. While this system was developing and maturing in the United States, the Scandinavian countries developed a significantly different approach to the enforcement of DWI laws.

In 1936, Norway passed legislation that provided that being in charge of a vehicle and having a blood alcohol concentration in excess of 0.50 was an offense. This was the first of the so-called "illegal per se" laws. Similar laws were later adopted by the other Scandinavian countries. The significance of the illegal per se approach is that it circumvents the issue of behavioral interpretation, since the offense has only two relevant criteria—being in charge of a vehicle and having an AC over a given limit.

Once these laws were in place, the police departments in the Scandinavian countries began to use field breath test devices. These consisted of tubes through which the suspect blew. Any alcohol in the breath would cause a chemical reaction in the dichromate crystals in the tube and produce a color change, from yellow to green. The length of the stain provided a rough measure of alcohol concentration. These legal and chemical test changes, when combined with the traditionally severe sanctions provided in Scandinavian laws, became known as the "Scandinavian model" (Ross 1975; Andenaes 1988).

The British Government implemented elements of this system in the Road Safety Act of 1967. Because of the wide publicity elicited in the British press while this new

legislation was being debated, the law produced one of the most dramatic examples of changed drinking driving behavior resulting from DWI legislation (Ross 1973, 1988). The success of the British Road Safety Act stimulated other nations, such as Canada, the United States, and Australia, to attempt similar programs. The implementation of the system in Canada had a much smaller effect because of limitations on the authority of police officers to require field tests. In Britain, roadside breath tests could be required of anyone in an accident or guilty of a driving infraction. In Canada, the officers could test only when there was cause to believe the individual was impaired.

In the United States, the success of the British Road Safety Act increased interest in roadside breath testing of drivers. Implementation of roadside testing was held back because of a challenge to the accuracy of the tube-type testers (Prouty and O'Neill 1971) and the question of whether roadside breath tests could be administered without reason to believe that a DWI offense had been committed.

The first problem was overcome through the development of miniature, electronic test devices using fuel cell or semi-conductor sensors. By the mid-1970s a small fuel cell test device the "Alco-Sensor"™ became available and was sold to police departments throughout the country. This device permitted roadside breath tests with substantially the same accuracy as could be obtained with the evidential breath test devices in the police station. It also appeared to increase the number of arrests. In Minnesota, in early 1980, the State purchased a large number of roadside breath testers and distributed them to State and local police departments. A time-series analysis performed by Cleary and Rodgers (1986) suggested that this distribution produced a permanent increase in arrests by Minnesota police agencies.

The second issue, regarding the authority of the officer to require a preliminary breath test in the absence of probable cause, has not been resolved by the Federal courts. Most police departments use field breath test devices only after the field investigation has been completed and the officer has decided that the driver is impaired and is about to charge him with the DWI offense. The field test device is then used to verify the officer's decision and to avoid transporting an individual who later turns out to be below the legal limit to the police station for the evidential test.

Rarely, if at all, are these devices used during the second step of the investigation where the officer attempts to determine if the individual has been drinking heavily. Because these devices are not used earlier in the arrest process, many impaired drivers avoid detection because they fail to give the signs typically observed by police. Field studies (Taubenslag and Taubenslag 1954; Vingilis et al. 1982; Jones and Lund 1985) have demonstrated that police officers miss at least half the impaired drivers with whom they come in contact. This is not surprising, since studies of the ability of physicians to identify drivers with ACs over 0.10 indicate that even they fail to detect half the individuals who would be legally impaired for driving (National Safety Council 1976, page 11).

Of all the nations that adapted modifications of this Scandinavian system, the state of New South Wales, Australia has recently made the most rigorous application of what Voas (1982) has labeled the "chemistry-based" enforcement program. In New South Wales and in Tasmania, laws were passed authorizing random breath testing of all drivers using the roads, and the police were provided with funds to establish a policy of vigorous use of sobriety checkpoints.

During 1982, the first year of the New South Wales "Staysafe Program," Homel (1986) reported that nearly 1 million breath tests were made on a driving population of 3 million, or nearly one in three licensed drivers, and monthly fatalities decreased by an average of 23 percent compared with the previous 6 years. Other data (Ross 1988) suggested that this change has been relatively permanent. As Ross noted, the evidence clearly supports the deterrence theory, since surveys of the driving public indicate that they are well aware of the law and the police enforcement practices. Moreover, it appears that a fair amount

of this information is reaching drivers through their own experience of being tested or through friends who have been tested at checkpoints.

The chemistry-based enforcement system implemented in New South Wales, Australia is in sharp contrast to the more behavioral approach used in America. Rather than selecting vehicles from the traffic flow based on aberrant or illegal behavior, the chemistry-based system makes extensive use of roadside checkpoints. A breath test is then conducted on every driver stopped. This makes it unlikely that drinking drivers can drive in a manner that will avoid observation and testing by the police. Once the field test for alcohol indicates that the driver has an illegal alcohol concentration, the individual is charged and taken to the police station for an evidential test.

While checkpoints have been used as an occasional feature of the enforcement programs in a number of communities throughout the United States, no jurisdiction has adopted this method as a principal feature of its enforcement activities. More widespread use of checkpoints has been constrained by questions regarding the constitutionality of the procedure and the manpower required to conduct checkpoints.

A series of Federal court decisions (Ifft 1983) have established a "balancing" procedure that permits the police to conduct checkpoints under certain highly controlled procedures where the State can demonstrate that this technique is required to protect citizens against the hazards posed by the drunk driver. The procedures required by the court are somewhat limiting. Survey sites must be preselected on the basis of drunk driving incidents and surveyed for safety. A plan must be developed in advance and approved by the highest authority in the police department. Checkpoints must be manned by a number of police officers, with their vehicles, to provide a significant "show of force" to reassure drivers that they are not being singled out for investigation. The procedure for selecting vehicles from the traffic flow must prevent individual officer discretion in order to avoid arbitrary or biased selection procedures.

Because of these rather elaborate requirements, checkpoints in the United States have been relatively expensive operations. Considerable controversy has arisen as to whether they are cost effective. In part, this controversy depends on the objectives of checkpoints. Some police departments hold that deterrence is accomplished by simply stopping and interviewing a large number of motorists, regardless of the number of arrests made. Other departments stress making DWI arrests in checkpoint operations.

Those departments that emphasize driver contacts and the creation of deterrence as the principal role of checkpoints generally employ very brief interviews (10-15 seconds) and only rarely use prearrest breath-testing devices. Such brief interviews make it unlikely that the officer can detect any but the most highly impaired drivers. Other departments conduct somewhat longer interviews (resulting in fewer drivers contacted), but make greater use of prearrest test devices, with a resulting higher arrest rate. Voas, Rhodenizer, and Lynn (1985) demonstrated that a checkpoint can produce more DWI arrests per hour than traditional patrol procedures.

The use of prearrest breath-test devices at checkpoints has been limited by the continuing issue as to whether a test can be required without probable cause, or at least "reason-to-believe" that the driver is impaired by alcohol. In an effort to overcome this limitation, passive sensors have been developed (Voas 1983; Jones 1986; Jones and Lund 1985). These handheld units pump mixed environmental and expired air from in front of the driver's face into the sensor and can be made sufficiently sensitive to reliably detect, those individuals who are over the legal limit (Jones and Lund 1985).

Legal analysis of these devices (Fields and Henricko 1986) suggested that they are not limited by the provisions of the Fourth Amendment prohibition against warrantless searches and could be used without establishing probable cause that an offense had been committed. This should make it possible for police to use such devices at sobriety checkpoints. When this is done, a drinking driver can be detected in 10-15 seconds (Voas

and Layfield 1983). Passive sensors are currently being tested by a number of police departments but the courts have not yet ruled on their constitutionality.

Current Status of DWI Enforcement in the United States

Beginning in 1980, a new element entered the DWI enforcement picture. This was the emergence of citizens' activist groups, such as Mothers Against Drunk Driving (MADD) and Remove Intoxicated Drivers (RID). These groups succeeded in calling public attention to the drunk driving problem and in motivating legislators to pass substantial DWI legislation. Most of the legislation dealt with increasing penalties and making them mandatory, or with prohibiting plea bargaining. The general effect of this type of legislation, with respect to enforcement, was to increase the efforts of defendants to avoid conviction, thereby putting increased stress on the quality of the evidence provided by the police officer in court. This increased pressure on the police investigation was counterbalanced somewhat by the adoption of illegal per se laws in 45 States. These laws made it an offense to be at an illegal AC while in control of a vehicle.

An illegal per se law reduces the requirement on the police officer to present evidence of impairment, though it does not eliminate it entirely. It is still necessary to show probable cause for administering the evidential breath test in the first place. In addition, despite the per se law, many courts continue to accept arguments regarding the behavior of the defendant.

A second significant element in the new wave of legislation was the passage of "administrative per se" laws that empowered motor vehicle departments to suspend the licenses of drivers not only for refusal to take a chemical test but also for failing a test. Many of these laws permit the police officer to seize the driving permit at the time of arrest and substitute a notice of hearing, which serves as a temporary license. The license is then forwarded to the motor vehicle administrator. The suspension takes place unless the hearing determines that the police officer did not have probable cause to require a chemical test or that the chemical test procedure was faulty.

Administrative per se laws provided an additional incentive for the police to make arrests by ensuring that arrests for drunk driving will result in an immediate consequence and that the efforts of the police will not be invalidated by plea bargaining or some other limitation in judicial procedures. At the same time, such laws add somewhat to the paperwork required at the time of arrest.

This wave of legislation also produced an increase in the number of States that specifically provided for the use of prearrest breath tests at the roadside by police officers. However, most police forces continue to use these devices as they had before, only at the end of the investigation.

Perhaps the most significant effect of this wave of legislation and the public attention given to drunk driving was the fact that it reminded police departments and individual police officers of the extent of public support for rigorous DWI enforcement. This public support also resulted in additional funds for many police departments for DWI enforcement and political support to pursue drunk driving arrests more rigorously.

Currently, the traditional behavioral system of enforcement (shown in the upper portion of figure 1) remains the primary method of apprehending drinking drivers in the United States. Considerable technology has been applied to this system since its initiation early in the century, particularly in the area of breath testing. However, the system remains basically dependent upon the experience and judgment of the officer in selecting the vehicles to be stopped and identifying drinking drivers, because breath test technol-

ogy is not applied until near the end of the investigative process. The chemistry-based system shown in the lower portion of figure 1 is not used in this country except for partial application in occasional checkpoints conducted in some jurisdictions.

Total arrests peaked in 1983 and have decreased slightly since then. The number of arrests seems unlikely to increase unless considerable additional funding becomes available to police departments to augment their traditional behavioral system or to pursue more extensive use of sobriety checkpoints.

Evaluation of Enforcement Efforts in the United States

While considerable effort has gone into the enforcement of drunk driving laws in the United States, and significant sums have been spent on equipment and overtime payments to special DWI patrols, relatively little rigorous scientific evaluation of these efforts has occurred (Jonah and Wilson 1983). Several factors mitigate against such evaluations. First, most enforcement efforts are implemented as part of a package of DWI legislative programs, making it difficult to separate the effect of the increased enforcement effort from other changes in the DWI control system.

Second, the public appears to accept relatively superficial evaluations and shows little appreciation of the need for rigorous scientific evaluation. Many enforcement programs are evaluated on the basis of a change in the number of DWI arrests. This is a completely inadequate basis for such evaluations, since the estimated arrest rate is 1 for every 1,000 offenses. Doubling such a rate can hardly have much impact in and of itself. Further, changes in the arrest rate are subject to differing interpretations. Increases in arrests are often cited as evidence that the increased enforcement is achieving its goal. Decreases in arrests are sometimes also cited as evidence that the enforcement process is achieving its goal, because (so the reasoning goes) fewer drunk drivers are on the road. Thus, this measure of enforcement effectiveness is completely circular and useless for the purposes of research, except as an intervening variable when an effort is made to determine the actual reduction in alcohol-related crashes.

The alcohol-related crash criterion is a difficult one to apply because AC data are principally available only for fatally injured drivers. Other AC data are available only for that small proportion of less severe crashes in which a DWI arrest is made, a clearly biased statistic. To obtain a more objective measure of enforcement impact, crash series, such as single vehicle crashes occurring late at night, are frequently used. Such crashes are more likely to involve a drinking driver than multivehicle crashes occurring during daylight hours. In many communities, relevant crash records are too poorly kept or the numbers of crashes are too few to provide a good basis for evaluating enforcement programs. A better, but much more costly, measure is to use voluntary roadside surveys in which the drivers are asked to voluntarily provide a breath sample for research purposes. These surveys provide a measure of the number of drivers who are impaired during those times when most drinking and driving occurs, an important measure of the impact of an enforcement program.

Two studies have shown changes in the average alcohol concentrations of drivers using the roadways as a result of enforcement programs. The first of these, Levy et al. (1978), evaluated the changes in roadside surveys at 19 of the 35 Alcohol Safety Action Projects. They found a statistically significant reduction in the number of drivers with illegal ACs in roadside surveys conducted after the projects were initiated, compared with results obtained before program implementation. These results, however, were undoubtedly influenced by elements of the ASAPs in addition to the increased enforcement of DWI laws.

A demonstration of impact more specifically traceable to increased enforcement was

reported by Voas and Hause (1987) in a study of a special enforcement program in the city of Stockton, California. Over a 3-year period, they reported a drop of as much as one-third in the number of drivers above the 0.10 legal limit. This drop in impaired drivers was accompanied by a significant reduction in nighttime crashes, compared to four other similar cities in the central valley of California. The reduced level of alcohol-related crashes was maintained during the 3 years of enforcement activity, but tended to disappear when the special enforcement project came to an end. Several other scientific evaluations of enforcement programs that have found positive results are available in the literature (e.g., Klein 1982; Lacey et al. 1986).

Overall, the studies of traditional enforcement programs in the United States have tended to be similar to those covered in Ross' (1984) international review of DWI programs. Short-term reductions in drinking driving crashes were obtained in some cases, particularly where enforcement was accompanied by considerable publicity. However, the changes tended to be transitory, maybe because the police failed to fully utilize the powers provided to them by the law (as in the case of the British Road Safety Act) or because, after an initial intensification, enforcement efforts returned to previous levels (as in Stockton). Finally, as Borkenstein (1975) hypothesized, it may be necessary to keep changing enforcement procedures to make them "new" and newsworthy and to attract the attention of the public.

Few chemistry-based checkpoint systems in the United States have been scientifically evaluated. Voas, Rhodenizer, and Lynn (1985) reported on a year-long enforcement program in which checkpoints were implemented every weekend within the city of Charlottesville, Virginia. Their evaluation indicated that the police apprehended for DWI approximately 1 percent of the drivers stopped at the checkpoint. In addition, another 1 percent of the drivers were arrested for driving without a license. Random digit dialing telephone surveys indicated that approximately one-fourth of the nighttime drivers in Charlottesville came into direct contact with a checkpoint and that more than 90 percent of all drivers were aware of the checkpoint program. Comparison of the nighttime and alcohol-related crash rates in Charlottesville with those of a similar community that did not employ checkpoints revealed that this procedure reduced such crashes by approximately 15 percent. A similar reduction was apparent when crash rates for Charlottesville were compared with those for the State of Virginia as a whole.

Additional evidence for the impact of checkpoint procedures was obtained by Williams and Lund (1984), who conducted a random digit dialing survey and compared the attitudes and knowledge of the driving public in those communities that used checkpoints with communities that did not use checkpoints. Where checkpoints were used, drivers reported higher levels of deterrence to drinking and driving than citizens of counties where they were not used. These studies provide some evidence for the effectiveness of the chemistry-based enforcement system. A full evaluation of the chemistry-based enforcement system awaits an adequate application of this technique in the United States.

Eight Issues for Future Enforcement Programs

This summary of the status of DWI enforcement in the United States suggests that it is having a significant general (but unmeasured) impact on deterrence to drunk driving. However, little additional effectiveness can be expected unless new resources are committed to, or new technology and procedures are employed in, the enforcement effort. Among the issues that are currently being debated and the proposals for new enforcement methodology being considered, the following 10 items should provide the subject matter for recommendations to be made in the Surgeon General's Report.

Issue 1: Increasing the use of sobriety checkpoints

As noted, the Federal courts have provided for the use of sobriety checkpoints under certain constraints (Ifft 1983); however, the legality of this procedure under the Federal constitution does not necessarily mean that it meets the requirements of each of the 50 State constitutions. As of this date, the Supreme Courts of 18 of the 50 States have made favorable decisions regarding checkpoints, while the Supreme Courts of 9 other States have made unfavorable decisions. These unfavorable decisions, however, frequently resulted from the consideration of checkpoint programs that did not meet Federal guidelines. Where there is full compliance with the Federal guidelines, it is probable that most States will find that checkpoint procedures meet the appropriate constitutional tests.

Perhaps more significant than constitutional issues is the acceptability to the public of checkpoint programs. Police administrators tend to be highly sensitive to public opinion. While police departments are often interested in new and novel procedures, police organizations tend to be basically conservative. Most public surveys show significant support for use of the checkpoint procedure. Voas, Rhodenizer, and Lynn (1985) found that the public in Charlottesville, where checkpoints were regularly conducted, were more in favor of checkpoints than the public in the comparison community which had not experienced a checkpoint program. Most available evidence suggests that police departments will be supported by the public if they implement checkpoint programs. Nevertheless, the concern with public relations remains a major drawback to checkpoint programs in the minds of many police administrators.

A third problem in mounting checkpoint operations is the issue of cost effectiveness. The Federal court specifications for checkpoint operations require the assembly of a number of police vehicles and the use of a minimum of four to six officers. (In contrast, a checkpoint can be conducted in New South Wales, Australia by a single officer). This requirement for a relatively large force presents personnel and cost problems for many localities. Some jurisdictions have addressed this problem by combining resources from State, county, and local police. Others have used overtime or diverted officers from other duties.

Depending on the procedures used and the policies implemented, a checkpoint may result in relatively few arrests or, alternatively, in more arrests per man hour than would be achieved in an equal amount of traditional enforcement activity. In any case, the impact of a checkpoint should not be assessed on the basis of the number of arrests produced. As demonstrated by Williams and Lund (1984), the impact of sobriety checkpoints on the general driving population is more important in creating deterrence than the number of arrests made by traditional enforcement procedures.

States and communities could be encouraged to promote checkpoint operations. This could be done both by influencing police policy and by providing additional funds for checkpoint equipment and operations. At issue is whether this procedure, which is a basic part of the chemistry-based enforcement system, would be cost effective in increasing deterrence to drunk driving. Evidence from Scandinavia and Australia suggests that it may be the most cost-effective procedure.

Issue 2: Using portable breath tests earlier in the DWI enforcement process

Portable breath test devices, about the size of a cigarette package, have been available to the police for over a decade. Twenty-six of the 50 States have passed legislation specifically authorizing their use. However, they are rarely used early in the investigative procedure. This occurs partly because of the general assumption made by police departments that the preliminary breath tester (PBT) cannot be used prior to obtaining

reason to believe that the individual has been driving while impaired. Thus, the devices are used only after the officer has completed his investigation. They are used only to verify the officer's decision, with the result that many over-the-limit drivers who did not appear to be intoxicated escape detection.

The prearrest breath test is clearly a search in the constitutional sense because the suspect is required to blow through a mouthpiece and provide an active breath sample. The Federal courts, however, have been willing to accept a compromise or a balancing test when the need of the State to protect its citizens is sufficiently great and the intrusion provided by the search is sufficiently small to make the search reasonable. Some constitutional experts believe that the act of blowing into a mouthpiece is such a small intrusion that it would meet this test. They predict that the Federal courts would find it acceptable to administer a breath test to motorists in accidents or to motorists guilty of driving offenses without requiring specific evidence that they are impaired by alcohol.

Should the courts find that the PBT does not meet constitutional standards without probable cause to suspect a DWI offense, then the passive sensing technology is available for use early in the arrest process. These devices, while somewhat less accurate than the PBT, would almost certainly pass constitutional tests since most experts agree that the passive sensor does not involve a search within the meaning of the Fourth Amendment (Fields and Henrico 1986). The use of such sensors on all individuals stopped at sobriety checkpoints or all individuals stopped for speeding or other traffic infractions would result in a significant increase in DWI arrests, since current evidence indicates that police engaged in these enforcement activities fail to detect half or more of the intoxicated drivers with whom they come in contact.

States and localities could encourage the use of PBTs and passive sensors through their influence on police policies and by providing funding for the purchase of this type of equipment. The important issue, however, is not providing additional equipment, but more significantly, encouraging police officers to use this technology at the beginning, rather than at the end, of their DWI investigation procedure.

Issue 3: Expanding DWI enforcement through new legislation

Borkenstein (1975) noted that a typical community with a population of 1 million will have 1,000 patrol officers. This same hypothetical city, would have approximately 325,000 hazardous moving violations per year. He proposed that, to increase deterrence to impaired driving, every driver stopped for such a hazardous moving offense should be tested for alcohol. If such a driver were found to have an AC over a minimum level (e.g., 0.05), he would be given a special aggravated-by-alcohol traffic citation. The offense of speeding might carry a fine of \$20.00 or \$30.00, but the offense of speeding while aggravated-by-alcohol would carry a higher fine (e.g., \$50.00) and would also result in a notation on the driving record that an alcohol-related offense had occurred. Drivers with ACs over the per se limit could also be charged with the DWI offense.

The principal issue that arises in this procedure is the Fourth Amendment limitation on conducting searches without probable cause. The proposal to test all individuals guilty of serious driving infractions is similar to the British Road Safety Act of 1967. Enforcement would require court acceptance of a driving infraction as meeting the requirements for permitting a "search" such as the use of a prearrest breath test device. If the courts determined that such a search was not permitted without specific evidence that the individual was impaired, passive sensors could be used to obtain evidence of drinking, followed by the use of a PBT. This procedure would likely result in a significant increase in the number of drivers arrested for DWI and an increase in the number of drivers receiving an alcohol-related offense citation on their driving records.

Another type of program directed at increasing the number of drinking drivers apprehended is the "Roadside License Suspension" program used in several Canadian

provinces. This legislation has two forms. In the first, as practiced in New Brunswick, Ontario, Manitoba, and Saskatchewan, the driver can be required to take a roadside breath test if the officer has reason to believe the driver is impaired. If the result is over 0.05, the officer can suspend the individual's driving permit for periods varying from 6 to 24 hours.

Another approach, used in Alberta, British Columbia, and the Yukon Territories, places the testing decision on the driver. Relevant to this approach, the British Columbia Motor Vehicle Act (Section 214) states that (a) if a police officer believes a driver's ability is affected by alcohol (or other drug), he may request the driver to surrender his license; and (b) the period of suspension is 24 hours unless the driver voluntarily submits to a test that determines an AC not exceeding 50 mg percent.

Thus, the suspected offender has the choice of submitting to the test to demonstrate that he is not over the 0.05 limit or of surrendering his driving license to the police officer, finding other means to get home, and returning to the police station the next morning to retrieve his driving license.

One potential problem with such lesser offenses is that they can be used inappropriately to avoid the paperwork and hassle involved in the prosecution of more serious drunk driving offenses. If the offense of a traffic violation aggravated-by-alcohol were created with lower penalty levels, it might well be used as an opportunity for plea bargaining with individuals apprehended with illegal ACs being allowed to plea down to this lesser offense. Police officers might also use the short-term suspensions to avoid the paperwork involved in bringing more serious charges in the first place. The basic issue is whether the enactment of such a law would increase the deterrence of drunk driving.

Issue 4: Expanding officer participation in alcohol enforcement

As noted earlier, the ASAP program popularized the use of special, dedicated DWI enforcement teams. This system was intended to stimulate the apprehension of impaired drivers by all members of the traffic patrol by offering the opportunity to earn overtime pay on the special patrols. Sometimes this opportunity was extended only to those officers who achieved a high arrest rate on their normal duty hours. To a certain extent, this general concept worked as intended. However, in the long run, it tended to establish a policy of allowing a few highly motivated officers to specialize in DWI, while permitting the large majority of traffic officers to make few, if any, DWI arrests. The fact that a two- or three-man special enforcement team active on Friday and Saturday nights could make as many arrests as the rest of the traffic department was more an indication of the lack of attention to drunk driving by the average officer on patrol than an indication of the level of skill of the special patrol members.

It will be difficult to greatly increase arrest rates as long as the pursuit of the drunk driver is seen as a specialist activity for a few officers. Expanding the role of the rest of the traffic department in DWI enforcement activities would not only increase the number of arrests but would also broaden the impact on the driver, since individuals would be investigated for impairment, not only on Friday and Saturday nights, but throughout the week.

States and localities should be able to increase the number of arrests by the regular traffic patrols through training and by providing the officers with prearrest breath testers or passive sensors. With a passive sensor backed up by an active preliminary breath tester to use in the field, the traffic officer need not be an expert in conducting sobriety tests or in detecting evidence of impairment from the appearance of the driver. Using these devices, he can identify individuals who are over the limit and bring them in for evidential tests.

With police management emphasizing the importance of drunk driving enforcement,

all officers who are trained and equipped with passive sensors and PBTs should be able to contribute substantially to the drinking driving enforcement effort within a community. The principal issue here is whether the State and locality should fund police departments to train officers, purchase passive sensors and PBTs, and encourage police administrators to make DWI enforcement a high-priority activity for all officers engaged in traffic patrol activities.

Issue 5: Lowering AC limits for private vehicles

Of the 50 States, 41 currently have per se limits at 0.10, while 2 others have 0.08 limits. The National Safety Council Committee on Alcohol and Drugs has taken the position that *all* individuals at 0.08 AC are impaired. The American Medical Association has gone even further, recommending that the National limit be 0.05 AC. Considerable controversy exists regarding the desirability of lowering the AC limit from 0.10, which is the current standard in the United States. The first issue is whether, in fact, ACs below this level increase the probability of accident involvement. The second issue is whether lowering the illegal AC level reduces the number of high AC drivers on the road or the number of alcohol-related accidents. The third issue is whether lower AC levels can be enforced, and, if so, what such enforcement costs.

With regard to the first issue, laboratory and epidemiological studies have indicated that increases in impairment and crash risk begin at low AC levels (Moskowitz and Robinson 1988). Hurst (1973) found that no matter how experienced with alcohol, any individual is at higher risk for involvement in a crash at any AC level over zero. This provides a basis for arguing that the AC limit should be zero, since any level above that will increase the probability of crash involvement. On the other hand, an attempt to eliminate all driving with any positive AC is beyond the resources and capability of the criminal justice system, as shown by the Nation's experience with prohibition.

With respect to the second issue, no adequate scientific studies demonstrate the effectiveness of lower AC levels per se. Data from Scandinavia (where the AC limit is 0.05) indicate that the number of high AC drivers on the roadways is clearly lower than in the United States, Canada, and the Netherlands, where the AC limits are 0.10, 0.08, and 0.08, respectively (Snortum 1984). However, many other differences between these nations could contribute to these differences, and it is not possible to determine the relative role of the AC limit compared to the differences in enforcement policy and procedure, the penalties for the offense, and the general cultural attitudes toward alcohol use and drinking and driving.

Overall, no reliable research evidence clearly demonstrates that lowering the AC alone produces a reduction in alcohol-related accidents. Rarely in real life is a single countermeasure feature implemented so that it can be evaluated on its own without the interacting effect of other changes in the law or in enforcement. A change in the AC level would probably also be accompanied by a change in enforcement, since enforcing lower AC limits may well require different enforcement techniques.

Relative to the issue of enforcing a lower AC limit, some police forces are currently experiencing considerable success in apprehending drivers at lower ACs with traditional patrols. In North Carolina, approximately 10 to 15 percent of all drivers arrested are below 0.10. A significant number of arrests below the 0.10 level are also made by other police departments, such as in the District of Columbia. A serendipitous impact of lowering the AC limit is to increase the probability of conviction for those at 0.10 and higher, since many prosecutors provide for a buffer zone at the legal limit, whatever it may be. In many cities, for example, the prosecutors operating under the current 0.10 law only move those cases where the measured AC is 0.12 or 0.13 and above, because of the difficulty in obtaining convictions where the AC is near the legal limit. Moving the

legal AC limit to 0.08 could lower this buffer zone and increase convictions for those with 0.10 ACs.

If the legal limit is reduced to 0.05 or 0.08, greater reliance will probably have to be placed on the chemistry-based system shown in the lower portion of figure 1. The use of checkpoints and passive sensors will likely be increased, since the individuals who are at these levels are less likely to present the signs of impairment on which the police normally rely.

Whatever final decision is made regarding lowering the AC limit, it is important to repeal the section of many State laws that provides that an AC below 0.05 is presumptive evidence that the individual is *not* intoxicated. More recent studies of the effect of alcohol on performance (Moskowitz and Robinson 1988) clearly demonstrated that some individuals are impaired below that level. Further, a number of individuals with low ACs may also have consumed drugs so that the combination of alcohol and drugs produce an impairing effect. This provision could make an AC below 0.05 an obstacle to prosecution of these cases. Further, a number of States have established zero AC limits in which any measurable AC (generally 0.01 to 0.02) is an offense for teenage drivers who are not permitted, under law, to drink. The presumption that an individual below 0.05 is not impaired is in clear conflict with this type of legislation.

Issue 6: Suspending driver's licenses

Historically, the suspension of the driving privilege has been the most salient penalty for a conviction of driving-while-impaired. The laws of the States varied in their procedures for administering the license suspension penalty. In some cases, this became a province of the court with the court seizing the license and, perhaps, substituting a limited driving permit. Usually, the court would forward an order to the Motor Vehicle Administrator to suspend the license. Because the driving public feared the loss of license and saw that as a significant penalty, it became the basis for considerable plea bargaining, to such an extent that in the early 1970s, license suspension occurred only irregularly, and many defendants got off with only fines.

Studies conducted principally in the States of California, Washington, and North Carolina (Popkin et al. 1983; Salzberg and Klingberg 1983; Sadler and Perrine 1984; Peck et al. 1985) demonstrated that while as many as one-half to two-thirds of those who receive suspensions continue to drive, suspended drivers were involved in fewer total accidents and fewer non-alcohol related accidents than individuals who retained their licenses in return for attending education or treatment programs.

Partly as a result of this evidence and partly as a result of the public concern and attention to the DWI problem stimulated by citizen activist groups such as MADD and RID, administrative suspension laws, which bypassed the courts, were enacted during the late 1970s and early 1980s. The lead was taken by the State of Minnesota, which enacted so-called administrative per se legislation in 1976. This legislation operated in conjunction with the implied consent law, so that the driver was not only to lose his license if he refused a chemical test, but also if he failed such a test. This administrative withdrawal procedure was adjudicated to be constitutional, provided the offender had the opportunity to have a hearing to determine that there was probable cause for his arrest and that the chemical test had been properly conducted (Reeder 1981).

An important feature of a number of these laws was that the police officer was allowed to pick up the license on the spot, upon either refusal or failure of the test, and replace the license with a hearing notice. The license was then returned to the Motor Vehicle Administrator by the police officer. In this way, an initial penalty for drunk driving was administered on the spot, a feature that could enhance the deterrence to DWI by reducing the time between offense and punishment and that has been shown to increase the motivation of police officers in some States.

Zador et al. (1988) conducted a study of the impact of per se legislation and the administrative per se laws and found evidence that the administrative per se law contributed to some of the national reduction in alcohol-related accidents that occurred between 1982 and 1986. The issue of the effectiveness of administrative license revocation as a penalty lies beyond the scope of this paper. However, this law is significant to the DWI enforcement effort in that it places an additional requirement on police officers but, also, provides them with a potentially motivating element in that they can be assured that the offender is receiving a significant penalty. Too often in the past, when the application of sanctions has been dependent upon litigation, plea bargaining, and other delaying tactics, the offender has received minor punishment or none at all. Currently, 23 States have administrative per se laws. The success of this procedure suggests that it would be desirable for the remaining States to enact similar legislation.

Issue 7: Enforcing driver's license suspensions

Suspension or revocation of the driver's license is considered to be the single most effective DWI sanction for reducing subsequent traffic offenses and accidents. However, this sanction comes under attack from practitioners and citizens groups alike because of compelling evidence that a majority of DWI offenders continue to drive to some degree during the period of their license revocation or suspension (Sadler and Perrine 1984).

Despite these indications that many offenders continue to drive while under suspension or revocation, there is evidence that those under suspension, as a group, have significantly lower rates of rearrest for DWI and of crash involvement (Popkin et al. 1983; Peck et al. 1985). However, those who do continue to drive (even if they are driving more safely than otherwise) are flaunting the sanction imposed on them and should be arrested and punished. The problem has been that driving with a suspended or revoked license has been a relatively invisible offense. In other words, it generally does not come to a police officer's attention unless some other violation of the law is detected. Even when it is detected and a citation for driving without a license is issued, the court frequently does not convict because of the inability of the prosecutor to demonstrate that the driver received legal notice of his or her suspension. This occurs because the notices frequently go through the mail, and there is no acceptable evidence that they were received.

The State of Virginia, among others, has attempted to use police in surveillance of the residences of suspended drivers in an effort to apprehend those who continue to drive. This procedure has yet to be adequately evaluated, but obviously involves fairly high costs in police manhours. Another traditional approach to dealing with this problem is to increase the penalties for driving while suspended by providing for vehicle impoundment or jail time for suspended drivers. The effectiveness of these more salient penalties procedures is unknown, but their deterrent effect is most probably highly dependent upon the effectiveness of the enforcement system in apprehending suspended drivers.

In urban areas with large numbers of automobiles, there is simply no way in which the police can, without some technological assistance, determine whether the individual operating a vehicle is properly licensed. One aid employed by the State of Minnesota and in certain other jurisdictions, such as New Philadelphia, Ohio, is to confiscate the vehicle tags of the drivers who are convicted of driving without a license or convicted of DWI and replace them with distinctive plates that call attention to the vehicle. This provides a means for identifying those vehicles that may be driven by a suspended driver. Several States are currently placing more emphasis on this approach.

A more technological approach to the identification of vehicles driven by suspended drivers is the use of the so-called TAGS system, which has been evaluated by the Insurance Institute for Highway Safety (Miller 1978). In that system, police officers are provided with a keyboard on which to enter vehicle tag numbers at random. These

numbers are transmitted to a central data file that checks to determine if the tag belongs to a vehicle that has been stolen, if the driver is wanted for other criminal offenses, or if the vehicle is owned and driven by a suspended driver. If a match occurs, a signal is sent to the patrol vehicle so that it can stop the car and interview the suspected driver. Using this TAGS system in Maryland, Miller found that 9.6 offenders were identified per officer hour compared to only .5 offenders per officer hour using traditional patrol methods.

The sobriety checkpoint also offers a method of enforcing the laws against driving while suspended. In the Charlottesville checkpoint program (Voas et al. 1985), 1 percent of the drivers stopped were given citations for driving without a proper license, equal to the number arrested for DWI. (For a full discussion of the technical problems in enforcing license suspension, see Voas 1988).

It is clear that if suspension of driver's licenses is to be the principal penalty for drunk driving, and if a large number of drivers are to be arrested each year, it will be important to enforce this restriction effectively. Approximately one-half of the drivers suspended do not reapply for licenses when they are eligible, apparently because of the high cost of automobile insurance to offenders. Therefore, between 500,000 and 1 million drivers come off the rolls of State driving license registers each year, but these dangerous individuals continue to drive. This places them outside the normal license control system. An efficient enforcement procedure that can deal with this problem needs to be developed.

Issue 8: Managing license penalties automatically

One function of sanctions is to incapacitate the offender and prevent a repetition of the offense by making it impossible to commit the same crime. Incarceration is the classic method for ensuring that an offender will not repeat his offense, at least during the prison term. In DWI adjudication, jail terms are generally far too short to have any significant effect through incapacitation. The offender is soon released and able to operate his automobile. Suspension of the driving license is intended to continue the incapacitation for a significant period, usually several months to a year or more. However, this type of incapacitation is only partially effective because it is difficult to enforce. A recently developed alternative to traditional enforcement methods, which will incapacitate the individual from repeating his offense, is the alcohol safety interlock. The concept for a device that would be mounted on the car and test the operator's performance or AC was first proposed in the Secretary of Transportation's report, *Alcohol and Highway Safety*, in 1968 (U.S. DOT, 1968). In 1970, Voas reviewed this concept, describing the opportunities and the problems posed by what he dubbed as "Alcohol Safety Interlock Systems" (Voas 1970)

The idea of an in-vehicle system that can determine the impairment of the driver and prevent vehicle operation is such a parsimonious and attractive approach to the solution of the DWI problem that this concept has long enjoyed considerable support among safety specialists and politicians. As a result, the Federal Government undertook a decade of research directed at developing an interlock system (Compton 1988). This research was primarily directed at using performance tests as a method for identifying the impaired driver. This is attractive because performance tests can detect drivers impaired by drugs as well as alcohol. However, the first commercially developed devices have all been based on the measurement of breath alcohol using simple semiconductor sensors.

Currently, at least 10 States have passed legislation authorizing the testing of these devices, and individual courts in a number of other States have established demonstration programs. To this date, however, there has not been a sufficient number of these devices in the field to provide an adequate scientific test of their effectiveness. Slightly over 200 units are currently authorized in two experimental counties in California in an

evaluation program that is being supervised by the Office of Highway Safety of the State of California. In another year or two, this program should provide scientific evaluation of these devices.

While these devices control only the driving in the vehicles in which they are placed and therefore do not control driving by offenders in other vehicles, they offer the potential for taking over much of the supervision problem. Since the systems are predicated upon the offender paying for their cost and the monitoring being done by commercial companies, these systems relieve the State of considerable expense. They will free the police to use their time in enforcing basic drinking driving and other hazardous driving laws. The principal concern of the highway safety community is that these devices will be implemented widely before they are fully evaluated and will be substituted by the courts for the full suspension penalty, which has been proven to be effective.

Conclusion

The issues listed above provide an important agenda for consideration in action programs and research studies. The first half of this decade has brought considerable progress in the reduction of alcohol-related accidents as a portion of total fatal accidents. It has provided the first evidence in history that it is possible to ameliorate the drinking driving problem through the criminal justice system. The recent leveling off of DWI arrests and alcohol-related fatalities suggest that new initiatives are needed if the progress seen during the first half of this decade is to be continued.

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Transportation Alternatives for Drinkers

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Drunk driving persists at stubbornly high rates despite continuing efforts to reduce its occurrence (Reed 1981; NHTSA 1985; National Commission Against Drunk Driving 1987). One of the most compelling explanations for this phenomenon is the observation that alcohol and automobiles have become such integral features of our society that drunk driving is virtually inevitable (Gusfield 1981; Mosher 1985; Ross 1987). If substantial reductions in drunk driving are to occur, dramatic changes must take place. Either drivers must sharply curtail their drinking, or ways must be found to stop intoxicated individuals from driving.

This chapter focuses on a class of prevention strategies that take the latter approach. These strategies share a philosophy of attempting to provide drinkers with safe transportation while requiring as little modification as possible in drinking practices. There is, of course, nothing new about informal efforts to find safe transportation for intoxicated individuals. Surely, efforts to help intoxicated individuals get home safely began long before the invention of the automobile. Today, incidents of hosts, fellow drinkers, sober associates, and police assisting intoxicated individuals in obtaining safe transportation have become part of our drinking lore, even though they have received little study. In contrast to these informal interventions, formal programs designed either to provide safe transport for individuals or to encourage informal actions appear to have originated only in the last few years. Unfortunately, they too have received almost no attention from researchers. These efforts to implement transportation alternatives for intoxicated drivers can be divided into two groups: (1) those in which the individuals participating in the drinking activity supply both vehicles and drivers—the designated driver tactic, and (2) those where neither vehicles nor drivers are typically provided by the individuals taking part in the drinking activity—the safe rides tactic.

Designated Drivers

With a simple and inexpensive tactic, groups of drinkers can assure themselves that a sober driver will be available when needed. Before drinking commences, they determine the number of drivers necessary to transport the entire group. Then, that number of individuals in the group remain sober and drive all of the others. This tactic, the use of “designated drivers,” has been championed by a diverse array of sources and is currently receiving wide dissemination through the mass media.

The tactic of drinkers designating individuals to remain sober and do the driving has great appeal. First, the tactic can be used in any setting where people drive together after drinking. For example, it can be employed in private homes, bars, sporting events, and restaurants. Second, underage youths can adopt the tactic without requiring the authority or approval of adults. Third, no cost need be associated with exercising the tactic. In fact, designated drivers save money by drinking nonalcoholic beverages. Even

when incentives are offered to designated drivers by drinking establishments, the cost of the incentives tends to be inconsequential. Fourth, if light drinkers or abstainers are unavailable, only the designated drivers need change their drinking behavior for the tactic to be successful. Other group members are free to drink in whatever way they choose.

Surprisingly, virtually no research has been done on the designated driver tactic. Nevertheless, even the sparse information that does exist reveals both the great potential and some important limitations of the tactic. The potential for widespread use of the designated driver tactic is apparent from the results of a 1987 Gallop Poll (Gallup 1987). Nearly all Americans (91 percent) who participated in social events where alcohol was available wanted the people with whom they associated to employ the designated driver tactic. Furthermore, results from another item in the survey suggested that ample numbers of individuals are willing to serve as designated drivers. Nationally, 78 percent of the individuals who visit settings where alcohol is served indicated that they would be willing, on occasion, to serve as a designated driver. Interestingly, drinkers were more inclined than nondrinkers to serve as designated drivers (84 percent versus 67 percent, respectively). Although the Gallop Poll indicated that most people approve of the designated driver concept, the question remains as to whether their favorable disposition translates into practice. How often and under what circumstances do groups of drinkers designate some of their members to remain sober and do the driving?

Informal Designated Drivers

One of the advantages of the designated driver tactic is that formal programs are not necessary. Any group of individuals in any drinking environment can designate someone to remain sober and do the driving. Unfortunately, information about these "informal" designated drivers is even more scarce than about those who participate in formal programs. It consists of responses to a few survey items included in studies directed primarily at other aspects of the drinking/driving problem. For example, as part of an unpublished telephone survey that Wayne Harding and I conducted in 1987, people living in a Boston suburb were asked about the designated driver tactic. Respondents were randomly selected from a list of licensed drivers and then screened to produce a sample of 502 individuals who reported having used alcohol and having driven (not necessarily together) in each of the 2 past years.

To estimate use of the designated driver tactic, we asked respondents, "During the last 12 months, how many times were you part of a group of drinkers in which someone didn't drink so they could drive others in the group?" Over half (53 percent) of the entire sample indicated that they had been part of such a group. Eighty-four percent of the individuals who had been in such a group reported that it happened 12 or less times during the past 12 months (nearly half said 3 or fewer times). Another item asked how groups made the decision to use the designated driver tactic. Only 3 percent of the respondents reported that they had been in a group that was "encouraged by a bar or restaurant" to designate someone to remain sober and do the driving. This low figure fits with the finding reported below that formal programs produce few designated drivers. All other respondents reported that their groups made the decision to designate a sober driver on their own.

Snortum, Hauge, and Berger (1986) also conducted surveys bearing on use of the designated driver tactic for reducing drunk driving. They estimated that 12 percent of American groups of drinkers always appoint one person to remain sober to drive, while 42 percent of such groups never designate a driver to remain sober. In sharp contrast, 76 percent of Norwegian groups were estimated to always employ the designated driver

tactic, while only 4 percent never used it. Unfortunately, the findings were clouded by a 58-percent response rate in their U.S. sample and an unknown response rate in Norway.

Survey of Formal Designated Driver Programs

In 1985, the National Highway Traffic Safety Administration funded a study specifically aimed at answering questions concerning designated drivers (Apsler et al. 1987). The major focus of the project became the examination of formal designated driver programs (DDPs) — systematic efforts by drinking establishments or organizations to actively promote the designated driver tactic. A “snowball” approach was employed in an effort to locate as many DDPs as possible throughout the United States. As various individuals and organizations were contacted, they identified some DDPs and suggested other individuals who might know of more. Ultimately, these sources produced the names of 431 alleged DDPs. To verify the existence of some programs and to learn more about them, we then began telephoning a geographically diverse sample of the programs that had been praised most highly by our sources. Telephone conversations were held with spokespersons from 37 operational and 3 defunct DDPs. Four of the 37 programs were also visited by the investigators.

A second series of phone calls was made to membership organizations, such as fraternal clubs, veterans organizations, and fraternities and sororities. Some of these organizations are notorious for the heavy drinking that takes place, yet virtually none appeared on the list of DDPs identified through the snowball survey. Fifty-four membership organizations randomly selected from seven major U.S. cities were contacted, resulting in five DDPs with whom extended conversations were held.

Characteristics of DDPs

The formal DDPs that were contacted tended to be similar in many ways, despite assorted variations. For example, most DDPs operated whenever the drinking establishment was open, though a few restricted the hours, and two operated only on holidays. All respondents claimed that the cost of operation for their DDP was minimal and inconsequential. All DDPs utilized some form of in-house publicity, such as posters, table tents, employee buttons, and promotion by the server or doorman. When publicity occurred in the mass media, it tended to be donated or consisted of news items. Over half of the DDPs stated that they had eligibility requirements for participation, usually in the form of a minimum group size that ranged from two to six people. One program also specified a maximum group size of six people, reasoning that larger groups would not fit in one automobile. Nearly all DDPs required that the designated driver abstain from alcohol, though some permitted the driver to have up to two drinks. All but two DDPs gave incentives to designated drivers, usually in the form of free nonalcoholic drinks. A few DDPs offered free food, and others gave coupons that could be redeemed in the future for free food or drinks. In many establishments, a patron wanting to obtain the incentive for becoming a designated driver had to approach the server and make the request. However, in roughly a third of the DDPs, one of the staff was expected to approach eligible parties with an explicit request that someone be designated as the sober driver. Once selected, the designated driver often received some form of identification, such as a button or hand-stamp.

The Number of Designated Drivers

It appears that few individuals are participating in the DDPs offered by drinking establishments. Precise figures were unavailable, since few establishments kept reliable records of the numbers of designated drivers, and none recorded the number of eligible

groups served. Nevertheless, estimates offered by drinking establishments provide at least a ballpark indication of the numbers involved. The majority of drinking establishments reported serving 20 or fewer designated drivers per week. A much more meaningful figure is, of course, the percentage of eligible groups in which someone served as a designated driver. Here the figures are even more tenuous, since only a few respondents made a guess at the number of eligible groups served by their establishment. Typically, less than 10 percent of the eligible groups participated in a DDP.

Limited Appeal of the Designated Driver Tactic

The vast majority of Americans approve of the designated driver tactic and are willing, on occasion, to serve as a designated driver. Yet existing evidence indicates that relatively few groups of drinkers in the United States actually employ the tactic. Part of the explanation may be that there are many circumstances in which serving as a designated driver is unappealing and/or impractical.

Who Will Abstain if Everyone Wants to Drink?

Individuals' willingness to serve as a designated driver is probably associated with their perception of how necessary drinking is for enjoying an activity. At sporting events, for example, beer drinking may be at least as important for some people (especially young males) as the contest. In such settings where drinking, particularly heavy drinking, is a central part of the experience, remaining sober may be seen by many individuals as too great a sacrifice. In principle, taking turns can make serving as the designated driver more palatable. But if group membership is fluid, equitable sharing of this role becomes difficult.

The designated driver tactic is likely to be unappealing in numerous other circumstances. For instance, when two people go out for drinks, will one of them drink alone? Social activities intended to bring together people who do not know each other well are another example in which drinkers might be reluctant to forego alcohol, since drinking is viewed by many as a social lubricant that facilitates meeting strangers. People who generally feel that alcohol helps them relax and become more outgoing may be unlikely to accept the handicap of not drinking. Problem drinkers are also poor candidates for the role of designated driver. Even people willing to remain sober may resist serving as a designated driver out of reluctance to transport a bunch of drunks. Who wants a car full of potentially belligerent individuals? Who will clean up the mess and get rid of the smell if someone vomits?

Logistical Problems

Even when individuals are willing to remain sober, they may often be reluctant to serve as a designated driver for logistical reasons. The designated driver tactic is most attractive only when the starting points of group members are geographically close and also when their ultimate destinations after drinking are near each other. It is unreasonable to expect one individual to drive long distances to pick up and drop off other group members. A compromise is for everyone to drive to a central location from which the designated driver ferries the group to and from the location where drinking occurs. This compromise does reduce the number of miles driven by the intoxicated members of the group. However, if intoxicated group members use the availability of a designated driver as justification for drinking more than they usually would, then their risk of a crash could be even greater than if they had drunk less and driven the entire distance themselves.

The Need for Planning

This last example points to another limitation of the designated driver concept: the need for organization and planning in advance of the activity. Once individuals have arrived in their own cars at the drinking location, it is probably too late in most circumstances to employ the designated driver tactic. Although it would still be possible for the drinkers to leave their cars at the drinking location and ride home with the designated driver, most people are probably reluctant to do so. Clearly, it is better to determine in advance who will attend an activity that will include drinking, how many vehicles will be needed, and who will drive. Timing is another critical aspect of the planning issue. The designated driver tactic requires all members of a group to arrive and depart at the same times. This extensive planning seems practical mainly in structured activities, such as staged events or regular social functions.

Other Disadvantages of the Designated Driver Tactic

Resistance From Servers

Alcohol servers in the drinking establishments we visited explained that they receive smaller tips from groups with designated drivers. The nonalcoholic beverages that designated drivers drink are usually free, or if purchased, they cost much less than alcoholic beverages. Consequently, alcohol servers, who rely on tips for much of their income, suffer economically when they serve designated drivers, unless drinking establishments make arrangements to compensate them for lost tips. Obviously, without a subsidy, servers may be reluctant to encourage patrons to adopt the designated driver tactic, and we found no establishment that provided such a subsidy.

Reliance on an Honor System

In many drinking situations, the success of the designated driver tactic depends entirely on the commitment of both the designated driver and other members of the group. Even when alcohol servers and hosts encourage use of the tactic, they can do little to ensure either that designated drivers begin sober, remain sober, or that they do the driving. Servers typically must rely on buttons or hand-stamps to identify designated drivers, and these devices can easily be hidden by someone determined to obtain alcoholic beverages. Similarly, servers or hosts have no way to guarantee that the designated driver drives all members of the group. We did find rare instances in our study of DDPs when doormen would occasionally follow patrons into the parking lot to make certain that an apparently sober individual got behind the wheel. Nevertheless, even such extreme efforts can easily be circumvented.

Determination of "Sober"

While most formal DDPs do not serve alcohol to designated drivers, individuals employing the designated driver tactic informally are free to determine the degree of sobriety that the designated driver must maintain. A potential danger is that some groups will be mistakenly complacent as long as the designated driver is less intoxicated than the others, even if not completely sober.

Excludes the Solitary Drinker

By definition, the designated driver tactic works with a group of individuals — not with a single individual. Consequently, the tactic cannot help provide safe transportation for the solitary drinker.

Safe Rides

Another transportation-based approach for reducing alcohol-related automobile crashes is to provide both vehicles and drivers for intoxicated individuals who would otherwise drive themselves or ride with an intoxicated driver. This approach is usually referred to as "safe rides." Formal safe ride programs (SRPs) encompass a wide variety of transportation alternatives, such as taxicabs, limousines, tow trucks, buses, and automobiles, while the informal provision of safe rides generally relies on taxicabs and automobiles. Typically, when transportation is needed by an intoxicated person, either that person or someone else, such as a server or host, obtains transportation from outside the drinking environment. In some instances, contact is made directly with a company that provides the transportation, such as a taxicab company, while in others a communications service is contacted, and it, in turn, makes arrangements for transportation.

The safe rides tactic is a theoretically perfect solution to the drinking/driving problem. A primary attraction from a drinker's standpoint is that no modification of drinking behavior is necessary. No one need remain sober or even moderate his or her alcohol consumption, and still all drinkers can be transported home without endangering either themselves or others. In addition, the safe rides tactic works with solitary drinkers. Unlike the designated driver tactic, the safe rides tactic does not depend on the existence of groups of individuals.

The safe rides tactic appears to receive the same high level of approval that was found for the designated driver tactic. Caudill, Kaufman Kantor, and Ungerleider (1988) interviewed 1,522 patrons as they entered bars and nightclubs in Sacramento and San Jose, California. The survey was conducted to obtain baseline data for a study of SRPs. Nearly all of their respondents (96 percent) believed that the availability of SRPs would be useful; 63 percent of the respondents selected the number "10" on a 1-10 scale of usefulness. In addition, 79 percent of all respondents reported that they might use such a service if it were available. An even larger percentage of heavy drinkers, 87 percent, indicated that they might take advantage of a safe rides service. On the other hand, they also found that a large number of respondents (38 percent) had not heard about SRPs, and few had actually used one. Seven percent of all respondents and 12 percent of heavy drinkers reported that they had used the services of a SRP sometime in the past.

Informal Safe Rides

As in the case of the designated driver tactic, formal programs are not necessary for the safe rides tactic to be used. Intoxicated individuals do not need a SRP to use taxicabs or receive rides from sober friends in order to avoid drunk driving. However, this informal use of the safe rides tactic has received almost no attention from researchers. One exception is an ethnographic study of bar settings conducted by Gusfield, Rasmussen, and Kotarba (1984). They recount observing incidents in four drinking settings where bartenders would sometimes call a taxicab for intoxicated patrons wanting to avoid driving. The likelihood of bartenders assisting patrons in avoiding drunk driving depended largely on the relationship between patron and bartender. Furthermore, the authors noted considerable variation both among and within drinking establishments in bartenders' efforts to help patrons obtain a safe ride.

Hernandez and Rabow's (1987) study of interventions in drunk driving situations also provides information about the informal use of safe rides. They questioned 247 college student volunteers from an introductory sociology class to learn about incidents in which someone had tried to stop them from driving after drinking. Ninety-seven of the students reported experiencing such an incident. Most of the 89 reported interventions in which

someone drove the respondent home occurred at parties (49 percent), and a somewhat smaller portion (33 percent) occurred at friends' homes. Many fewer instances of respondents being driven home took place at either bars (12 percent) or restaurants (6 percent). The results of these two studies substantiate informal use of the safe rides tactic but obviously leave a great many questions unanswered.

Survey of Formal Safe Ride Programs

In 1986, the National Highway Traffic Safety Administration funded a survey of SRPs (Harding, Apsler, and Goldfein, 1988*a, b*) that followed the same procedure described above for our earlier study of the designated driver tactic. First, leads on 515 SRPs across the country were obtained using a snowball survey. After information for 325 programs were verified, detailed data were collected on 52 programs (see Harding, Apsler, and Goldfein 1987 for a directory that summarizes key features of the 325 programs). Twelve of the 52 safe ride programs were then visited by the investigators.

Characteristics of SRPs

We found SRPs existing in communities ranging from small towns to large cities. They were operated by numerous types of organizations, including cab and bus companies, charitable organizations, trade associations, hospitals, government agencies, and non-profit organizations set up specifically for this purpose. Many operated year-round, often providing service every day of the week. Safe ride programs advertised themselves both through the local media and with signs in drinking establishments and other locations. Programs run by transportation companies typically used their own dispatchers and drivers, while other programs used various combinations of paid and volunteer staff. Often, SRPs were staffed largely by volunteers and operated in conjunction with a transportation company that provided the vehicles and drivers.

Even though nearly all programs provided their service at no cost to riders, the average annual cost of the year-round programs was under \$12,000. Most programs obtained funding from a wide variety of sources, the most common of which were donations in the form of free advertising from the media, member fees paid by drinking establishments and/or corporations, donations from alcohol distributors, and fundraising activities.

Most programs accepted requests for rides either from drinkers or someone calling for the drinker, while some took calls only from drinkers and others only from alcohol servers. Many programs screened riders to make sure they fit their requirements, such as whether the rider was intoxicated, drove his/her own vehicle to the drinking site, intended to go directly home, and whether the origin and destination fit within the program's operating range.

The Number of Riders

As was the case with DDPs, reports of the number of riders transported by SRPs must be interpreted with caution. For instance, some programs could only make estimates, and others could not separate the number of requests received from the number of rides provided. Nevertheless, about half of the programs reported delivering roughly 400 or more rides per year, and about a quarter delivered 1,000 or more rides per year. Unfortunately, almost no ride programs gave estimates for the size of the target population. Since SRPs tend to cover entire communities or large sections of major cities, the number of eligible intoxicated drivers within their operating boundaries could be quite large.

Disadvantages of Ride Programs

Cars Are Usually Left Behind

Only a small percentage of SRPs (about 15 percent of those we contacted) transport drivers' cars or provide free transportation the next day to help drivers retrieve their vehicles. Obviously, some drivers may forgo a ride home knowing that they must leave their car behind. They may be concerned that returning home without the car will incriminate them; they may fear that their car will be stolen and/or vandalized if left overnight; or they may simply want to avoid the inconvenience of retrieving their car.

Determination of Level of Intoxication

With rare exceptions, SRPs rely on either the drinker or someone else at the drinking site to determine whether the drinker is too intoxicated to drive safely. Intoxicated individuals are notoriously incapable of accurately judging their level of intoxication, and research shows that even people who often observe intoxicated drivers, such as alcohol servers, tend to be poor judges of level of intoxication (Langenbucher and Nathan 1983). As a result, it may be the more cautious drivers who tend to seek out rides for themselves, while observers, such as servers, may tend to single out only the most obviously intoxicated individuals for a safe ride home. Various devices, such as "Know-Your-Limit" cards and breathtesting machines, could easily be made available to patrons wanting assistance in judging their level of intoxication. Even so, it might still be only the more cautious individuals who would use these devices.

Potential for Abuse

People who are not intoxicated can easily take advantage of many SRPs, as can intoxicated individuals who do not have cars. In an effort to minimize abuse, some SRPs screen clients. For example, some take requests for rides only from servers as one way of insuring that riders are intoxicated, and some ask to see driver's licenses and keys as at least partial assurance that the rider would otherwise drive. However, no information exists about the prevalence of inappropriate use of SRPs. Staff in some programs also reported efforts to screen out individuals who made frequent requests for rides. Unfortunately, those individuals (often referred to by program staff as "alcoholics") may be the ones who present the greatest danger on the roads.

A Special Case: Transportation to and From Drinking Locations

A rare variation of SRP transports drinkers in both directions – first bringing them to drinking locations and then taking them home from those locations. This "round trip" version of safe rides overcomes several important limitations of the "home-only" programs. For instance, the question of what to do about drinkers' cars disappears, since people do not drive their cars to the drinking locations. In addition, these SRPs make no attempt to determine level of intoxication, so the issue of abuse of the program disappears – anyone, intoxicated or not, can use these programs.

In those situations where the "round trip" SRP is practical, safe rides can become a nearly perfect solution to the drunk driving problem. The most common examples are special buses or trains that transport people to and from a scheduled event, such as a sporting event. Another variation occurs in Boston, where the mass transit system is kept

running later than usual on New Year's Eve to help transport the thousands of people attending events held in the downtown area. The problem with these versions of the safe rides tactic is that many drinkers may drive themselves home from the points where buses, trains, or subways deposit them. Another example of round-trip SRPs is the increasing popularity of limousine service on high school prom nights in some communities. If door-to-door service is provided, then there is obviously no driving after drinking.

The major obstacles to wider use of round-trip SRPs based on mass transit are the same ones that prevent wider use of mass transit in general. Given the widespread ownership of automobiles in most locations and the existence of an extensive highway system, mass transit cannot compete with automobiles on convenience and cost. Round-trip SRPs are a realistic option when (1) a large number of individuals live in relatively dense areas, and (2) they travel to drinking sites located in a relatively small geographical area. These conditions are typical of some college towns. Dormitories might be clustered in one area and fraternities and sororities in another, while many of the favorite drinking establishments congregate in one section of the nearby town. However, now that the legal drinking age has been raised across the country, most undergraduates cannot legally drink in drinking establishments. Consequently, there may no longer be sufficient traffic between campuses and drinking establishments to make round-trip programs practical.

The Costs of Expanding Safe Ride Programs

If SRPs are to be more effective, they must transport more riders. Yet, it is not clear whether the existing sources of funds and/or volunteers could keep pace with a significant increase in the use of SRPs. The key, of course, is determining how much the ridership would increase if efforts were made to expand the role of SRPs. The answer to that question depends largely on the nature of the population of potential riders that is chosen as a target. For example, SRPs could transport anyone who wants a ride, or they could be restricted to intoxicated individuals. If riders must be intoxicated, then a level of intoxication should be chosen. The commonly used BAC of 0.10 percent is an obvious candidate, though a much lower level, such as the 0.05 percent BAC recommended by the American Medical Association (Council on Scientific Affairs 1986) must be considered. Will potential riders have to prove that they would drive if they are refused use the safe ride program? Will passengers trying to avoid riding with an intoxicated driver be transported, as is usually the case with existing SRPs? Will underage drinkers be transported? The maximum length of rides and permissible destinations of trips are other factors that markedly impact cost estimates. At present, little is known about how the number of eligible individuals would vary with the selection of different target populations. Nor is there information on the percentage of eligible people who might be persuaded to take advantage of SRPs.

At least two other types of costs must be considered in planning for broader use of safe rides programs. First, drinking establishments might have to increase their parking facilities to hold the cars that accumulate as their intoxicated drivers receive alternative transportation home. Second, the cost of transportation back to the drinking site at a later time for drivers to retrieve their cars must be included in the overall equation. These costs can be built directly into the SRPs by having them transport cars along with their drivers. For example, a few SRPs transport riders' cars with tow trucks or provide a second, sober driver.

On the other side of the cost issue is the question of who would pay for an expanded system of SRPs in the event that existing funding sources could not cover the costs. There are several possibilities. Additional expenses could be borne by those who obtain rides, or the costs could be spread across a larger population, such as all drinking estab-

lishments, all drinkers, or even across all taxpayers. Cost sharing, say between riders and drinking establishments, is another option.

Finally, an effort to markedly expand SRPs will almost certainly depend heavily on taxicabs. Consequently, it will have to contend with the 50-percent drop in the number of taxicabs and the 40-percent decline in taxicab operators that occurred over a recent 10-year period (Gilbert et al. 1984). On a more positive note, Teal (1985) reported on developments in the taxicab industry that may improve its financial health.

Conclusions

The designated driver and safe rides tactics comprise a class of transportation alternatives that help reduce the number of intoxicated drivers on our roads. Both tactics enjoy broad support from potential users and can be employed in virtually any drinking setting. Safe rides programs make even fewer demands on drinkers than the designated driver tactic and can be successful without advance planning. Hundreds of designated driver and safe rides programs have been established in a broad array of settings. They cost little to operate in their present forms and receive broad support from drinkers, drinking establishments, community organizations, activist groups, and the alcohol beverage industry. Yet, two key questions remain: (1) Just how much impact have the designated driver and safe rides tactics had so far in reducing numbers of intoxicated drivers? (2) What is their potential for making a further reduction?

Formal DDPs, according to reports of the programs themselves, produce relatively few designated drivers. While some people employ the designated driver tactic on their own, they may do so infrequently. Based on scanty results, the main effect of publicity about the designated driver tactic may be to encourage drinkers to ride with abstainers or light drinkers when such individuals happen to be available and willing to transport others. The most important disadvantages of the designated driver tactic are probably the need for planning and the existence of many circumstances where the tactic is unappealing to drinkers and/or logistically impractical.

Nationally, SRPs transport thousands of individuals each year. However, riders' levels of intoxication have not yet been documented, nor has the number who would have either driven or obtained a ride from an intoxicated driver in the absence of SRPs been verified. Furthermore, little is known about the numbers of eligible riders and the feasibility of markedly expanding the scope of SRPs. One likely obstacle to increasing ridership is the requirement in many SRPs that riders leave their cars at the drinking site.

The policy implications of existing data are that the designated driver and safe rides tactics should continue to be encouraged and supported with the clear understanding that these strategies are limited in what they can be expected to accomplish. Until additional research shows otherwise, it appears that these strategies are unlikely to fulfill what, at first glance, appears to be their enormous potential for reducing the numbers of intoxicated drivers.

Of the two strategies, the designated driver tactic is the more questionable. At present, the only prudent position is to remain extremely skeptical about the impact that it can have. In those circumstances when use of the tactic is both appealing and practical, it can be completely effective in eliminating intoxicated drivers from the roads. Research is necessary to determine how often those circumstances exist and to explore the possibilities for increasing the frequency with which they occur. Safe rides programs, especially when coupled with servers and hosts assuming the responsibility for detecting intoxication and ensuring the use of alternative transportation, can be extremely effective. Here, too, research is necessary to determine just how effective SRPs are in practice and how serious are the obstacles to their wider use.

Use of the designated driver and safe rides tactics could be increased by addressing some of the problems discussed above. For example, participation in the designated driver tactic could be bolstered by stressing the need for planning and encouraging drinking establishments to provide incentives for groups of drinkers who arrive in a single car and also participate in a DDP. More people would probably take advantage of SRPs if their cars were transported. Employers could help by following the lead of those who distribute coupons for a free ride to their employees, thereby making it increasingly difficult for them to justify driving while intoxicated.

Motivation Is a Key Factor

Ultimately, however, the prospects for expanded use of the two strategies may depend less on their specific characteristics than on the level of motivation among drinkers to avoid drunk driving. Both strategies are primarily procedures that can be employed by drinkers who are already motivated to avoid drunk driving. While publicity about DDPs and SRPs may reinforce concern with drunk driving and may trigger action when presented during drinking activities, it probably contributes relatively little to overall motivation.

Results from surveys cited earlier are consistent with this line of reasoning. For example, Snortum, Hauge, and Berger (1986) attribute the much greater use of transportation alternatives in Norway than in the United States to national differences in attitudes toward drinking and driving. They make no mention of differences between the two countries in either publicity about transportation alternatives or in availability of these services. Similarly, the discrepancy between American's widespread approval of both the designated driver and safe rides tactics and their infrequent use of the tactic points to lack of motivation as a likely explanation.

More Research Is Essential

The tentative conclusions presented here are largely speculative due to the paucity of data. Thus, the one clear message that emerges from the area of transportation alternatives for intoxicated drivers is the need for additional research. The scarcity of research is surprising given the central role that alternative transportation will have to play if drunk driving is to be substantially reduced. Drinking practices appear to be relatively immune to change. Consequently, the success of efforts to motivate people to avoid drunk driving will depend heavily on the availability of attractive and practical alternatives to driving.

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Server Intervention and Responsible Beverage Service Programs

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The recent rise in alcohol-impaired automobile crashes, injuries, and fatalities after a dip in those rates over the past few years reminds us how intractable this problem is. School-based education and mass media programs, intensified law enforcement, and court-ordered treatment programs have no doubt changed the normative climate regarding drinking and driving, and yet something about the phenomenon limits the effectiveness of these attempts to change individual attitudes and behavior.

Recognizing that people's ability to alter their habits depends greatly on situational influences, prevention specialists have turned their attention to reducing the risk of alcohol-impaired driving through modification of the drinking environment itself. Altering those contexts can, in conjunction with the educational approaches, reduce risk to a far greater degree than would either strategy alone.

Server intervention refers to a broad set of strategies to create safer drinking environments that first, reduce the risk of intoxication and second, reduce the risk that intoxicated persons will harm themselves or others. These strategies include specialized training for servers and managers, but could also comprise raising the prices of alcoholic beverages, promoting food, and altering decor to foster safe drinking. Since approximately half of those driving while intoxicated (DWI) come from a place licensed to sell alcoholic beverages (O'Donnell 1985), it seems natural to look at ways to intervene in those places to prevent the problem.

In a series of articles, Mosher (1979, 1983, 1984a) has laid out a conceptual framework for server intervention that addresses environmental reforms at two basic levels: the legal environment and the specific environment of the licensed establishment. The broad goal of server intervention is to work in a coordinated fashion at both levels to achieve consistent and effective prevention.

The first and most encompassing level, the legal environment, includes dram shop (civil) liability law, State and local Alcoholic Beverage Control (ABC) codes, and criminal statutes that affect serving practices. Dram shop (liquor liability) laws are those that hold commercial servers (and sometimes social hosts) liable if they serve obviously intoxicated or underage persons who subsequently cause harm to others or themselves. Mosher (1984a) as argued that current liability laws are vague and pay little attention to their potential in preventing alcohol-related deaths and injuries, and has coauthored a model dram-shop law that would correct these deficiencies (Colman et al. 1985). ABC

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statutes and regulations also, of course, determine how, when, and where alcoholic beverages may be served, but there again, little heed is paid to prevention. Indeed, many view these provisions as "quaint but outdated remnants of a past era" when the primary concern was with controlling vice and other criminal activity (Mosher 1984b). Criminal statutes constitute a third facet of the legal environment, usually drafted to state explicitly what is often contained in ABC codes and dram shop laws (e.g., laws prohibiting sale to minors or obviously intoxicated persons).

The level that has received more attention is the environment of the establishment itself. The earliest server intervention programs concentrated primarily on training servers to recognize intoxication and refuse service to any customer who appeared intoxicated.¹ As they gained experience with such programs, however, many trainers felt that server training alone was not sufficient to prevent intoxication.² First, intervention took place after the onset of intoxication, and second, servers seemed unable to carry out their new responsibilities unless management and management policies were solidly behind the prevention effort. Thus, more comprehensive programs were developed to include review and modification of management policies and operations, in addition to training for employees. Reflecting the evolution, one now hears more about "responsible beverage service" than server intervention per se.

The review and revision of management policies are not limited to those prohibiting alcohol sales to minors and obviously intoxicated customers. They also focus on the availability and promotion of nonalcoholic beverages and food, standards for customer behavior, minimum staffing levels, transportation for intoxicated customers, and full management support for servers who limit their customers' consumption.

Server training is necessary because most new policies require the server to accommodate to several major changes. Servers must redefine their role with respect to the customer and learn a new set of skills for monitoring and controlling customers' drinking. In addition to concrete knowledge and skills, however, training must help servers understand the program goals, modify their own attitudes about alcohol and its service, and overcome any fear or anxiety they may have about their new duties.

Research to Date

In the last couple of years, a handful of server intervention studies have been conducted. Although their aims and methods differ, each has tried to estimate the impact of server training or server intervention on either the server's behavior or the customer's consumption of alcohol. Very little (if any) systematic research has yet been conducted regarding specific components of a program, or how the program can be delivered for maximum impact and efficiency.

One of the first evaluations of server intervention, the Navy Server Study (Saltz 1987), sought simply to determine whether the concept of server intervention had potential merit as a prevention strategy. Two similar Navy Clubs for enlisted personnel were selected, with one serving as a program site and the other as a comparison. The test site employed approximately 50 people who had direct contact with customers. It took in

1 For a brief history of Server Intervention programs and evaluation, see Saltz, R.F. Server Intervention: Conceptual overview and current developments. *Alcohol, Drugs, and Driving: Abstracts and Reviews* 1(4):1-14, 1985.

2 One may compare the proceedings from the 1984 and 1987 Responsible Beverage Service Forums sponsored by the Responsible Hospitality Institute of Springfield, MA. The proceedings from the latter meeting of program and research specialists revealed a much greater concern for management systems to support server training.

over half a million dollars from alcohol sales in 1985 (when the data were collected), and would get as many as 800 customers on a busy night. The program itself involved extensive consultation with the club manager, producing several changes in club policies and practices, and an 18-hour training course for all staff.

The policy changes included promoting nonalcoholic beverages and food, overtly delaying service of an alcoholic beverage if it would put the patron at or above the legal limit for intoxication, and discontinuing the sale of beer in pitchers. Food service, which had previously been segregated from the bar area, was installed in the barroom, and money incentives were provided for servers and cooks to promote food sales. In addition, where servers had been free to serve customers anywhere in the building, the new program assigned them to specific sections of optimal size so that customers' consumption could be monitored. The food and beverage menus were expanded and drink prices raised marginally to cover the program costs.

The training course, broken into five modules and spread out over as many weeks, covered the reasons for change, alcohol's effects on the body, monitoring customers' consumption to know when they had reached the limit, and techniques to pace service and refuse it when necessary. Group discussions and visual presentations were used throughout the 18-hour program, with role-play exercises dominating the last two sessions.

Data to measure the program's impact came from interviews with randomly selected customers, structured observations of selected customers' consumption, and archival data of alcohol and food sales provided by the clubs. The project did not measure changes in server behavior, primarily because the researchers could not agree on a method, but also because the prime question was the program's effect on patron consumption. Data were collected for 2 months prior to program implementation and 2 months following.

Results have been reported from the interview data. Customers were interviewed on Thursday, Friday, and Saturday nights for 3 to 5 minutes. Questions included arrival time, mode of transportation, consumption of specific foods and beverages, frequency of patronage, age, height, and weight. The primary dependent measure was whether the patrons were over their "limit" as defined by a drink-counting system introduced in the training (a limit based on the number of drinks, the duration of time drinking, and the patron's weight category). This limit, incidentally, corresponds very closely to the BAC estimate derived from a formula given in Segal and Sisson (1985). A logistic regression analysis that statistically controlled for intervening variables showed that the risk of intoxication, which was as high as 32 percent for males at the test site, was cut in half (to 15 percent) after the program was implemented. For females, the rate dropped from 5 percent to 2 percent. Figure 1 shows the cumulative distributions of BAC levels (pre- and post-program) at the experimental site. Note, for example, that the BAC for the 70th percentile dropped from approximately 0.12 percent to 0.07 percent.

While the Navy study accomplished its goal of showing the potential for server intervention, many questions remained about the generalizability of its findings, the relative effectiveness of the training and policy changes, and the need for such extensive consultation and training to achieve the results. The servers' behavior was not monitored, the evaluation only assessed the short-term impact, and no one knows how the Navy Club setting may differ from commercial establishments.³

A second study, reported by Russ and Geller (1987; Geller et al. 1987), concerned

³ While some wonder whether the Navy Club was a more controlled environment, it was not unusual to see fistfights break out on the premises, along with the usual attempts by underage patrons to obtain an alcoholic beverage. The club was also under constant pressure to produce the profit necessary to keep various other recreational base operations funded.

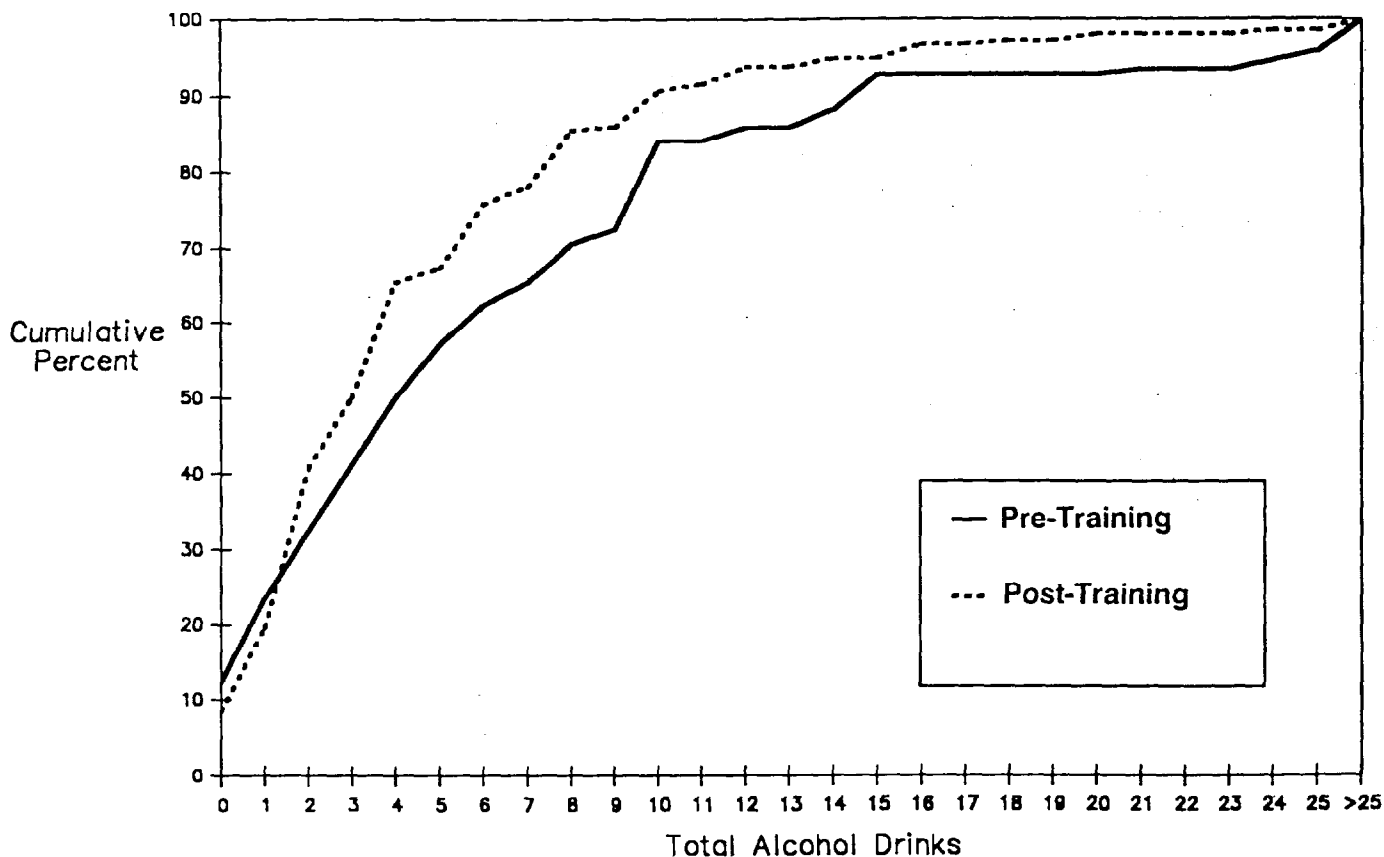


Figure 1. Experimental site interview data, pre- versus post-training

one of the commercially available server training programs, TIPS (Training for Intervention Procedures by Servers of Alcohol) (Chafetz 1984). This program comprises a 6-hour course that includes video vignettes, group discussion, and role-playing, with an emphasis on identifying signs of impairment, pacing service, checking patrons' age, and promoting alternatives to alcoholic beverages. The trainees must then score at least 70-percent correct on a 40-question written test to become certified servers.

The authors recruited 17 trainees from two commercial establishments, ending up with about half the employees having been trained. Research assistants, posing as customers, entered the establishments 24 times before and 25 times after the training and attempted to order and consume a drink every 20 minutes over a 2-hour period. If the training were effective, the server should intervene in some way to slow down or terminate the "pseudopatrons'" consumption. Russ and Geller counted the type and number of interventions for each drink ordered (up to the maximum of 6 drinks) and compared the type and frequency of intervention for the trained staff ($n = 17$) and the untrained staff ($n = 9$) against the pretraining baseline (type and frequency of interventions) with all staff ($n = 24$). They found that while the untrained staff intervened no more frequently than at baseline (about 0.75 interventions), the trained staff intervened more frequently (3.24 interventions). Interventions included the offer of food or water, checking ID, delaying service, commenting on the quantity or speed of the customer's alcohol consumption, and making a driving-related comment.

A second measure of the program's impact was the pseudopatrons' BAC taken after the 2-hour drinking period. Whereas those served by the untrained staff had BACs as

high as baseline (mean of 0.103, with four of nine pseudopatrons above the legal limit), none of those served by the trained staff was over the legal limit (mean of 0.059 BAC).

These results were obtained without the benefit of policy changes at the management level or having all staff at an establishment working together to make the program a success. It would certainly be interesting to compare these findings with those obtained when all of an establishment's staff was trained at once.

In contrast to the Navy Server Project, the TIPS evaluation addressed training per se rather than training as part of a broader program. Its advantages include a direct measure of the server's behavior and its impact on the pseudopatron's BAC but, as with the Navy study, it has a few weaknesses as well. It, too, measured program impact in the short term, collecting baseline and posttraining data over an 11-week period. Though the trained servers were more likely to intervene, the interventions themselves were fairly mild. For instance, only 10 of the 55 interventions involved delay of service, and half of those were during the first three drinks, with no server delaying service of the sixth drink. The modal intervention was the offer of food or water, which accounted for about a third of the interventions. Eleven of the 13 interventions occurring on the sixth drink were either offers of food and water, or comments about the pseudopatron's consumption or driving. At no time was service refused.

The mildness of the interventions was reinforced by the few examples given of how they were coded. The pseudopatrons were accompanied by a confederate who activated a small tape recorder when the server and pseudopatron interacted. Two research assistants, blind to the pre- or post-training condition, independently coded the interventions. "Delay of service" could mean that the server offered to refill the confederate's nonalcoholic beverage without offering to get the pseudopatron another alcoholic drink. Since the confederate ordered only one drink during the 2-hour period, it's hard to interpret the significance of the "delay." A "driving-related comment" could be asking who was driving or suggesting that a nondrinking partner drive carefully. These interventions do not seem capable of having a major impact on driving while intoxicated.

What, then, of the pseudopatron's BAC? Here again, interpretation is complicated. The pseudopatrons were instructed to order a drink every 20 minutes for 2 hours. If the server intervened, they were to react in a manner similar to their normal drinking behavior. If offered food, for example, the pseudopatrons were told to accept it if they were hungry. This leaves the BAC measure to be a result of the interaction of the server's behavior and the pseudopatron's (unmeasured) inclination to accept the offer or heed the comment, whatever the case may be. As an example, two pseudopatrons could enter the same establishment, one could accept the offer of food while the other wasn't hungry. They would then presumably exit with different BACs despite identical "interventions" by the server. If the pseudopatron's behavior is not consistent, the generalizability of the results is uncertain.

While we know the mean level of intervention increased for 17 trainees, we cannot tell from the reported data whether the increase in intervention was widespread among the trainees, or whether, say, 2 or 3 trainees were especially active and accounted for all the interventions while the other 14 or 15 remained unaffected by the training.

Finally, individual trainees were not compared pre- and post-training, since the baseline data did not identify servers. Since the pool of trainees was basically self-selected, we don't know the degree to which the serving practices between the trained and untrained servers were different even before the training.

The National Highway Traffic Safety Administration (NHTSA) has sponsored two demonstration and evaluation studies of server intervention. The first, called TEAM (Techniques of Effective Alcohol Management), represented a collaborative effort of NHTSA and several other organizations, and focused on alcohol service at seven selected arenas associated with the National Basketball Association (NHTSA 1986). The

program called for policy review and revision, followed by a 4-hour training covering the drinking and driving problem, liability law, alcohol's effects, recognizing impairment, policies and practices, and dealing with alcohol and drug related incidents. All arena employees were included in the training, not just those who served beverages.

The TEAM evaluation report is hard to assess because the evaluation activities were directed toward program development. The program was constantly changing as different data were collected at subsets of the seven participating arenas. The program was evaluated through a combination of a followup review of arena management policies (at five sites), surveys of staff and patron attitudes and reported behavior (at seven and three sites, respectively), and a review of sales data from two sites. The study showed that the program did result in policy revisions at the participating arenas, and that alcohol consumption (especially beer) declined in two sites while food and nonalcoholic beverage sales increased.⁴ Through data collected from the staff and patrons, the researchers also concluded that management support was critical to the success of the program, and furthermore, that the support had to be visible for the staff to carry out their own responsibilities.

The TEAM evaluation is best thought of as an informal summary of loosely organized quantitative and qualitative data, much of which was apparently collected after the programs were in place. It provides many suggestions to program designers and trainers, but should not be considered a formal impact evaluation. The authors of the report, in fact, state that a formal evaluation design was inappropriate for their purposes and needlessly constraining.

NHTSA also sponsored a study conducted by McKnight (1987) that involved the development and delivery of a responsible beverage service program to 32 establishments in Louisiana and Michigan. In this study, a 3-hour training was given to servers and managers, with 3 additional hours for the managers alone; 245 people were trained in all. A specially selected group of 10 establishments in each State was used for comparison, along with 24 establishments that were invited to participate but did not.

The emphasis of the training was on prevention, providing the servers with strategies to prevent customers from becoming intoxicated. If service is performed responsibly, it should not be necessary to refuse service to anyone. The server's training used videotapes followed by discussion of the material shown in the tapes. The training covered the concept of server liability, the moral and legal responsibility to prevent intoxicated patrons from driving, and the physiological effects of alcohol. The course then moved to prevention, including checking ID, serving food and nonalcoholic beverages, providing activities, and observing patrons for signs of impairment. The final module for servers covered intervention — what to do when customers became intoxicated — and included such tactics as delaying service, providing alternative transportation, and refusing service. The servers were expected to know when intervention was needed, but the managers were expected to carry it out.

The extra 3 hours for managers covered intervention skills and strategies (with role-play exercises) and a section on responsible alcohol service business practices, where managers were encouraged to formulate policies relevant to their own establishments.

The program's effectiveness was measured via pre-post differences in scores on a 10-item knowledge test and a set of 10 items measuring opinions about the service of alcohol. The knowledge test comprised different, but equivalent, items for the pre and post-tests, while the opinion scale remained the same for both administrations. In a

⁴ The report does not offer consistent data on these changes, nor are there significant tests. Given the lack of comparison sites, it would be difficult to attribute changes in the test sites to the TEAM program alone.

separate set of items, servers were also asked about the frequency with which they engaged in several different types of activities related to prevention (e.g., offering coffee, inquiring as to who is driving, refusing service). Managers were given a checklist of beverage service policies (e.g., closing hours, availability of snacks) to indicate which they employed at their establishment. The same forms were given to servers and managers 4 months after the training.

Research assistants were used in this study, also, to pose as customers, but here they were to feign intoxication when entering the establishment to see if they would be served a drink despite their condition. The pseudopatrons were trained to maximize the consistency of their behavior, which included staggering to their table, missing the chair or stool when sitting, slurred speech, and exhibiting difficulty in handling the money to pay for the drink. After 15 minutes, the pseudopatron would leave the establishment and record details of the encounter, whether any intervention had taken place, and whether any customers were intoxicated or drinking despite appearing underage. All establishments were visited four times by four different assistants before and after the training.

The results of the Louisiana and Michigan programs differed somewhat. Knowledge scores increased in both States, with Louisiana trainees (n = 120) improving their scores from a mean of 6.35 to 7.65, and Michigan scores (n = 95) improving from a mean of 6.24 to 8.23. The Michigan score change was (statistically) significantly greater than the other State's. The trainees' opinions became more favorable, too, after the training, with the Michigan trainees starting out with more favorable opinions than the Louisiana trainees.

A self-report, serving practices questionnaire was completed by 55 percent of the Louisiana servers and only 29 percent of the Michigan servers. Apparently, many of the servers had quit working at their original establishments, and some had been promoted to managers. Both sets of servers reported a statistically significant increase in responsible serving practices. The manager's reports on serving policies showed a significant change in policies in Michigan but not Louisiana.

Table 1 summarizes the level of intervention by servers confronted by the "intoxicated" pseudopatron. One can see that in the best of circumstances (the Michigan treatment post period), the pseudopatrons were served 72 percent of the time with no intervention of any kind. On the other hand, outright refusal of service jumped from 3

Table 1. Distribution of server action by experimental group, site, and period
(in percents)

Server action	Louisiana				Michigan			
	Treatment		Control		Treatment		Control	
	Pre N=62	Post N=62	Pre N=127	Post N=126	Pre N=63	Post N=61	Pre N=141	Post N=135
Service, no intervention	92	90	93	85	87	72	86	86
Service, status	3	3	4	2	3	7	6	5
Service, alternative	3	3	3	10	3	0	3	4
Service, slow	2	0	0	0	3	2	3	0
Service, transport	0	0	0	0	0	0	0	1
Service, final	0	0	0	0	0	3	1	0
No service	0	3	0	2	3	16	2	4

Source: McKnight 1987.

Table 2. Mean intervention level by experimental group, site, and period for collapsed intervention score

Time	Louisiana			Michigan			Total
	Treatment	Control	Both	Treatment	Control	Both	
Pre	.08	.07	.07	.16	.16	.16	.12
Post	.13	.17	.16	.44	.18	.26	.21
Diff	.05	.10	.09	.28	.02	.10	.16

Source: McKnight 1987.

to 16 percent in the same group of establishments. While the Louisiana treatment group was more likely to refuse service after the training, so was the control group.

To test the outcomes for statistical significance, the author collapsed the intervention levels into "service without intervention," "service with some form of intervention," and "no service," with scores of 0, 1, and 2, respectively. Table 2 shows the resulting differences across sites and conditions. An analysis of variance (ANOVA) showed that the program produced in a significant increase in interventions in Michigan, but not Louisiana. Unaccountably, the Louisiana control group's increase in intervention was greater than the treatment group, primarily in their suggesting alternatives.

McKnight concluded that the program can improve knowledge and attitudes and can produce a small increase in interventions, but, depending on situational variables, changes in management policy may be small and limited, and finally, the type of establishment influences the program's chance of success. In particular, the program seems to be most successful in places with a smaller volume of sales, or that serve affluent clientele.

The latest reported evaluation of a responsible beverage service program was conducted by researchers of the Addiction Research Foundation in Toronto, Canada (Glicksman and Single 1988; Simpson et al. 1986). Here, manager and complementary server training courses were given in four different types of establishments in Thunder Bay, Ontario, with four other sites used for comparison. Managers and owners were trained to implement specific policies of which servers were aware and which would reinforce the desired serving practices. Training for servers included such topics as serving and the law, health, preventing intoxication, and managing intoxicated persons. The training emphasized clear and concise steps for servers to take. The program also set a limit on the number of drinks a customer could have.

A 35-item true/false test was used along with three open-ended items to assess changes in trainees knowledge of appropriate serving practices. A t-test showed significant increases in both portions of the test, with true/false scores improving from 24.1 to 30.2, and the open-ended items from 1.3 to 5.3 (out of a perfect score of 11).

The study also adapted and expanded on the pseudopatron approach used in the Geller and McKnight studies by devising seven alternative scripts for the pseudopatrons, covering different situations that would require intervention, as follows:

Being too "young" to be served

Ordering too many drinks at once

Ordering too often

Displaying drunken behavior and disorderly conduct

Displaying drunken behavior but quiet conduct

Preparing to drive home when obviously intoxicated

Ordering drinks when intoxicated

The research team also constructed a 12-point scale of server responses to these incidents, ranging from a -6 for unsolicited service of more alcohol (when service should be denied) to +6 for calling the manager over. Intermediate scores were assigned for responses that fell in between—for example, a -1 for ignoring the customer and a +2 for commenting on the pseudopatron's behavior. If the server's actions involved more than one response, the scores were added together.

Pre- and post-measures of knowledge about alcohol and good serving practices showed a significant improvement among those who had been trained, and measures of receptivity to the training were also positive. ANOVA was conducted with three pairs of matched bars (the fourth pair had to be eliminated because of untrained staff in the experimental site) using a 2 X 2 repeated measures design using time (pre versus post intervention) and group (experimental versus comparison). The dependent variable was the server's response scores (with a constant added to make all scores positive). As with the Navy Server study, results showed both a time effect and an interaction of time and group. The mean score of the comparison sites increased slightly from about 16.3 to 16.9, while the experimental sites' mean score rose from about 15 to over 21 (see figure 2). It seems clear that the trained servers had moved toward more appropriate responses to the problematic scenes acted out by the pseudopatrons.

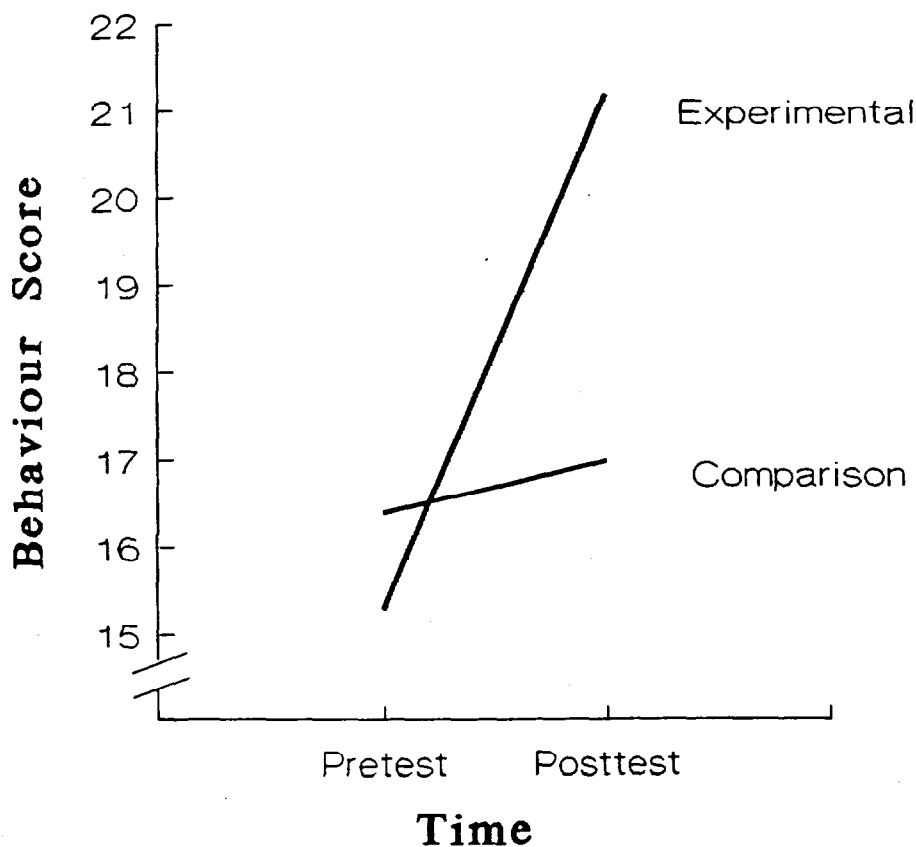


Figure 2. Server behavior—interaction of time by group

Source: Gliksman and Single 1988.

As with the other evaluations, only short-term effects were measured, and again, one cannot tell from the report how widespread the interventions were across trainees. Since the server could respond in several ways, it is theoretically possible with an additive score for a few servers to have exceptionally high scores while others remained unchanged, resulting in an overall gain in the mean intervention score.

In summarizing the existing research, we should point out that these studies differed in their aims. The TEAM study did not employ a strict evaluation design partly because the researchers felt it was not appropriate for program development, but also because they wished to remain open to any opportunities to get a "feel" of how the program was working. The Navy study was trying to measure the impact of a comprehensive program that included more than server training on customer consumption, and thus, did not focus on the servers' intervention so much as on whether the overall program both reduced customer demand and limited the supply of alcohol.

The TIPS evaluation and the McKnight study, on the other hand, were explicitly concerned with whether the server training had increased the likelihood of intervention by the server directly. It is unclear why the TIPS program would have seemed somewhat successful despite having only some of the servers trained and no particular management support, while the McKnight program had a limited impact in only one of the two States. Perhaps the difference was due to the different definitions of "intervention." For the TIPS study, mild forms (comments, offering food and water, etc.) were weighted alike, whereas for McKnight's analysis, mild forms were scored lower than refusals. On the other hand, the TIPS pseudopatrons did not necessarily show overt signs of intoxication as did the other study's staff. One might guess that refusal of service to obviously intoxicated customers would be one of the easier objectives to achieve in the training.

Research Recommendations

Obviously, we have only just begun to explore this promising avenue for prevention. The studies summarized above were designed to assess the potential for server intervention. There are, of course, a host of specific questions remaining regarding the proper emphasis for such prevention strategies and questions regarding the social and legal environments that may encourage the intensity and growth of responsible beverage service. Among these research questions are the following:

- *Training curriculum.* How much emphasis is needed on "affective" topics versus specific skills in intervention? Which modes of training (e.g., lecture, videotape, group discussion, role play) are best suited for each topic in the curriculum? How long must the training be? Who should be trained? What kind of followup training is required and how often should it be offered?
- *Establishments.* What program modifications are necessary for very large or small businesses? Should the program be tailored for different clientele (e.g., upscale versus casual)?
- *Management policies.* Which policies and practices should be considered the minimum necessary to create an environment conducive to the prevention aims of the training? Which specific practices pose the largest risks for intoxication (e.g., happy hours or other promotions)? What is the impact of patron education?
- *Social and legal environment.* What role does dram shop liability play in encouraging effective programs? What is necessary for insurance companies to offer meaningful discounts to businesses that participate in responsible beverage service programs?

Summary

It should be clear that much remains to be done to refine the design and implementation of server intervention or responsible beverage service programs. While current results are somewhat mixed, there does seem to be an opportunity to reduce the risk of intoxication, or at least the level of intoxication, among customers at licensed establishments.

Obviously, research and evaluation of server intervention or responsible beverage service is in its infancy. While we now have reason to believe that server intervention can reduce intoxication and subsequent alcohol-impaired driving, the results are mixed, especially regarding the size of that impact. When results differ, we naturally turn to questions about the nature of the programs being evaluated and how they were implemented. Further research can take the materials that were developed in the programs designed to date, compare their features, and begin a systematic exploration of which features should be kept and which discarded, which methods are best suited for delivering those elements, and what situational and environmental influences help or hinder an effective program's implementation.

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Injury and Disability Prevention and Alcohol-Related Crashes

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This chapter is built around four assumptions. First, contrary to the general impression of the public, and even of many working in the field of highway safety, about 80 percent of the people fatally injured in alcohol-related crashes are individuals who themselves had been drinking and are either drivers, impaired passengers of alcohol-impaired drivers, or impaired pedestrians (Waller 1985). About two-thirds of injuries in alcohol-related highway crashes also involve such individuals.

The image of the innocent victim who is run down by a drunken driver who escapes all injury himself has great emotional impact but only limited support from the real world. We have a responsibility to be fully aware that injury to the innocent is not the largest aspect of the problem.

Second, the tendency over the years has been to see issues involving alcohol and injury primarily as a safety problem, rather than a public health concern. As work over the past two decades has shown, reinforced by the recent National Academy of Sciences report *Injury in America*, injury is the primary cause of lost productive years of life in the United States, and alcohol abuse is an important contributor to that toll (National Research Council Committee on Trauma Research 1985).

A very substantial proportion — probably a majority — of persons who get into trouble with alcohol on the highway are not typical social drinkers, but rather problem drinkers or alcoholics. The safety issue is only part of a much larger public health problem.

In looking at the safety aspect, we must constantly be aware of this broader perspective. For example, an important effect of increasing the age for alcohol consumption to 21 was the reduction in the highway crash toll among teenagers. But, although at least some short-term data suggest otherwise (Vingilis and Smart 1981), it may be that the most important long-term result of such legislation will be to reduce a wide range of alcohol-related problems among teenagers and the onslaught of teenage and young adult alcoholics that we began to see when the drinking age was lowered to 18.

Third, during the late 1960s, Dr. William Haddon developed a matrix of highway crash analysis in which human, vehicular, and environmental factors interact during the precrash, crash, and postcrash phases to determine the occurrence, initial severity, and ultimate outcome of these events. He subsequently described generic interventions relevant to these phases in his brilliant paper, "On the Escape of Tigers" (Haddon 1970). In talking about injury prevention and amelioration, this chapter utilizes Haddon's basic approach, with an awareness of all three types of factors across all three phases of crash events.

Finally, this review is clearly not alone in discussing components of Haddon's nine cells. Therefore, this examination is quite selective, focusing on aspects that will not be considered by others or that will be considered in a different context.

Behavioral Issues in the Precrash Phase

How do we alter behavior to prevent the occurrence of crashes? All the other panels are concerned with one or another aspect of this area. This chapter focuses particularly on three aspects. One is the characteristics of the populations we are trying to reach.

As data expand, it is becoming increasingly clear that many people begin to be impaired at blood alcohol concentrations (BACs) below 0.05 gm/dl. But the data about who gets into trouble are equally clear. Over three-quarters of alcohol-related fatalities, and almost as high a proportion of alcohol-related injury crashes, involve drivers or pedestrians with BACs of 0.10 gm/dl or higher. Usually the BAC is much higher, averaging 0.16 gm/dl (NHTSA 1986).

My own work and that of others has focused on two groups of heavy drinkers, namely, teenage and young adult males, and problem drinkers and alcoholics. A new group causing increasing concern is teenage and young adult females who are drinking more and driving more, at least in part as aspects of their new independence (Fell 1987).

This discussion, however, focuses on a different issue, namely, the interdependence of lifestyle components. Studies show that those teenagers most likely to drive after drinking are also the ones most likely not to use seatbelts, to drive recklessly, to have less exercise, to prefer more fat in their diet, to have had premarital sexual experience, and to have done so without benefit of contraceptives (Jessor 1987; Maron et al. 1986). We know that heavy drinkers tend also to be heavy smokers, a fact not lost on the tobacco and alcohol beverage manufacturers, which often are divisions of single companies and thus are able to consolidate marketing strategies. A recent study by the Internal Revenue Service shows that individuals most likely to cheat seriously on their taxes are also more likely to be taking chances in other aspects of their lives, including speeding, drunken driving, adultery, and risky investments and sports (Goleman 1988).

This is precisely why it is so important to take a broader public health viewpoint. Specific behavioral interventions often show at least partial success. But such interventions all tend to bog down on the fact that they have minimal effect on those hard core segments of the population that are most overrepresented in whatever behavioral aspect they are trying to change.

The problem, simply stated, is that we are just beginning to learn which behaviors interact, and how, so as to create that entity we called lifestyle. We know relatively little about how lifestyles are either transmitted or altered between generations or within generations, and whether it is possible to alter selectively one aspect of lifestyle, even if it creates dissonance with other aspects. Frankly, we need such information if we are to do more than simply nibble around the edges of behavioral modification. Alcohol-related behavior is far too intimately and intricately tied to other life beliefs and behaviors to permit us to expect success with simplistic approaches to modifying behavior, especially as it relates only to the activity of driving.

The foregoing and subsequent comments may sound like a plea for more research, and on one level they are. But the ultimate goal is to achieve intervention programs that work. In addition to basic research, we need to try out interventions in such a way that they can be adequately evaluated to answer the following questions, among others (Waller 1980).

- Does the program alter behavior, morbidity, or mortality overall? Are any other activities or events going on in the community that may explain any changes observed? For example, the rise of activities by MADD, SADD, RID, and other groups concerned with alcohol and highway safety coincided with the end of the baby boom, and it appears that at least a part of the reduction in alcohol-related crashes can be attributed to the reduction in young males, rather than

to specific anti-alcohol activities. This is not a criticism of the activities per se, but rather of the method of determining effect.

- Is the program more or less successful with some segments of the population, or under some circumstances, than with others?
- What proportion of the total problem do those segments account for?
- What factors seem to explain the population or circumstance differences? Are the factors intrinsic to the population or circumstances itself, to the way the intervention was carried out, or to both?
- Can the program be modified in a way more likely to reach the hard to reach, for example, by addressing more specifically those unique aspects of knowledge, attitudes, and practices that make them a more difficult target?
- Given the availability of other nonbehavioral options for injury control, is the cost-effectiveness of the program sufficient to warrant its continuation, or are other options preferable?

The methods for answering these questions must be built into the initial design of the intervention rather than being tacked on as an afterthought. This requires early involvement of someone with skills and knowledge in process and outcome components of program evaluation. It has been said that knowledge without action is futile; but action without knowledge is fatal. We need sound use of both.

The third concern is about alcohol-impaired pedestrians, who account for 7 percent of all alcohol-related highway fatalities (NHTSA 1986) but a substantially higher proportion of those in urban areas. Most attention in the efforts to reduce the alcohol-related highway toll has been paid to the impaired driver, as indeed it should. But we must not overlook the pedestrian. Efforts to educate people about alcohol-related risks should also mention the risks to this group of road users.

An excellent study by Blomberg et al. (1979) in New Orleans showed that, unfortunately, it is not possible to identify high-risk locations where impaired pedestrians are more likely to be found. Nonetheless, some efforts aimed at high-risk populations may be of use. Efforts to provide alcohol in controlled settings on campuses, for example, may reduce the likelihood that college students will travel as either drivers or pedestrians after becoming impaired off campus. But apparently no evaluation of such activities has taken place. Clearly, more needs to be done in both the research and program areas.

Vehicular Issues in the Precrash Phase

There is a tendency to assign *all* responsibility for a crash to the driver or the pedestrian if alcohol is present. But, as Patricia Waller cogently notes (Haight et al. 1976),

The fact that the human error involved in accidents is frequently related to information failure (including recognition errors) strongly suggests that the demands of the driving situation are more than the driver can handle. There is considerable need to recognize that the human being varies in his performance and that on the whole it can be assumed that he probably does about as well as he can be expected to, given the circumstances. Accident investigations should be conducted in which the human element is taken as a given and the vehicle and environment are analyzed to determine the extent to which *they* need to be modified so that the human can function satisfactorily. Thus, simply because a vehicle is performing up to the manufacturer's standards does not mean that the vehicle performance is satisfactory. Perhaps the manufacturer's standards need to be modified and the vehicle performance enhanced. Simply because the roadway signing meets the criteria set down in a highway design handbook does not mean that the

signing is adequate. The criteria often used call for signs that can be readily viewed by drivers with 20/30 vision. Furthermore, the standards must be met only by the signs when they are new. Most highway signs remain in place for years, and many legally licensed drivers cannot meet a vision criterion of 20/30. Under such circumstances, when the driver fails to read the sign in time to make a decision, is it a driver failure? Most human factors experts would not agree, yet *accident causation studies persist in perpetuating the myth that drivers are somehow supposed to be able to compensate under any conditions for the shortcomings (legalized failures?) of the vehicles and driving environment.* (p. 48-49)

Ample evidence exists that vehicle design or other characteristics contribute to the occurrence of highway crashes.

- Perhaps the most obvious example involves the motorcycle, which combines special problems with stability and handling, reduced conspicuousness so that other drivers are less able to avoid it and, once in a crash, reduced survivability for the occupants. Recent work from California and New York indicates that special training and licensing requirements for motorcycle drivers are inadequate to compensate for these problems (Insurance Institute for Highway Safety). In 1986, fully 54 percent of motorcycle fatalities had been drinking (NHTSA 1986), but whether the unique features of the motorcycle exacerbate the effects of the alcohol impairment is not known. In other words, if a driver has a crash at a given BAC it is not known to what extent the vehicle handling characteristics versus the driver's handling capabilities contribute to the crash.
- One modification of motorcycle design that has aided crash avoidance has been linking the ignition switch to lights so that motorcycles always operate with their lights on during the daytime, thus increasing their visibility. The addition of reflectors to bicycles also improves the nighttime visibility of these vehicles, thus giving a car driver impaired by alcohol additional time to react.
- Issues of vehicle handling characteristics also are relevant to the crashes of certain utility vehicles that have a propensity to roll over in crashes (Reinfurt et al. 1982). When faced with the rollover data, persons representing the automotive industry on a related lawsuit countered that the overrepresentation of rollovers did not reflect the vehicle characteristics per se, but rather the sorts of people who drive these vehicles, for example, the fact that such vehicles are often driven by the young.¹ As seen in figure 1, the propensity to rollover is associated with age. Both the young driver and the "older" driver are at higher risk of rollover in crashes for two of the three models examined. If the issue were solely driver characteristics, one would expect to see overrepresentation only of young drivers, but not of those who have reached the "senile" years of 35 or older!
- But it is also known that the automotive industry – as does any industry – tries to target its buying audience by selective placement and design of advertisements to highlight vehicle characteristics that are likely to attract certain buyers. It is unlikely that many 45-year-old business executives drove around during the 1960s and 1970s in VW bugs, or currently use pickup trucks as their transportation of choice. It is equally unlikely that many 19-year-old laborers or college students are in the market for a Mercedes or Volvo or Lincoln Continental, and advertisements for these vehicles that appear to be aimed at these audiences are seldom, if ever, seen.
- How does all this relate to alcohol? A study from the General Motors research staff shows a strong correlation between "Youth Sport," "High Sport," "Sixties

¹Comments about the Reinfurt et al. paper by Kent Joscelyn and others during post-presentation question and answer period at AAAM meeting, 1982.

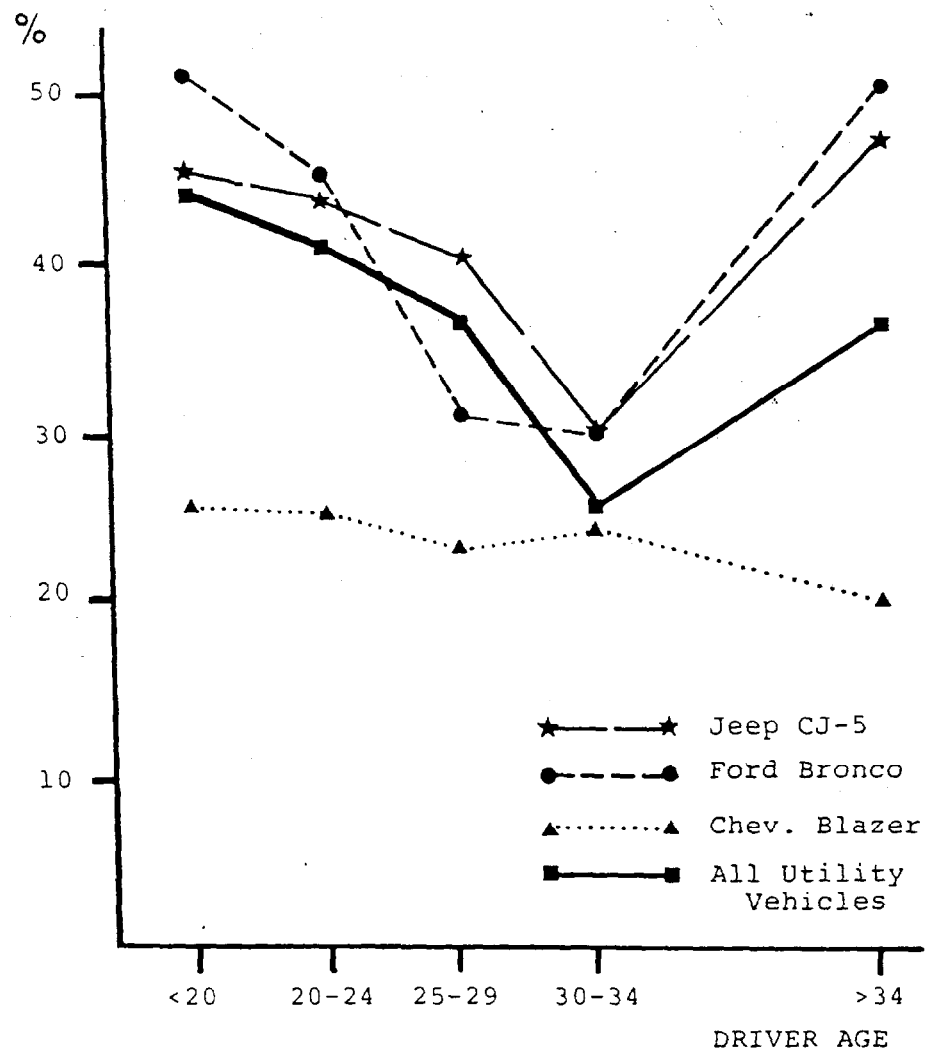


Figure 1. Utility vehicle rollover percentages by driver age for single vehicle crashes.

Generation,” and “Wild West/Cool Bravado” vehicles and likelihood of involvement or death in an alcohol-related crash, and either negative or no association for “Sedate, Self-restrained” or “Domestic Economy” vehicles (Angell and Von Buseck 1985). The authors of this research were not able to divulge which vehicles fit into such categories. The question, of course, is to what extent do handling characteristics of the vehicles involved make driving easier, more difficult, or have no effect for drivers with alcohol in their systems?

- Issues related to braking provide an additional vehicular example. Recent improvements of braking systems in more expensive vehicle models through the use of computers are aimed at a longstanding problem of brakes that lock up and permit the vehicle to skid. In considering the anticipation or early identification of a skid situation, Olsen (1978) has noted that suspension systems in many U.S. vehicles are sufficiently “soft” so the driver may realize he is beginning to skid when there is barely time, or it is already too late, to make an appropriate response.
- Given the fact that alcohol alters perception, judgment, and slows response

time, "soft" suspension and standard brake systems can only add to the demands of the driving task for a person who is already impaired. The recent installation of elevated rear brake lights is an important improvement to quickly alert drivers to potential danger and should especially benefit those with modest impairment by alcohol.

- Side and rear view vision systems have been faulted in many vehicles, especially trucks, and in 1972 an estimated 900,000 crashes per year were attributed to inadequate vision on trucks, with 500,000 of those believed to result from poor but correctable mirror design (Reiss et al. 1972). Alcohol severely affects vision, including narrowing of visual fields. Inadequacies of vehicle vision systems, therefore, are likely to be even more of a problem for the alcohol-impaired driver than for the average driver.
- Trucks present their own set of difficulties. In 1986, almost 5,100 medium or heavy trucks (over 10,000 lbs) were involved in crashes, in which 4,881 persons died. Only 16 percent of the fatalities were truck occupants (NHTSA 1986). Crash rates for trucks exceed those of other vehicles on all types of roads, including freeways, and when trucks account for 25 percent of traffic volume on an expressway system, a 3-percent increase in truck traffic produces a 23-percent increase in crash frequency per mile (U.S. Bureau of Public Roads 1963). Overwhelmingly, such crashes are more serious because the energy loadings are greater.
- Other drivers find it particularly difficult to maneuver in the presence of large trucks, not only because they are behemoths, but because they often are traveling faster or slower than the traffic flow, may be poorly visible at night, create aerodynamic turbulence and, in bad weather, may obscure the vision of other drivers by splashing their windshields. Each of these characteristics adds to the alcohol impairments of the driver. Therefore, the very presence of more trucks on the roads quite likely exacerbates the problem of alcohol-related crashes. Add to this the safety effects of deregulation and of increases in truck size and double trailers that have been approved at the Federal level and it is clear why we have a serious problem.

Roadway Issues in the Preinjury Phase

The earlier quote by Patricia Waller is relevant to issues of highway design and construction as well as to vehicles. It is not enough to know that individuals crashed because they were impaired by alcohol. The question also is, if they were so impaired, why did they crash where they did and not at an earlier location along their path? The answer often is that only at this location did the driving task become too demanding.

Much is already known about the types of roadway characteristics that increase demands on the driver and are associated with more crashes. In addition, some recent work has pinpointed the interrelation between some of these factors and alcohol impairment. Here are a few examples.

- Several studies done for the Insurance Institute for Highway Safety pinpointed roadway characteristics that are overrepresented in single vehicle crashes. One study in Georgia showed that such crashes are most likely to occur at or near curves of greater than 6 degrees, especially if associated with grades of 2 percent or more (Wright and Robertson 1976). These data, however, are not specific to drivers using alcohol, and it is reasonable to assume - but currently not known - that a person with a BAC of 0.10 gm/dl might be at greater risk at somewhat less demanding locations, e.g., curves of 4 degrees or greater with or without an associated grade.
- Presumably, the higher the BAC the less demanding the roadway that will prove

excessive. However, since the Georgia study examined single vehicle crashes, which commonly involve alcohol, it may also be that unimpaired individuals tend not to crash until the road is much more demanding and, in fact, the combination of a 6-degree curve and 2-percent grade is a good measure of the point at which the demand becomes too great for the typical driver impaired by alcohol. This can only be determined, however, by a BAC-specific analysis of crash environment.

- Increasing the speed with which a traffic light changes from green to red is associated with an increase in intersection crashes, whereas slowing the change cycle reduces the crash rate (Zador et al. 1985). A change of 20 percent, from 10-percent slower than that recommended in traffic management manuals to 10-percent faster, is associated with a fourfold difference in crash rate. Again, impaired drivers are uniquely likely to be affected by such changes because they have slower reaction times, especially for situations that involve making choices.
- A report from the National Transportation Safety Board (1980) identified the State of Utah as having two to three times as many crashes per day of wet weather as do the surrounding States. It does not seem reasonable to assume that Utah has more careless or alcohol-impaired drivers than these other States. In fact, given its large Mormon population, one would anticipate less alcohol use. The difference appears to be attributable to the Utah roads, which are built with a dense aggregate so that water doesn't drain off readily and vehicles can hydroplane easily.

While this situation has been documented for Utah, it is not known how often such differences in roadway construction contribute in extremely subtle ways to the occurrence of crashes, or to those involving alcohol. Police investigations simply take the roadway construction as an immutable fact and, if drivers skid, they assume it must have been something they did wrong, rather than considering the possibility that something may also have been wrong with the way the road was built.

- Two cases provide information about the effect of roadway characteristics on drivers at different BACs. One study indicated that drivers at BACs of 0.05 gm/dl, and, to a lesser extent at 0.10 gm/dl, are less likely to wander off the sides of roads or across the center line if the painted stripes are 6 or 8 inches wide instead of the usual four inches (Nedas et al. 1982). Test areas of roadway with wider side and center stripes had significantly fewer crashes than did standard roads.
- Other work shows that putting reflectors on signs or on pedestrians permits drivers with moderate BACs to recognize these features from a further distance (Hazlett and Allen 1969). Since the inadequacies of road sign placement, size, readability, and information presented have been well documented, such greater visibility and consequently longer time for the impaired driver to react can only be helpful (Tamburri 1969). Studies of wrong-way driving by alcohol-impaired drivers about 20 years ago identified problems of poor signage and inadequate separation of some on- and off-ramps on freeways and resulted in important and successful corrective actions (Alcohol and Highway Safety 1968).

The Missing Link in Alcohol-Related Crash Avoidance Research

Excellent information has existed for at least the past two decades about the relative risk of crashing that a driver faces at given BACs (Jones and Joscelyn 1978; Haight et al. 1976). Information is also available about the crash contribution, and sometimes even the relative crash risk, of certain vehicular or roadway characteristics. What is not known is how the three sets of data interact. To date, no study has specifically examined the

interaction of alcohol, roadway, and vehicular characteristics in crashes without making the methodologic error of assuming that the roadway and vehicular aspects were functioning optimally if they were working as designed and constructed. The fact that they may have been designed or constructed so as to increase crash risk has been considered irrelevant by prior researchers.

Again quoting Patricia Waller on this issue (Haight et al. 1976),

It is a serious error to consider the vehicle and environment as noncontributory simply because they meet the currently established standards. Most drivers also meet the currently established standards. After all, driver licensing programs exist precisely to see that this is the case. Critics may quickly point out that our licensing standards are not adequate, but cannot the same criticism be made with equal validity of the standards concerning vehicles and roadways? Why are these standards somehow sacrosanct while the standards used to license drivers are so readily the object of criticism? If the driver in a crash holds a valid license, then the argument can be made that he, too, has met existing standards and can be held no more culpable than the inadequate signing that is nonetheless legal. (p. 31)

Such unnecessary additions to the demands on the driver or the pedestrian, of course, create a problem not only for the person impaired by alcohol, but also for the elderly, those just learning to drive, persons unfamiliar with the specific road, and all the rest of us at times when traffic is particularly heavy, weather is bad, or when, for whatever reason, we happen to be functioning at less than our personal optimum capacity. If the goal is truly the prevention of crashes, rather than simply the excoriation of those who consume alcohol, we will look to all possible options in crash prevention, especially if they have the wider benefits described above.

Human Issues During the Crash Phase

A common axiom says, "Drunks don't get hurt when they fall because they are so relaxed." Unfortunately, this assumption not only is inaccurate; it is the exact opposite of what occurs. Both laboratory and epidemiologic evidence has been growing rapidly documenting that, especially at lower levels of kinetic impact, persons who have consumed alcohol are more likely to be injured, to have severe injury, to die, and to die before definitive treatment can be brought to bear (Waller 1985). The reason is that alcohol adversely affects both the internal function of individual cells and the functioning of organ systems to make it easier for them to become injured and more difficult for them to respond properly to injuries that do occur. Clearly, this myth of invulnerability for alcohol-impaired persons needs to be dispelled.

Vehicular Issues During the Crash Phase

The past two decades have seen considerable attention to, and correction of, vehicular components that increase crash severity. Examples include laws requiring seatbelt use and the move toward wider availability of airbags, collapsible steering columns designed to absorb damaging kinetic energy before it reaches the driver's chest, development of high-penetration windshields, dashboard construction that is less hazardous on impact, removal of pedestrian-spearing hood ornaments and tail fins, and attempts to alter the front design of vehicles to reduce pedestrian damage on impact.

Some major hiatuses still exist, however. Attempts to reduce the effects of side impacts on vehicle occupants are as yet unsuccessful. Most States have not reinstated laws requiring use of helmets by motorcyclists, despite the documented savings of life, limb, and money that accompanied initial passage of such laws and the loss of such savings where these laws were repealed.

Unfortunately, with both helmet and seatbelt laws, among those least likely to obey the law are persons under the influence of alcohol (e.g., Jessor 1987; Maron et al. 1986). Research has shown that excessive nonuse of seatbelts is to be found as often among persons entering bars as among those leaving and, therefore, greater nonuse is not an acute effect of the alcohol per se but rather appears to reflect underlying lifestyle issues (Preusser et al. 1986). Despite this relatively greater tendency toward nonuse, however, persons using alcohol more often wear helmets and seatbelts where the law requires them than where use is voluntary, indicating that this high-risk group may be harder to reach, but not impossible to reach.

Another major hiatus is the failure to improve truck design or construction to reduce crash severity. It has been known for years, for example, that sides and rear ends of trucks can be constructed to prevent underride by automobiles during crashes and, consequently, to avoid decapitation of automobile occupants. But the trucking industry, to date, has successfully avoided regulations that would require this small addition to truck weight (Minahan and O'Day 1977). The industry may have gained, but public safety has lost. In similar fashion, energy-absorbing features universally found in automobiles are often not required by NHTSA in pickup trucks or various recreational vehicles, which are probably the vehicles preferred by high-risk young, heavy-drinking males.

Roadway Issues During the Crash Phase

The past two decades have seen both substantial progress and continuing problems in roadway safety. Energy-absorbing construction of guardrails, bridges, and underpasses, and of light- and sign-posts has become far more common, especially on primary roads built for higher speeds. These changes reflect the decades-old data indicating that such design and construction reduce crash severity. Little of this, however, has been applied to secondary roads, and in many places trees, rock outcroppings, and telephone poles remain – or in some cases continue to be planted or placed – dangerously close to the roadway, even for roads that have posted speed limits of 50 mph or higher.

One continuing problem is that even the best energy-absorbing devices that were designed for one generation of vehicles may be inappropriate for subsequent generations of vehicles that might follow during the expected lifetime of these devices. For example, devices built to deal effectively with crashes of the large and mid-size cars that preceded the 1973 oil embargo are no longer adequate for the large population of compact and subcompact automobiles, especially as these share the roadways with more and larger trucks.

Again, the Missing Link

Alcohol increases injury severity, especially at lower rates of energy exchange. All the vehicular and roadway research and designs for alteration of energy transfer to date have been based on a presumption of normal tissue response. It is not known to what extent, if at all, assumptions need to be altered in considering the reduction of injury for alcohol-impaired persons or, as well, for the elderly, rather than just for unimpaired young individuals.

Issues During the Postcrash Phase

Only two issues during the postcrash phase are considered, namely, the acute management of injured persons who have consumed alcohol, and the application of rehabilitation concepts. Treatment of underlying alcoholism postinjury is also an extremely important issue, but it is being considered by another panel.

Before turning to alcohol-specific issues of acute management, a brief comment should be made about the general status of trauma care systems in the United States.

Over the past two and a half decades, substantial improvements have occurred in the trauma care system. Modified hearses and police cars to transport the injured have been replaced by modular, well-equipped ambulances. The 80-hour or beyond emergency medical technician (EMT) training has replaced the 8-hour standard Red Cross course. Ambulance-to-hospital radio communication has become commonplace. Emergency department nurses and many physicians are being trained in advanced life support, and the whole specialty of emergency medicine has developed.

What is still missing is the widespread regionalization of such improvements, especially as they involve cooperation between ambulance services, between ambulances and hospitals and, most assuredly, between hospitals themselves. A tremendous economic power struggle is taking place in many States concerned with designating specific hospitals as trauma centers because they are better equipped and better staffed, while neighboring hospitals perceive them as likely to "steal" lucrative cases. Until we see a system of regionalization of trauma care in every State of the Nation, instead of the current spotty distribution of such systems, we will not be able to say that this Nation's acute care system is beginning to be adequate.

We turn now to alcohol-specific issues in acute care. As long ago as 1928, Bogen documented the need to determine whether a person had consumed alcohol in order to provide effective emergency care. It is becoming increasingly apparent that the competent physician must determine if the individual is likely, not only to be acutely under the influence of alcohol, but also to be an alcoholic.

Acutely alcohol-impaired patients are more likely to have cardiac arrhythmia that may be life-threatening either at the crash site or shortly after arrival in the emergency department. They may have greater respiratory distress both because of the acute effects of alcohol and because they are likely to be smokers. Alcohol may cause severe hypotension. The presence of alcohol may, on the one hand, cause serious masking of symptoms of intra-abdominal injuries because of clouded sensorium and, on the other hand, result in overdiagnosis of the severity of head injury because alcohol-related altered consciousness is confused with trauma-related effects.

If patients are alcoholics, their wounds are more likely to become infected, because alcohol depresses immune response. But, at the same time, sudden fever may not be a sign of infection, but rather of impending delirium tremens, which carries a 25-percent mortality rate.

Many physicians have been concerned about their legal liability if they do a blood alcohol determination without specific patient approval. It is becoming increasingly obvious, however, for all of the above reasons, that the physician who does not obtain a BAC for clinical management is courting a suit for malpractice if problems occur that might have been foreseeable had the BAC been known.

Lastly, attention must be turned to the subject of rehabilitation. The whole field of rehabilitation medicine developed as a result of the progressively higher survival rates of severely injured soldiers that was achieved during World War II and the Korean Conflict. The years since have seen tremendous advances in basic research in this field as well as in the design and development of new techniques, skills, equipment, and prostheses and the formation of rehabilitation teams.

Unfortunately, as was pointed out in the National Research Council (1985) report, *Injury in America*, much of what is known is not being applied. Patients may not be referred to a physiatrist, or the referral may be sufficiently delayed so that disability is unnecessarily prolonged or may even have become permanent. Complete rehabilitation centers are few and far between, and many physicians do not know how to access them. This is especially true for the services needed for severe head injury, which is a more common outcome in the presence of alcohol. The plea of this chapter, therefore, is not so much for new research, but rather for the wider application of what is already known.

Summary

Alcohol contributes not only to the occurrence of crashes but also to the initial severity of injuries, problems in treatment, and ultimate outcome. The exact relationship of alcohol use and abuse and other lifestyle issues is just beginning to be examined, and the dearth of knowledge remains an important obstacle to achieving behavioral change for drivers and pedestrians who drink.

Characteristics of the vehicle and the road environment also contribute to crash occurrence and crash severity. Because little research, either qualitative or quantitative, has examined the interaction of vehicular and road environment characteristics in crashes at various blood alcohol concentrations, the exact relationship remains conjecture, and potential improvements in injury and disability prevention may be missed. Specifically, the following are recommended:

- Research needs to be carried out and the results used to intervene in the interaction between alcohol use practices and other aspects of lifestyle.
- Persons knowledgeable in evaluation concepts and methods must be utilized early in the design of intervention programs, and evaluation should be an integral part of all such programs.
- Research should be undertaken into the interaction between different BACs, vehicle handling characteristics, and aspects of road design, construction, and maintenance to determine which vehicular and roadway aspects exacerbate the effects of impairment caused by BACs below 0.10 gm/dl, and to set vehicle and road standards that will take this knowledge into consideration. Similar research is needed to determine quantitatively the relation between BAC and vehicle and roadway features relevant to injury severity, and to apply such knowledge for injury reduction standards.
- Motorcycle helmet laws need to be reinstated in those States where they were rescinded.
- Federal crash and injury prevention standards currently applicable to automobiles should be extended to pickup trucks and recreational vehicles. Rear and side guards on trucks should be mandated to prevent other vehicles from underriding medium and large trucks in two-vehicle crashes.
- All necessary steps must be undertaken, including legislation if necessary, to ensure that regionalization of adequate trauma systems is achieved throughout the Nation.
- Physicians must be educated through hospital quality assurance programs and other means about the need to determine BAC and to screen for alcoholism as part of the proper management of the trauma patient. Similar educational methods should be used to get physicians to seek prompt and appropriate assistance for the rehabilitative aspects of trauma care.

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Youth and Other Special Populations

Youth Impaired Driving: Causes and Countermeasures

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Traumatic injury is responsible for more deaths among American adolescents and young adults age 14-24 than all other causes combined (Paulson 1983). Far and away the leading cause of traumatic injuries is traffic crashes (Robertson 1981; Lewis 1987). Traffic crashes have been cited as the cause of about half of all accidental deaths in adolescents and young adults and have also been cited as the cause of half of all spinal cord injuries (Robertson 1981). Not only adolescent drivers, but also their passengers (who tend to be adolescents) are at significantly increased risk when compared to older age groups (Insurance Institute for Highway Safety 1984).

The exact contribution of alcohol use to youth traffic crashes has been debated (e.g., Zylman 1973; Cameron 1982). However, the conclusion appears inescapable that alcohol is a major causal factor (Cameron 1982; Lewis 1987). Young drivers are overrepresented in alcohol-related fatal crashes even when driving exposure is controlled (Vegega 1984). Although teen alcohol-related traffic fatalities steadily decreased from 1982 to 1985, they increased again in 1986 to a level just below that of 1983 (DOT 1987). Unpublished Fatal Accident Reporting System data for 1987 suggest another downturn, but overall death rates still exceed those observed in 1985. The reasons for this downturn are not clear but may reflect increasing public awareness and intolerance and recent changes in legislation.

The most compelling evidence for a causal link between alcohol and youthful crash involvement comes from studies of changes in minimum alcohol purchase age (e.g., Fell 1988; Smith et al. 1984; Hingson et al. 1983; Wagenaar 1982a, b, 1983b). Although results have varied from State to State and from study to study, consistent reductions in youthful crash involvement have been observed following increases in the minimum purchase age. Interestingly, most studies that examined the effects of purchase age changes failed to find meaningful differences in youthful alcohol consumption (Moskowitz 1989). This may simply reflect the difficulties associated with measuring changes in consumption as opposed to changes in crash rates. Alternately, it may be that the relationship between minimum purchase age and crash involvement is not mediated simply by consumption, but rather reflects more complex changes in youth drinking patterns and drinking locations.

Crash data reflect only a small segment of the youth drinking/driving problem. Overall, youthful drivers are much more likely than their older counterparts to report driving after drinking (Hingson et al. 1988). Recent survey data gathered from the Nation's high schools (Bachman et al. 1987) revealed that approximately one in four seniors had driven after drinking in the 2 weeks predating the survey, and approximately one in six had driven after having five or more drinks in a row. During the same 2-week period, two in five seniors had ridden with a drinking driver, and one in five believed the driver had consumed five or more drinks. Driving while impaired (DWI) and riding with

impaired drivers (RWID) would appear to be a regular occurrence for a significant minority of American youth.

Causes and Correlates

Any successful attempt to reduce the extent of impaired driving and riding with impaired drivers among youth must be rooted in an understanding of the factors that predispose, reinforce, and enable these behaviors. However, current knowledge of the causes and correlates of youth DWI/RWID is incomplete. The majority of relevant studies have focused on alcohol consumption and related problems rather than on DWI per se, and only a very limited number of studies have focused on factors related to riding with impaired drivers. In addition, predisposing, reinforcing, and enabling factors have often been studied in isolation, complicating assessments of the relative contribution of different variables or classes of variables to DWI/RWID.

Individual Characteristics

Perhaps the largest body of correlate research has focused on characteristics of individual youths. These studies noted that personality factors such as aggressiveness, intolerance of authority, nonconformity, escapism, and immaturity may be associated with increased probability of driving after drinking (Lightsey and Sweeney 1985; Boyd and Huffman 1984; DOT 1975; Kraus et al. 1970). DWI has also been associated with poor academic performance, greater participation in social activities, access to cars including car ownership, more discretionary income, and working part time (Klitzner et al. 1987, 1988; Williams et al. 1986).

Other individual-level studies have focused on the stresses of transition from adolescence to adulthood (Pelz and Schuman 1971) and on the relationship between stress and alcohol consumption (e.g., Forney et al. 1984; Wagenaar 1983a; Koningsberg et al. 1983; Cameron 1982). A recent study of adolescent DWI offenders (Farrow 1987) suggested that offenders are more likely than nonoffenders to use risky driving as a stress management technique.

Studies that assessed young people's awareness of the physiological and psychological effects of alcohol revealed that young people are generally ignorant of the effects of alcohol (Forney et al. 1984; Blane 1983; Hetherington et al. 1979) and are unable to identify the amount of alcohol that impairs driving performance (Pawlowski 1982).

Several studies have explored the effects on DWI risk of positive attitudes toward drinking and drinking and driving. Most have focused on attitudes toward alcohol (Krohn et al. 1982; Milgram 1982; Lowman 1981; Douglass 1983; DOT 1975; Kraus et al. 1970). These studies suggest that normative acceptance of drinking by youth increases both alcohol consumption and DWI risk. Two recent studies by Klitzner et al. (1987, 1988) found that normative acceptance of DWI was also strongly related to both alcohol consumption and actual DWI/RWID behavior.

Social Influences

A second broad area of correlate research has focused on social influences, especially those associated with peer groups. Numerous studies have reported increased alcohol consumption among youth who associate with peers who drink and/or approve of drinking (Vejnoska 1982; Scoles and Fine 1981; Krohn et al. 1982; Nusbaumer and Zusman 1981; Biddle et al. 1980). A study by Finley (1983) implied that peer influence may be so pervasive as to negate the effect of countervailing influences such as fear of legal sanctions or parental disapproval. Group centeredness, a probable component of

susceptibility to peer influence, has also been found to increase DWI risk (Kraus et al. 1970; DOT 1975), and a recent study by DiBlasio (1988) found that peer modeling plays an important role in decisions to ride with intoxicated drivers.

Jessor (1987) recently extended Problem-Behavior Theory (Jessor and Jessor 1977) to youthful risky driving, including DWI. Problem-Behavior Theory has a 25-year history as a major theoretical orientation for understanding youth substance abuse and related problems. Jessor's recent work demonstrated that youth who are more influenced by friends than parents, and whose friends model risky driving behaviors, are more likely to report risky driving.

Studies of social influence have also focused on the effects of mass media, especially alcohol advertising, on youth alcohol consumption and DWI. Most advertising research has examined general populations and has failed to find consistent effects (Frankena et al. 1985). Studies that looked specifically at youth (Atkin et al. 1983, 1984; Strickland 1983) reported possible effects of advertising exposure on both alcohol consumption and DWI, but methodological weaknesses in these studies limit the strength of conclusions that may be drawn from them (Moskowitz 1989).

Characteristics of Youth Drinking and Youth Driving

A third broad approach to understanding the youth DWI problem has been to explore the special characteristics of youth drinking and youth driving. For young drivers, risk of crash involvement begins to increase at very low blood alcohol concentrations (BACs), and studies suggest that any measurable BAC can result in a significantly increased risk for younger drivers (Simpson et al. 1982; Farris et al. 1976; Perrine et al. 1971). Thus, the gap between risky and illegal BACs for youth in most States is large, and "safe" consumption guidelines publicized for adults may be dangerously misleading for youth. The more rapid impairment of the younger drinker is reflected in the fact that crash-involved adolescents are likely to have lower BACs than their older counterparts (Cameron 1982), and in the higher risk of fatal crashes for young drivers when compared to adults with comparable BACs (Bergeron and Joly 1986).

The simultaneous acquisition of driving skills and drinking experience may further increase the likelihood of crashes (O'Day 1970; Lewis 1987), and youth who DWI may tend to be riskier drivers in general (Bergeron and Joly 1986). Nataanen and Summala (1976) also noted the importance of considering the "extra motives" (beyond simple transportation) that driving may fulfil for youth. These include tension reduction, meeting the need for competition, showing off, and deliberate risk-taking. Summala (1987) found that these extra motives may be more important than lack of driving skill in contributing to poor youth driving performance.

Research conducted in preparation for a National Institute on Alcohol Abuse and Alcoholism (NIAAA) youth and alcohol media campaign pointed to a number of structural and contextual factors that may serve to associate youth drinking with youth driving (URSA/Pacificon 1980). These data suggest that, for many youth, the automobile represents the only place where privacy may be relatively certain. Drinking and other negatively sanctioned behaviors are most likely go undetected when undertaken in cars. Consistent with this assumption, data from the 1986 yearly survey of high school seniors (Bachman et al. 1987) revealed that over half of all seniors who drank had done so in cars, and approximately 28 percent reported doing so "some of the times" or "most of the times." Similarly, a national survey conducted by Grey Advertising (DOT 1975) revealed that among students who drank, 38 percent reported drinking "while driving around," and 20 percent reported drinking at drive-in movies within the previous 3 months. Driving constitutes a social occasion for youth, and the ride to and from a social event constitutes a prelude to and continuation of that event (Farrow 1987). Thus, drinking in cars may be a simple extension of other teen drinking.

The NIAAA planning data indicated that youth are more likely than adults to drink all that they possess at any given time, thus eliminating problems of storage or hiding of contraband alcohol. Moreover, data reported by Vegega and Klitzner (in press), Farrow (1987), and Bachman et al. (1987) showed that the great majority of teen drinking occurred outside the home. Thus, the structure of teen drinking may lead to the consumption of large quantities of alcohol in settings that subsequently require some sort of transportation home.

Multiple Correlate Studies

In an effort to assess the relative contribution to DWI/RWID of a variety of risk factors discussed in the literature, Klitzner and colleagues (1988; Vegega and Klitzner in press) surveyed and/or interviewed a convenience sample of approximately 1,550 youth in grades 7 through college in six U.S. cities. In one study (Klitzner et al. 1988), 1,323 youth completed anonymous questionnaires that assessed lifestyle variables (friends' drinking practices, participation in parties and dates, access to cars), alcohol use variables, DWI/RWID risk factors, and self-reported DWI/RWID behavior. Of nine risk factors studied, only one—perceived deviance of DWI—was strongly related to DWI and RWID. Two other factors—use of alternative modes of transportation and decisionmaking skills—were related to DWI and RWID, but only insofar as they predicted drinking practices. The remaining six risk factors—awareness of alternative modes of transportation, self-concept, communications skills, alcohol knowledge, knowledge of local DWI laws, and susceptibility to peer influence—predicted neither drinking practices nor DWI/RWID. Despite the failure of these risk factors to predict drinking or DWI/RWID directly, all nine risk factors were interrelated. Thus, the factors that did not directly predict drinking, DWI, or RWID may still contribute to overall risk. Drinking practices were themselves strong predictors of both DWI and RWID, a point discussed later.

In a second study (Vegega and Klitzner in press), in-depth interviews were conducted with 120 youth who reported DWI and 121 youth who reported having ridden with an intoxicated driver. This study focused on the contribution of situational factors to youth DWI/RWID. Among the factors assessed were social context variables; social pressures to drink, drive, and/or ride; perception of immediate risk; destination variables; and availability of alternative transportation. In general, the results showed that DWI/RWID is largely a function of the role alcohol plays in the youth culture. Many respondents suggested that DWI and RWID are "inevitable" because drinking is an "inevitable" component of adolescent lifestyles.

Despite the current popularity of "peer pressure" as an explanation of youth drinking and related problems, only about 15 percent of Vegega and Klitzner's DWIs reported any pressure to drink, and only 13 percent reported any pressure to drive after drinking. Among RWIDs, less than 7 percent reported that peer pressure contributed to their decision to ride with the impaired driver. To the extent that DWI and RWID were situationally determined, they were controlled largely by a perceived need to get home or to get a passenger home. This finding is consistent with data reported by Farrow (1987), who found that home was the most common destination for youth engaging in a variety of risky driving behaviors, including DWI/RWID.

Vegega and Klitzner described a special case of RWID that occurred when the impaired driver was a parent or other adult relative. In this case, which represented slightly more than a quarter of the reported RWID incidents, the youths' apparent inability to affect parental DWI or to utilize alternative modes of transportation effectively precluded any protective action (other than fastening a safety belt) on the part of the affected youngster. Here, parents and other adult relatives appeared to make a significant contribution to the DWI-related risk experienced by youth.

Summary

In general, the factors that predispose, reinforce, and enable youth DWI and RWID appear to be similar to those risk factors associated with other adolescent health risk behavior (Jessor 1987). Social and normative influences, risk-taking orientation, and individual differences in attitudes toward and beliefs about drinking and drinking and driving all appear to contribute to increased or decreased risk.

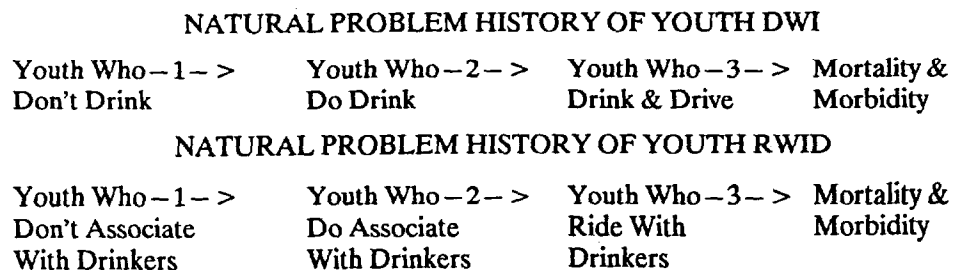
Of particular import in considering DWI and RWID specifically, however, is the powerful role played by alcohol consumption per se in increasing risk of both DWI and of RWID (for which consumption is not a prerequisite). Indeed, Klitzner et al.'s (1988) data revealed that DWI/RWID risks increased directly and potently as a function of both quantity and frequency of alcohol consumption. Moreover, among Vegega and Klitzner's (in press) sample of DWIs and RWIDs, alcohol use was perceived to be an inextricable part of the youth culture, and DWI/RWID were viewed as "inevitable" results of the strong association between youth socializing and youth drinking. Thus, it seems unlikely that meaningful reductions in youth DWI/RWID can be realized without significant attention to changes in youth drinking practices.

Countermeasures for Youth

The past two decades have witnessed a rapid expansion in the number and types of programs and strategies employed to prevent youthful DWI and RWID. A review of 133 youth DWI prevention models (Vegega and Klitzner 1988) revealed enormous diversity of focus, underlying assumptions, and activities. Youth DWI/RWID countermeasures include school curricula, clubs, alternative transportation, alternative (alcohol-free) parties, teen retreats, and youth-focused legislation and regulation.

Current DWI/RWID prevention strategies can be grouped into three major categories—those mainly concerned with the prevention of drinking, those mainly concerned with separating drinking and driving, and those concerned with preventing mortality and morbidity when and if DWI/RWID occur. The differences among these approaches can be illustrated by considering the natural history of DWI and RWID. Figure 1 presents, in highly simplified flow diagrams, the processes that lead to DWI/RWID and related mortality and morbidity.

Figure 1. Processes that lead to DWI/RWID



These flow diagrams indicate three points at which DWI/RWID strategies and programming can be directed. Point 1 represents strategies that have as their primary objective the prevention of youth drinking and the establishment of nondrinking lifestyles among youth. Such programs attempt to alter the factors that either predispose, reinforce, or enable drinking among individual youth (e.g., school curricula, "say no" organizations, intervention programs for users) and attempt to reduce youth access to

alcohol (e.g., alcohol-free alternative parties, minimum purchase age increases, server training, limited outlets, education of retail clerks). Strategies at point 1 would not, of course, address the problem of youth who RWID when parents or other adults are the drivers.¹

Point 2 represents strategies that attempt to disassociate drinking and driving. Here, although youth alcohol use may still be of concern, the major objective is to address risk factors that lead drinking youth to drive, or that lead youth who associate with drinkers to be passengers. Examples of strategies at point 2 include SafeRides, designated driver, alternative transportation, direct intervention (e.g., taking keys), parent/student transportation "contracts," general and specific deterrence, and a variety of licensing strategies.

Point 3 represents strategies that attempt to limit morbidity and mortality among drinking drivers, their passengers, and those with whom they crash. Examples of these strategies include passive restraints, other vehicle-related technologies, highway design elements such as breakaway sign posts, and so on.²

Point 1 Strategies

Many point 1 strategies (those that attempt to reduce youth drinking) have been extensively studied. In particular, school-based strategies of various types have been the object of intense research scrutiny for at least two decades. Programs have been developed and evaluated that focus on arousal of fear of negative consequences, provision of information, development of "life skills" (e.g., positive self-regard, communication skills, assertiveness, decisionmaking, coping), clarification of values, and, most recently, "resistance" training.

The literature on school-based alcohol and other drug prevention programs has been repeatedly reviewed (e.g., Moskowitz 1989; Klitzner 1987; Goodstadt 1985; Wittman 1982). In general, these reviews concur that evidence in support of school-based alcohol and drug prevention programs is sparse. Although increases in knowledge and changes in attitudes are often reported, effects on behavior have been weak, inconsistent, transient, and sometimes in the wrong direction. The failure to demonstrate educational program effects has been attributed to failures in program models, to failures in program implementation, and (more optimistically) to weak or inappropriate research designs (Klitzner and Bell 1987; Moskowitz 1983). Whatever the causes, no scientific mandate currently exists for adopting any particular school-based approach to alcohol use reduction and prevention.

Emerging strategies focusing on family education (e.g., DeMarsh and Kumpfer 1985), management of early antisocial behavior (e.g., Hawkins and Lishner in press), changes in school and classroom structure (Gottfredson 1987), and school drug and alcohol policies (Moskowitz 1987) have shown promise and hold out the hope of more effective responses to youth alcohol-related problems in the future. Until such time as these strategies are thoroughly researched, however, their appeal remains largely theoretical.

Several strategies to control youth access to alcohol have been studied with varying results. The uniform purchase age of 21 (e.g., Fell 1988; Hingson et al. 1983; Wagenaar 1982a, b, 1983b) and increased taxation (Saffer and Grossman 1985; Coate and Grossman 1985) have been shown to have an impact on the sequelae of consumption including

1 Some DWI/RWID program developers have labeled point 1 programs as "prevention programs" in order to distinguish them from point 2 programs, which have been labeled as "intervention programs." This distinction seems somewhat artificial, since both types of strategies seek to prevent the occurrence of DWI/RWID.

2 These strategies are the topic of a separate background chapter and will not be discussed further.

youthful crashes, although effects on consumption per se, have been difficult to document. Failure to document effects on consumption may be due to methodological difficulties in measuring such effects, or it may result from the inadequacy of a simple, direct model of the effects of youth access to alcohol on consumption and related problems.

The effect of numbers of alcohol outlets per capita on consumption has also received some scrutiny, although no studies have focused directly on youth. The results of these studies have been mixed, with one study demonstrating lower consumption in States with fewer outlets (Ornstein and Hannens 1985) and two studies failing to find such effects (Hoadley et al. 1984; Schweitzer et al. 1983). A fourth study revealed a correlation between numbers of outlets and alcohol-related problems including felony and misdemeanor DWI arrests in 213 California cities (Watts and Rabow 1983). This study did not include direct measures of consumption.

Student assistance programs to intervene with alcohol- and drug-using youth (e.g., Chambers and Morehouse 1983; Morehouse 1982) have been studied from a process perspective, but rigorous assessments of student drinking outcomes are not available. Other popular approaches (e.g., prevention "clubs," alcohol-free recreation, concerned parent groups) have received minimal research attention.

Point 2 Strategies

Of the available strategies aimed at point 2 (separating drinking from driving), perhaps the most extensively discussed is deterrence. Unfortunately for the current discussion, existing research does not generally address specific effects on youth. Ross (1984, 1985) and Moskowitz (1989) provided extensive reviews of various deterrence-based strategies, including increased penalties, per se laws, enforcement crackdowns, and administrative license revocation. In general, these reviews showed that enforcement crackdowns, especially when accompanied by extensive media coverage, can have short-term (months to a few years) effects. On the other hand, a study of increased enforcement in France that focused specifically on drivers under 25 (Jayet 1986) failed to find a deterrent effect.

Recently, concern over the risk of crashes associated with even very low BACs in youth has motivated some States to adopt a lower legal BAC limit for youth than for adults. In most of these States, license revocation is either an automatic or discretionary penalty for violations. Drummond et al. studied a zero BAC limit for first-year drivers in Australia. Preliminary data disclosed that this law reduced nighttime, weekend driving—a peak time for youth crash involvement (e.g., Farrow 1987; Robertson 1981). However, actual crash data concerning the Australian zero BAC law were not available at the time the research report was prepared.

Hingson et al. (1986, in press) studied the effects of a 0.02 BAC limit and administrative license revocation for 1 year on youth in Maine. Initial results (Hingson et al. 1986) revealed that self-reported DWI and self-reported nonfatal crash involvement among drivers 19 and under declined significantly when compared to Massachusetts teens and Maine adults. Declines were most dramatic for teens who were aware of the law. In addition, actual injury and fatal crashes among Maine teens increased at a much lower rate than for drivers 20 years old and over. Followup results (Hingson et al. in press) have generally mirrored the 1986 findings, although differences between Maine and Massachusetts teens have declined to a nonsignificant level. This lack of difference appears due to a "catching-up" on the part of Massachusetts teens, perhaps owing to the high level of antidrug and anti-DWI activity in that State. Hingson et al. also noted that enforcement of the 0.02 BAC law has become sporadic, and police appear to arrest juveniles with less regularity than adult offenders.

Several States have experimented with license revocation as a sanction against youth

possession of alcohol and other drugs. In recent testimony before the National Commission Against Drunk Driving (NHTSA, October 1987), Judge C. Foley of Milwaukee, Wisconsin, credited such a law with significant reductions in youth DWI between 1982 and 1986. However, the existence of a zero BAC law in Wisconsin, increased public awareness of the youth DWI problem, and the lack of comparison data render interpretation of these reductions difficult. At this time, the effects of license revocation as a sanction for youthful alcohol and other drug possession are unproven.

A recently popular strategy for separating drinking from driving is to issue youth restricted licenses that limit the hours during which they may operate a vehicle. Impetus for such a strategy derives from the previously cited observation that youth DWI as well as youth fatal crashes are most likely in the evenings, especially weekend evenings. As reported by Williams (1987), at least 18 States have some sort of curfew restrictions. Williams cited a study of restrictions in four States by Preusser et al. (1984) that reported dramatic reductions in crashes during the restricted hours. He also cited additional data from New York, Louisiana, and Maryland that supported the efficacy of restricted driving hours for youth. Despite one study of the Maryland law that did not find effects on crash rates (McKnight et al. 1983), Williams concluded that curfew restrictions can substantially reduce youth crash involvement.

Other licensing approaches to reducing youth crashes include making drivers' licenses more difficult to obtain and presenting the license in juvenile court to both the youths and their parents. Preliminary data from California (Hagge and Marsh 1986) suggested positive results from making licenses more difficult to obtain, although, as noted by Williams (1987), the California program had so many facets that it was impossible to determine which elements contributed to the positive results and which did not.

Separation of youth drinking from youth driving has also been attempted through educational strategies. There is little evidence that such programs reduce crash rates (Williams 1987; Moskowitz 1989). One well-conducted Canadian evaluation of a drinking/driving education program (Albert and Simpson 1985) demonstrated decreased intentions to DWI, but these decreases were realized at the cost of an increase in reported drinking frequency. Some critics of drivers' education (Robertson 1980; Robertson and Zador 1978) have suggested that such programs may actually increase crash rates by increasing the licensure of 16- and 17-year-olds. However, as discussed by Moskowitz (1989), these claims are based on short-term results and may not justify possible long-term negative effects of discontinuing drivers' education.

Cognizant of the general failure of drinking/driving education programs, the National Highway Traffic Safety Administration (NHTSA) sponsored the development of a Peer Intervention Program (McPherson et al. 1983) aimed at enabling and motivating youngsters to intervene in the drinking and driving behavior of their peers. The program provided 8 hours of role-playing as well as 1 hour of alcohol and traffic safety information. A true experiment with random assignment compared the Peer Intervention Program to a traditional drinking and driving education program (McKnight and McPherson 1986). Students in the Peer Intervention Program reported statistically significant gains in intervention behavior at followup intervals of 1 to 4 months. The actual magnitude of these effects appeared small, although the description of the behavioral measure provided by McKnight and McPherson is too sketchy to determine the meaning of the differences reported.

Students Against Driving Drunk (SADD) (Anastas 1983) represents an attempt to change school and community norms with regard to youth DWI/RWID. Klitzner et al. (1987) conducted an evaluation of SADD in two cities in the Western United States. This quasi-experimental study failed to find effects of SADD on any drinking or drinking/driving variables. However, weak program implementation in the SADD

schools, high subject attrition from the research study, and other design confounds limit the strength of these conclusions.

Alternative transportation (e.g., SafeRides, designated driver) as a means of separating drinking from driving has not been well evaluated (Klitzner et al. 1988). Klitzner et al. (1987) provided preliminary data on parent/student contracting. These data showed that signing contracts increases the likelihood that youth will call parents for a ride. However, no differences in DWI or RWID as a result of signing the contracts were observed. This somewhat puzzling result suggests that although signers are calling home, safer transportation does not result.

Critics of alternative transportation strategies have objected to these approaches on the grounds that they implicitly sanction youth drinking. Klitzner et al. (1987) failed to find evidence that signing parent/student contracts had effects on youth drinking or related problems. On the other hand, Klitzner et al. (1988) found that heavier drinkers also reported using more transportation alternatives. The meaning of this latter result is unclear. It may, indeed, confirm the fears of critics of alternative transportation strategies, or it may simply reflect the fact that heavier drinkers have more reasons for using and opportunities to use transportation alternatives.

Multicomponent Strategies

One common indictment of many attempts to prevent alcohol- and drug-related problems among youth is too narrow a programmatic focus (Klitzner 1987; Klitzner and Bell 1987; Goodstadt 1986; Huba et al. 1980). That is, communities have tended to focus on one kind of response (e.g., a school curriculum, a SADD club, a police crackdown) to the exclusion of other types of responses.

Recently, some communities have attempted to overcome the narrowness and fragmentation of past responses to youth DWI by instituting communitywide, systemic responses that attempt to institute a coordinated and comprehensive package of mutually reinforcing countermeasures. Thus, a community might institute a strong anti-alcohol use school policy, work to restrict alcohol sales to minors through increasing alcohol beverage control enforcement, rigorously enforce DWI laws, institute roadblocks, aggressively prosecute and heavily sanction youthful DWI offenders, and develop community resources for the treatment of addicted teens. Ten communities that are attempting to implement communitywide responses are described by Pacific Institute (in press).

The communitywide model has considerable theoretical and conceptual appeal, and many of the strategies communities appear to be using have been shown to be effective in their own right (e.g., increased enforcement, reductions in alcohol availability to youth). To date, however, rigorous evaluations of multicomponent, communitywide anti-DWI programs have been extremely limited.

Perhaps the most relevant research is the Lackland Air Force Base Experiment (Barmark and Payne 1961), which effectively reduced DWI among airmen through a variety of normative, informational, and enforcement strategies. However, strategies shown effective in the highly insular and controlled environment of a military installation will not necessarily be effective in the less well-controlled environments of most American communities.

The communitywide model has shown promise in other health areas, notably the reduction of risk factors associated with cardiovascular disease (Farquhar et al. 1977; Puska et al. 1985). However, the effectiveness and feasibility of systemwide responses to the youth DWI problem awaits further research.

Summary

Current research into youth drinking and driving countermeasures suggests that effective strategies are available for reducing youth access to alcohol and for separating youth drinking from youth driving. However, despite the continuing popularity of strategies focused on developing or changing individual knowledge, attitudes, and skills, almost all the effective countermeasures reviewed in this chapter have been regulatory or legislative in nature.

Recent evidence indicates that the most effective countermeasures will likely be those that focus on minimum purchase age, alcohol pricing, limiting alcohol outlets, lower legal BACs for youth, curfew restrictions on youth driving and other licensing restrictions, and enforcement. This is not to imply that the search for effective programs focused on individual youth should be discontinued. However, many individually focused prevention approaches popular in the 1970s and 1980s appear to have outlived their usefulness.

Issues and Recommendations

Proven technologies exist for reducing the death and disability suffered by youth as a result of drinking and driving. As discussed, these include restrictions on youth access to alcohol and restrictions on youth driving. The problem is not so much one of finding effective countermeasures as it is overcoming societal inertia to implement them. Thus far, the uniform alcohol purchase age is the only proven countermeasure to be adopted nationwide. In some States, even the threatened loss of Federal highway funds did not guarantee speedy legislative action.

Williams (1987) posed the question of whether society is ready to take the steps necessary to improve the current situation with regard to youth drinking and driving. He responded: "To the extent that legislative restrictions are necessary to rectify the situation, [this] question can at present be answered in the negative." A major item on the Nation's public health agenda should be to educate parents, legislators, and other concerned citizens about the regulatory measures that can be taken to realize additional meaningful reductions in youth DWI.

Of course, regulatory responses will only be effective to the extent that they are enforced (Ross 1984). In general, the quality of enforcement of novel DWI laws decreases over time, an effect observed in Maine's experience with 0.02 legislation enacted in 1982 (Hingson et al. in press). Public support must be developed for the vigorous and continued enforcement of new laws as well as for their enactment.

It is also clear that regulation alone will never be a complete answer to the youth DWI/RWID problem. Youth will always have access to alcohol and cars. Indeed, licensing restrictions will never affect all teenagers, since a significant minority of teen drivers are unlicensed (Klitzner et al. 1988; Williams et al. 1985). Moreover, the high crash rates of teens continues into the early twenties — an age group to whom purchase age restrictions do not apply. Thus, in addition to regulatory responses, continued efforts should be made to develop prevention programs that affect the drinking and drinking/driving choices of individual young people.

Prevention program development and research need to break away from the unsuccessful models of the past. New approaches are needed that are firmly grounded in an understanding of the factors that predispose, reinforce, and enable youth alcohol use and DWI/RWID. Given the current state of knowledge, such an understanding will require a program of additional research into the etiology of youth drinking and DWI/RWID. This is not to imply that the testing of new program models should be delayed until a comprehensive and widely accepted set of etiological models is available.

Rather, program research and etiologic research should be seen as complementary endeavors, with data from one area of inquiry informing theory development and research activities in the other.

Significant programmatic attention must be paid to youth alcohol consumption per se. It is possible, in theory, to separate youth drinking from youth driving. However, these behaviors are currently so inextricably intertwined that successful DWI/RWID prevention programs may ultimately be those with a heavy emphasis on reducing alcohol consumption.

The youth DWI/RWID problem is not limited to impairment due to alcohol. Data from a 1983 survey of 18- to 24-year-olds (Elliot 1987) revealed that one in five respondents had driven while high on marijuana, and nearly one in ten had driven while high on other drugs. Moreover, the prevalence rate for DWI was twice as high for multiple drug users as it was for youth who only used alcohol. More research is needed on the contribution of marijuana and other drugs to crash-related mortality and morbidity, and future discussions of the youth DWI/RWID problem should specifically address these substances.

An effort should be made to involve physicians in the national effort to combat youth drinking/driving. Questions about alcohol use patterns, driving, and seatbelt use should be part of all doctor visits for teens and should be specifically explored when a presenting complaint suggests alcohol involvement (AAP 1987; Klitzner and Schonberg 1988). Moreover, parents of preteens should be counseled concerning the effects of their own drinking and drinking/driving attitudes and behavior on the behavior of their children. Parents should also be encouraged by physicians to disallow alcohol consumption by their adolescent children, including restrictions on attending parties where alcohol is served (AAP 1987).

Finally, continued efforts should be made to change social norms regarding youth alcohol use and DWI/RWID. It has been argued that changes in social norms and values as a result of two decades of antismoking activities and programs have contributed significantly to the efficacy of smoking cessation and prevention programs (Polich et al. 1984; Moskowitz 1983; Leventhal and Cleary 1980). Similar changes in drinking and DWI/RWID norms toward greater intolerance can facilitate the adoption of effective regulatory measures (Moskowitz 1989) and can also have a direct impact on youth behavior (Klitzner et al. 1988). The communitywide approach discussed earlier is one appealing strategy for effecting normative change because it attempts to involve all segments of the community in combating the youth drinking/driving problem.

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Motor Vehicle Crashes and Alcohol Among American Indians and Alaska Natives

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The American Indian population, made up of well over 300 tribes, now numbers more than 1.5 million or over 0.6 percent of the U.S. population. Throughout the recent past, it has been a rapidly growing population that has consistently had a birth rate twice that of the rest of the U.S. population (IHS 1988; May 1988; Broudy and May 1983). Because of this high fertility, the median age of the Indian population was 22.9 in 1980, compared to 30.3 for the overall U.S. population. The median age of the population living on reservation was 19 years in 1980 (U.S. Congress 1986). The young age composition has definite implications for the study of both motor vehicle injuries and alcohol.

Some other general considerations of the U.S. Indian population are also vital here. While Indians and Alaska Natives live in every State of the Union, most live in 32 "reservation States" (see exhibit 1), the vast majority (over 1 million) in Western States (IHS 1988). Many Indians live in rural areas (46 percent) or other urbanized settings such as small towns (32 percent), while 22 percent live in central cities. In 1980, 37 percent lived on reservations or in Indian communities. Many who live in cities or off reservations are characterized as highly mobile (U.S. Congress 1986). Average economic indicators for Indians as a group remain poor. The 1980 Census indicated unemployment rates twice the national average, and the median family income for Indians was about half the average for the entire U.S. population (U.S. Congress 1986; U.S. Bureau of Census 1984a, b). Finally, educational attainment of many Indians remains lower than the national averages (Brod and McQuiston 1983).

Overview of Accident Statistics

When reviewing accident data for Indians, one must first consider accidents as they affect the overall Indian population and then move to specific considerations of gender, age, and local and regional data. Only recently have accidents fallen to second place among causes of mortality. Accidents were the leading cause of death throughout the 1950s, 1960s, and 1970s for Indians and Alaska Natives in the 32 reservation States (IHS 1988). In 1983-85, accidents caused 3,218 deaths or 16 percent of all mortality (see table 1). Of these deaths, 1,753 or 54.5 percent were caused by motor vehicles. When measured by crude rates, accidents are the fourth leading cause of death among other U.S. residents. Motor vehicle accidents take a higher toll among Indian males than females, and this is even more true of other accidents.

Table 2 presents age-adjusted death rates that allow comparisons between Indians and other groups in the United States. When age-adjusted rates are considered, accident

Exhibit 1

Indian Health Service (IHS) reservation States numbered 24 from 1969 to 1974. Prior to that, IHS calculated rates on 50-percent samples of U.S. records. Since 1974, eight more States have been added. The current 32 states listed by administrative area and the year added for the most recent additions are:

Nashville Area:	Alabama (added in 1984), Connecticut (added in 1983), Florida, Louisiana, Maine (added in 1979), Mississippi, New York (added in 1979), North Carolina, Pennsylvania (added in 1979), Rhode Island (added in 1983).
Bemidji Area:	Michigan, Minnesota, Wisconsin
Oklahoma Area:	Oklahoma, Texas (added in 1983), Kansas
Aberdeen Area:	Iowa, Nebraska, North Dakota, South Dakota.
Billings Area:	Montana, Wyoming
Albuquerque Area:	Colorado, New Mexico
Navajo Area:	Main Navajo reservation (parts of Arizona, New Mexico and Utah)
Phoenix Area:	Arizona (most), Nevada, Utah
Tucson Area:	Southern Arizona (Papago reservation)
Portland Area:	Idaho, Oregon, Washington
Alaska Area:	Alaska

mortality becomes the third leading cause of death for all Indians and Alaska Natives. The rate of 42.2 per 100,000 for motor vehicle accidents is 2.3 times the rate for all races combined. Other accidents, which in the distant and relatively recent past have played a major role in mortality among Indians (Kunitz 1983) and particularly Alaska Natives (Boyd et al. 1968), are 2.2 times higher than U.S. averages.

The trend in accident mortality rates for Indians and Alaska Natives has been down over the years that accurate, Indian-specific rates have been kept, but the exact magnitude of this drop is difficult to determine. Many procedural changes have affected the calculation of Indian mortality rates, confusing the interpretation of trends. Some of these changes include: alterations in census enumeration methodologies for American Indians and Alaska Natives; changes in methodologies for estimating the Indian population (which was necessary to correct suspected undercounts;); debate over whether tribal enrollment or resident population figures were the most appropriate for use as denominators; and, most importantly, the addition of Indians from States such as Pennsylvania, Rhode Island, and Connecticut to Indian Health Service "reservation States" (see U.S. Congress 1986, pp. 59-82; IHS 1988; Passell 1976; Passell and Berman 1986; May 1988).

Taken at face value the Indian Health Service (IHS) rates indicate that accident mortality has fallen dramatically. The age-adjusted rate of motor vehicle accident mortality declined from a high of 106.2 in 1956 to 42.6 in 1985 (IHS 1988), a drop of 59.8 percent. However, a more realistic trend figure might be obtained by using 20-year figures from 1956 through 1976, when the major reshaping of the IHS denominator began. From 1956 to 1976, the Indian rate of motor vehicle accident death dropped from 106.2 to 74.5 or 29.8 percent. This is quite comparable to the overall U.S. drop of 14.7 percent from 1956 to 1976 or 34.0 percent from 1956 to 1985. Therefore, it is safe to conclude that the American Indian rates have dropped, probably in a magnitude similar to or slightly greater than the drop for the overall U.S. population.¹ One positive reason for this drop could certainly be the upgrading of emergency medical services begun in the middle 1970s on many reservations.

¹ Indian vital statistics in many areas tend to parallel U.S. statistics, although some rates usually remain higher. For example, most tribes experienced a baby boom similar to the total U.S. population, only the birth rates were substantially higher and the peak was several years later (see Broudy and May 1983). Also, motor vehicle accident rates were reduced in 1974 on the Navajo reservation when the oil embargo forced the lowering of the national speed limit (Katz and May 1979).

Table I. Leading causes of death for American Indian and Alaska Natives by frequency, gender, and rates per 100,000, 1983-85

Causes of death	Males		Causes of death	Females	
	Number	Mortality rate		Number	Mortality rate
All causes	11,894	568.4	All causes	8,216	382.2
Diseases of the heart	2,727	130.3	Diseases of the heart	1,958	91.1
Accidents	2,385	114.0	Malignant neoplasms	1,301	60.5
Motor vehicle	1,263	60.4	Accidents	833	38.7
Other accidents	1,122	53.6	Motor vehicle	490	22.8
Malignant neoplasms	1,424	68.0	Other accidents	343	16.0
Chronic liver disease and cirrhosis	520	24.8	Cerebrovascular diseases	513	23.9
Suicide	485	23.2	Chronic liver disease and cirrhosis	404	18.8
Cerebrovascular diseases	456	21.8	Diabetes mellitus	392	18.2
Homicide	453	21.6	Pneumonia and influenza	295	13.7
Pneumonia and influenza	387	18.5	Certain conditions originating in the perinatal period	171	8.0
Diabetes mellitus	284	13.6	Nephritis, nephrotic, and nephrosis	151	7.0
Chronic obstructive pulmonary diseases and allied conditions	254	12.1	Homicide	144	6.7
Certain conditions originating in the perinatal period	216	10.3	All other causes	2,054	
All other causes	2,303				

Source: Indian Health Service, *Chart Book Series*, 1988.

The greater magnitude of the rate of motor vehicle accident death warrants further discussion here. The overall aggregated data for 1983-85 indicate that Indians and Alaska Natives die twice (2.3 times) as frequently from motor vehicle crashes. But since these are overall figures that include both males and females, eastern and western Indians, Alaska Natives and Indians, rural and urban Indians, and a great diversity of tribes with differing social and cultural traditions, it is imperative to examine data that are more specific to local, tribal, and gender variations.

Table 3 gives age- and gender-specific data for U.S. Indians and Alaska Natives. Indian males' rates of motor vehicle accident mortality are substantially higher than Indian females, in each age category. Further, Indian males age 15 to 85 years and older die three times more frequently than Indian females in motor vehicle crashes. Both Indian males and Indian females have higher rates of death at virtually every age category than all races combined, the exception being Indian women 75 and over.

This higher rate of accidental death for Indian males, when expressed in years of potential life lost or life expectancy, is dramatic. Among the Navajo in 1972-74, motor vehicle deaths reduced the male life expectancy at birth by 5.2 years, and other accidents reduced male longevity by another 3.1 years (Carr and Lee 1978). For Navajo females, the respective figures were 2.7 years and less than 1 year (Carr and Lee 1978). The comparable figures for the U.S. population at this time were reductions of less than 1 year for motor vehicle and other accidents for both males and females (Tsai et al. 1978).

An examination of geographical and cultural variations in unintentional injury death rates (table 4) reveals three items that need to be emphasized. First, the highest rates of

Table 2. Age-adjusted mortality rates (per 100,000 population) for American Indians and Alaska Natives in reservation States, 1983-1985, and U.S. populations, 1985

	Indians and Alaska Natives	United States			Ratio of Indians to all US races
		All races	White	All other	
All causes	542.7	546.1	523.1	697.8	1.0
Major cardiovascular disease	174.6	224.0	216.9	273.4	0.8
Diseases of heart	141.6	180.5	176.1	210.4	0.8
Cerebrovascular diseases	26.8	32.3	30.1	49.4	0.8
Atherosclerosis	2.5	4.0	4.0	3.9	0.6
Hypertension	1.0	1.8	1.4	4.7	0.6
Malignant neoplasms	84.9	133.6	130.7	155.7	0.6
Accidents	77.7	34.7	34.1	39.7	2.2
Motor vehicle	42.6	18.8	19.1	17.4	2.3
All other	35.1	16.0	15.0	22.3	2.2
Chronic liver disease and cirrhosis	29.2	9.6	8.9	14.4	3.0
Diabetes mellitus	22.9	9.6	8.6	17.7	2.4
Pneumonia and influenza	17.9	13.4	12.8	16.8	1.3
Homicide	14.3	8.3	5.4	24.4	1.7
Suicide	14.1	11.5	12.3	6.7	1.2
Chronic obstructive pulmonary diseases and allied conditions	11.5	18.7	19.2	13.8	0.6
Tuberculosis, all forms	1.6	0.5	0.3	1.8	3.2

Source: Indian Health Service, *Chart Book Series*, 1988.

motor vehicle accident deaths occur in the West (Rocky Mountain, Plains, and Upper Midwest). Indians in the Billings, Aberdeen, Tucson, and Navajo areas have the highest rates, which are 6.7, 5.4, 4.9, and 4.6 times, respectively, that of the general U.S. population. Alaska has the lowest rate.

Second, Alaska Natives, while they have lower rates of motor vehicle mortality, have much higher rates of other accident mortality such as from water transport, firearm incidents, and air transport. Third, females, particularly those living in Alaska and the West, are at increased risk for motor vehicle and other injury-related death. In summary, even though the overall age-adjusted death rates for accidents among Indians seem to have improved dramatically over the years and are now only 2.2 to 2.3 times the national averages, many tribes, cultures, and subcultures, particularly in the West, still have dramatically higher accident mortality rates. The reasons for this are sociocultural (Mann 1982) as well as geographical and environmental.

Local Mortality Data From the West

Isolated State data confirm, in another way, the extremely high accident mortality rates for western Indians. From 1982 through 1986 in Montana, the Indian crude rate of death from motor vehicle accidents was 79.7 per 100,000, while the non-Indian rate was

Table 3. Age- and gender-specific motor vehicle accident death rates (per 100,000 population) for American Indians and Alaska Natives in reservation States, 1983-85, and U.S. all races, 1984

	MALE			FEMALE		
	American Indian and Alaska Native (1983-1985)	U.S. all races (1984)	Ratio Indian to U.S. all races	American Indian and Alaska Native (1983-1985)	U.S. all races (1984)	Ratio Indian to U.S. all races
Under 1 year	19.5	4.3	4.5	12.0	4.6	2.6
1 to 4 years	23.8	8.0	3.0	18.8	5.7	3.3
5 to 14 years	9.9	8.3	1.2	7.9	4.9	1.6
15 to 24 years	87.7	54.9	1.6	31.9	18.3	1.7
25 to 34 years	99.1	37.0	2.7	30.7	10.7	2.9
35 to 44 years	78.4	25.2	3.1	29.4	9.2	3.2
45 to 54 years	71.0	22.4	3.2	25.7	8.8	2.9
55 to 64 years	59.0	21.9	2.7	22.1	10.1	2.2
65 to 74 years	57.0	24.9	2.3	15.2	12.7	1.2
75 to 84 years	89.4	42.0	2.1	14.4	20.0	0.7
Over 84 years	71.9	53.3	1.3	9.5	13.5	0.7

Source: Indian Health Service, *Chart Book Series*, 1988.

26.5 (calculated from data in the State of Montana, 1983-88). Even though these were not age-adjusted, one can conclude that the Indian rate was approximately 2.5 to 3² times the non-Indian rate in the same State. In New Mexico, similar trends are found. In both 1976-78 and 1984-86, the age-adjusted motor vehicle accident death rates for Indians were considerably higher than for the other three major ethnic groups (see table 5). Indian rates in both periods were 2.5 to 5.2 times higher than the other groups, even though the rates for all groups decreased with time. The rate of decrease was 35.5 percent for Indians, which was a more substantial reduction than among Hispanics and blacks, but not as desirable as the decline among non-Hispanic whites. Among Indian and non-Indian populations in the same State, Indians have higher rates of motor vehicle accident death.

Even in the same county, Indians and non-Indians have differential rates of motor vehicle accident death. For example, in Montana in 1974, a colleague of mine and I calculated crude accidental death rates for both Indians and non-Indians on a county-by-county basis. This was facilitated by the fact that reservation boundaries cross several counties, and each county therefore has a substantial number of both Indian and non-Indian residents living in a similar natural ecology. Of the 17 counties characterized by this situation, Indians had higher rates of accidental death (motor vehicle and other) in 11. The overall mortality rate for Indians in these counties was 253 per 100,000 compared to 70 per 100,000 for non-Indians (May and Morigeau 1976).

Morbidity Statistics

Accidents among Indians put a great burden on the health care system as measured by hospital discharge data. In fiscal year 1987, injuries and poisonings was the leading diagnostic category for Indian and Alaska Native males at IHS and contract hospitals,

2 Actually 3.6 times, but since the rates are not age-adjusted, too specific a comparison is not appropriate.

Table 4. Age-adjusted death rates (per 100,000 population) by type of injury, sex, and area for Indians and A

Type of injury	EASTERN				WESTERN			
	Nashville	Oklahoma	Aberdeen	Bemidji	Billings	Albuquerque	Navajo	Phoenix
Male								
Motor vehicle traffic	74.4	64.5	160.4	109.9	204.7	104.3	156.8	120.7
Ratio to U.S. all races	2.3	2.0	4.9	3.4	6.3	3.2	4.8	3.7
Other unintentional injury	84.5	36.7	103.0	79.7	149.8	85.6	114.3	106.5
Ratio to U.S. all races	3.1	1.3	3.7	2.9	5.4	3.1	4.2	3.9
Female								
Motor vehicle traffic	22.2	27.8	77.2	46.6	87.2	48.0	51.2	54.1
Ratio to U.S. all races	2.0	2.5	6.8	4.1	7.7	4.3	4.5	4.8
Other unintentional injury	4.2	6.7	30.8	28.3	35.2	17.6	20.1	24.8
Ratio to U.S. all races	0.5	0.7	3.4	3.1	3.9	1.9	2.2	2.7
Total (both sexes)								
Motor vehicle traffic	48.2	45.8	116.8	77.6	145.0	74.8	101.3	85.9
Ratio to U.S. all races	2.2	2.1	5.4	3.6	6.7	3.4	4.6	3.9
Other unintentional injury	42.7	21.1	65.5	53.1	91.1	49.6	64.4	63.9
Ratio to U.S. all races	2.4	1.2	2.3	3.0	5.1	2.8	3.6	3.6

Source: U.S. Congress, *Indian Health Care*, 1986.

Table 5. Age-adjusted and crude mortality motor vehicle accident rates (per 100,000 population) for New Mexico ethnic groups 1976-78 and 1984-86

	Crude rate	Age-adjusted rates			Percent change 1976-86	
		Total	Ratio Ind/Other	Male		Female
1976 through 1978						
Indian	125.5	150.4	—	243.5	67.9	—
Hispanic	44.6	51.2	2.9	85.7	22.8	—
White non-Hispanic	39.1	42.6	3.5	61.4	26.2	—
Black	23.5	29.2	5.2	39.7	19.4	—
1984 through 1986						
Indian	85.9	97.0	—	148.3	52.0	-35.5
Hispanic	36.3	38.8	2.5	58.6	19.8	-24.2
White non-Hispanic	24.9	25.2	3.8	35.6	14.9	-40.8
Black	23.7	27.7	3.5	43.7	10.3	-5.1

Source: *New Mexico Selected Health Statistics*, 1978 and 1986.

accounting for 18.7 percent of all inpatient stays. Among females, the same category was the fourth most frequent inpatient diagnosis, accounting for 6.8 percent of all stays. Within these statistics, motor vehicle-related injuries are the largest category in most areas of the country, rivaled and/or surpassed only in certain age groups by falls (IHS 1988; unpublished IHS program statistics.).

Available Literature and Explanatory Themes

All the above material raises some interesting questions about why Indians and Alaska Natives are plagued by high rates of accidental death and injury. Realizing that the word "accident" is both unpopular and also inaccurate because vehicle crashes have objective, recognizable, and predictable precursors, it is now expedient to examine the research literature.

Few major studies are available on motor vehicle accidents among Indians or Alaska Natives. However, some studies have examined all types of accidents combined and also violent death. Most of these articles include motor vehicle accidents as one of a number of variables. Schmitt et al. (1966) studied accidental deaths among Indians in British Columbia (Canada). In this study, motor vehicle deaths accounted for 24 percent of all Indian accident deaths as opposed to 35 percent for non-Indians. Drownings and burns were the most common causes of death.

Boyd et al. (1968) studied accident mortality in Alaska in 1958-62 and found drowning (water transport) as the leading cause of death (62.7 per 100,000) and motor vehicle accidents as the third leading cause, behind fires. Brown et al. (1970) also studied all types of accidents, but used clinic records to examine both morbidity and mortality among the Navajo. Motor vehicle accident deaths accounted for 48 percent of Navajo accident mortality in the late 1960s and 19.3 percent of the injuries. Factors related to motor vehicle crashes were unlicensed drivers, alcohol use, lack of driver education, lax enforcement of laws, and poor roads.

Omran and Laughlin (1972) also studied injury morbidity and mortality among the

Navajo, but focused only on clinic records from an earlier period (1950s and early 1960s) from a remote, central portion of the reservation. All the studies cited above are rather descriptive and in many ways serve to place the motor vehicle accident experience in a historical context (e.g., in relation to horse and wagon-induced injuries) and in the broader context of all injuries (cuts, falls, etc.).

A more recent study of all types of injury was undertaken by Leon Robertson for the Indian Health Service (1985). Using national IHS clinic data and existing literature, Robertson reviewed the nature of injury morbidity and mortality as they related to magnitude in all areas served by IHS. Also, there was an attempt to identify individual risk factors that relate to injury. Such high-risk diagnoses are venereal diseases, diabetes, etc. While this was an interesting attempt to identify a general population at risk, the epidemiological and public health implications of this study were limited by a lack of focus on local and specific conditions and socio-cultural variables.

Four major articles/works have been published about the Papago of Southern Arizona. Each work examined the total range of injuries from clinic records in various modern and traditional communities. Hackenberg and Gallagher (1972) found that injury rates were twice as high in the more modern villages and explained this as a function of social change correlating with wage labor, Protestant religion, and higher education. Change produced stress that, coupled with alcohol use, produced more injury.

Stull (1972, 1973) also studied Papago clinic records and found that the highest injury rates were typical of modern individuals in progressive communities, but that rates of accident and injury were lower for traditional individuals in progressive communities and lowest for traditional people in traditional communities. In a later article, Stull (1977) modified this argument to say that injuries were more prevalent in modern settings "simply because the environment and associated lifestyle place individuals at a greater risk for injury." Alcohol was also mentioned as a contributing factor to injury.

One other article that explored the theme of modernization and social stress was written by James Wills (1969), who worked among the Oglala Sioux of Pine Ridge, South Dakota. Wills states that a comprehensive, baseline self-report survey showed that accident and injury were higher among fullblood Indians. Further, one half of those individuals involved in vehicular accidents had been arrested at least once for drinking and were also prone to other social and legal problems. The bulk of this study, however, was concerned with brief psychological autopsies of three male Sioux drivers killed in motor vehicle crashes. These drivers were characterized as having problems of adjustment, low self-esteem, failure to achieve, and feelings of a lack of control over their own lives.

Another study among the Navajo focused solely on motor vehicle accidents. Using police data from three States and from tribal police, this project produced three documents – one monograph (Katz and May 1979) and two article/pamphlets (May and Katz 1979a, b) – that described and analyzed the multivariate nature and epidemiologic features of both Indian and non-Indian fatal ($n = 500$) and nonfatal crashes ($n = 2,347$). Data were collected on both the Navajo reservation and roads leading to it in 1973-75. Some of the key findings regarding fatal crashes in this study include:

- Mortality rates per 100 million miles traveled (which control for driving exposure) were higher for Navajos (12.6 per 100 million) than for the State of Arizona (5.0), New Mexico (6.1), or the U.S. population (3.8).
- Of all the fatal Indian crashes, 51 percent were single vehicle, 29 percent were multiple vehicle, and 20 percent were pedestrian.
- In fatal single vehicle crashes, Navajos were significantly more likely than non-Indians to be driving a pickup truck, have an invalid license, be younger and have been drinking.

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- When comparing Navajo fatal single versus multiple vehicle crashes, single vehicle drivers were significantly more likely to have been drinking (41 percent versus 28 percent), less likely to have a valid license, were younger, and single vehicle fatalities were more likely to happen at any time of day and in the daylight.
- Regarding multiple vehicle crashes, the only significant difference between Navajo and non-Indian experience was that Navajos were more likely to be driving a pickup.

No differences were found between fatal Indian and non-Indian crashes regarding number of persons in the vehicle, condition of vehicle, or environmental conditions (weather, light, hour of day, weekend, or season).

In nonfatal crashes, weather, road, and environment were more important. Therefore, this study pointed heavily, but not exclusively, to the individual characteristics (e.g., youth, alcohol, license) of the Indian driver. Local belief at the time of the study maintained that the roads, environmental conditions, vehicles in poor condition, and driving greater distances were the major determinants of serious crashes. In the study, however, the rates per hundred million miles traveled and other comparisons did not support these beliefs, but rather showed that most fatal crashes were related to driver characteristics.

In addition to the specific findings of the Katz and May (1979) Navajo studies, general conclusions were reached as to why Indians have a higher rate of motor vehicle death than others in the United States or surrounding areas.

First of all rurality is a key factor. As Waller (1967) and Waller et al. (1964) have shown, accidents in rural areas produce four times the amount of death than urban accidents of similar severity. Since the Navajo reservation is possibly the most remote area in the U.S. with a very sparse population (150,000 to an area the size of West Virginia), high rates of death are to be expected. The U.S. in general is about 70 percent urban and had a rate of death of 4.20 per 100 million miles traveled in 1973. One would, then, expect the total rate for the Navajo reservation (approximately 10-20 percent urban) to be approximately 12 per 100 million overall and 16 or higher on many roads. Thus lack of access to medical care due to remoteness and time and distance to medical care influence the fatalities greatly. . . .

A second major factor in the high rates is the age of the population. Young persons in the U.S. are frequently involved in and killed in accidents. To a similar extent Navajo under 30 years of age are also highly involved in accidents, particularly, single car accidents. The difference, which has the effect of raising Navajo rates, is the sheer number of people who are under 30 years old. While only 50 percent of the U.S. population is under 30, 70 percent of the Navajo population is under 30. Thus, unless age specific rates are calculated, crude rates and rates per 100 million miles will be higher for the Navajo population. The preponderance of young Navajo results in a high risk population.

A third factor in the high rates is alcohol and the drinking patterns. Younger persons are more likely to be experimenters with alcohol in the U.S. in general and this is also true with the Navajo. Most Navajo who drink are under 45 years of age (Levy and Kunitz 1974) and the modal drinking style of those who do is sporadic, binge drinking (Ferguson 1968). This style of drinking, coupled with prohibition, is a factor in high accident rates. Under prohibition, with most cultural and ethnic groups, drinking styles emphasize hurried drinking and intoxication (see May 1976). The Navajo are no exception and drinking in border areas such as Gallup, Farmington, Flagstaff, etc.,

takes this form. After drinking, however, a long drive or walk home of 10 to over 100 miles becomes a more difficult task, especially on two-lane roads. Thus, the higher rates of motor vehicle and pedestrian accidents and alcohol relatedness among the Navajo are influenced by alcohol and particularly the laws of prohibition on the reservation.

A final variable in explaining high accident rates is culture. As many authors have pointed out, cultural variables are important in many areas of deviance or "social pathology" (Levy and Kunitz 1974), and for accidents this is true (Hackenberg and Gallagher 1972; Selzer and Vinokur 1974). Nevertheless the nature of Navajo acculturation and assimilation should not be ignored. Acculturation and assimilation of cultural items are slow processes and are never uniform. Presently in Navajo society, acculturation has occurred in that the motor vehicle (particularly the pickup truck) has been adopted and is used with great vigor. Assimilation, on the other hand, the internalizing of values from another culture, is a much slower process and has not occurred among many Navajo with regard to motor vehicle use. The Navajo use pickups in a fashion which is strongly based in traditional values. One very prominent value surrounding accidents is fatalism. . . . Related to this is a lack of adoption of safe or defensive driving, many people disregard licensing procedures and laws, and seat belts are rarely used. This is not to deny that overall U.S. and European populations could be accused of these behaviors, but the degree is different. Due to differences in culture and world view, fewer Navajo have adopted safe practices for motor vehicles than some other groups in the U.S. population. (Katz and May 1979)

Alcohol Involvement

Because of drunk-Indian stereotypes and other folk beliefs about the West, a strong relationship between alcohol and motor vehicle accidents among Indians has been assumed by many (see May and Smith 1988; May 1982). The fact is, however, that there is little concrete evidence in print to document the true extent of alcohol involvement in motor vehicle accidents involving Indians and Alaska Natives. There is, however, enough evidence to generalize here.

First of all, a little known fact is that Indian drinking behavior is highly variable from one tribe to the next. In some tribes, more youth and adults drink than the general population but in others, fewer individuals drink. For example, among the Navajo in 1970 only 31 percent of adults drank at all, and many individuals in the over-40 age categories were abstainers (Levy and Kunitz 1974). By 1985, some increase had been registered in Navajo drinking prevalence, which was then believed to be as high as 52 percent, but the prevalence was still lower than the 67 percent reported in the overall U.S. population (May and Smith 1988). The point here is that Indian drinking patterns are highly variable from one tribe to the next, and drinking styles are also unique and may not always conform to popular notions put forth by mainstream stereotypes. Particular drinking styles, however, are important to consider when studying and intervening with the unintentional injury complex.

Going back to earlier accident studies, Schmitt et al. (1966) in British Columbia used hospital insurance data to find that 28 percent of the 300 accidental (of all types) native deaths in their study were alcohol-related. Further, they found that among those over 20 years of age, 39 percent of the male accident deaths and 49 percent of the female deaths were alcohol-related. Alcohol intoxication, they concluded, was an important factor in native driving and transport accidents.

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Other studies dealing with all types of accidents have found and/or speculated upon a native alcohol and injury relationship. Boyd et al. (1968) found that 12 percent of all motor vehicle accidents and drownings in Alaska were alcohol-related. Wills (1969) found a significant correlation between Sioux accident victims and alcohol arrest. Brown et al. (1970) listed alcohol as the most influential factor in Navajo motor vehicle accidents, but provided no data. Omran and Laughlin (1972) reported that of 10 motor vehicle accident deaths studied among the Navajo, 5 were alcohol-related. Among the Papago, both Hackenberg and Gallagher (1972) and Stull (1973, 1977) related alcohol consumption to modernization and acculturation stress, and these in turn combined to increase injury rates. Katz and May (1979) found that police records linked alcohol to 41 percent of the Indian drivers in single vehicle crashes, 46 percent³ of multiple vehicle crashes, and driver or pedestrians in 44 percent⁴ of pedestrian fatalities.

With all of these studies, however, the role of alcohol was, no doubt, underestimated, for police reports in the 1970s, hospital and clinic records, and death records seldom reported the true magnitude of the problem (Zylman and Bacon 1968). Further, police data might be biased in that Indians might be tested more frequently than others as Westermeyer and Brantner (1972) found, or recording of alcohol involvement on Indians may be more common or acceptable in terms of societal norms. For example, in the Navajo studies (Katz and May 1979), the Indian alcohol involvement was 2.8 times higher in single vehicle crashes, 1.7 times higher in multiple vehicle crashes, and 1.3 times higher in pedestrian fatalities than non-Indian events. Maybe this was the actual magnitude, but underreporting and selective reporting of all alcohol involvement must be considered as a possibility with all these studies.

Some investigators used more accurate or valid data sources. In an intensive autopsy study of sudden death in British Columbia, 43 of the subjects were Native (Cutler and Morrison 1971). Of the accidents, suicides, and homicides of these Indians, 54.8 percent involved BACs at or above to the legal intoxication limit (0.08) in Canada. The authors concluded that the "high rate of Indian sudden death is primarily the result of occasional, but intense intoxication in high risk situations" (Cutler and Morrison 1971).

In another study of sudden death, the Kenora (Ontario) Planning Council found, through inquiry of knowledgeable parties, that alcohol was a factor in more than 70 percent of the nearly 200 sudden Indian deaths, including even 50 percent of the victims of homicide. This report concluded that the 70 percent may be an underestimate. In Manitoba, Trott et al. (1981) found sudden death to be more common among Native Indians, with 52.5 to 54.3 percent of the accidental deaths alcohol- and/or drug-related. These data, however, included many non-Indians as well as Indians. Jarvis and Boldt (1982) studied the deaths of Alberta Province Indians in a prospective fashion, using interviewers in 35 native communities. Alcohol was involved in 70.6 percent of all motor vehicle accident deaths as reported by informants immediately following a death. The four Canadian studies have increased our knowledge considerably, but the question remains, what about Indians in the United States?

In New Mexico, the medical investigator system and the State laboratories are centralized in both authority and in operation. Blood and breath testing are strictly overseen by these centralized bureaus, so the quality of information is good. Since more than 8 percent of the State is populated by American Indians, and several counties are heavily Indian, one might closely examine the alcohol and accident situation among Indians using routine data. Realizing the real risk of committing the ecological correlation fallacy in examining county data without linking it to individuals (Robinson 1950),

3 Includes data on all drivers of both vehicles, so that if one or the other or both were cited as intoxicated, it was counted as an alcohol-related crash.

4 The pedestrian involvement included 22 percent of the drivers (excluding the 25.5-percent hit-and-run who may well have been intoxicated) and 22 percent of the pedestrians.

Table 6. Motor vehicle accidents and alcohol in three selected counties in New Mexico, 1982-84

County	Percent Indian (major tribe)	Alcohol involvement (percent)	
		Fatal accidents	Severe accidents*
A	66 (Navajo)	78.0	33.1
B	33 (Navajo)	78.0	28.8
C	27 (Pueblo)	73.7	24.2
Entire State	8	63.7	21.2

*Severe accidents are those that involve injury or death.

Source: New Mexico Traffic Safety Bureau 1984 and *New Mexico Vital Statistics, 1984*.

table 6 shows that serious accidents are slightly more alcohol-related in those counties with a substantial Indian population. County A, which is 66 percent Indian, is probably the best comparison. In the 3 years covered, 1982 through 1984, 78 percent of all fatal accidents and 33 percent of all serious accidents were alcohol-involved as measured by blood or breath alcohol.

One final statistic from New Mexico is also available. Several studies, particularly in Canada, referred to one particular Indian pattern or style of drinking—binge drinking—that is characterized by rapid consumption and leads to high blood alcohol levels. Autopsy data examining alcohol levels in blood and vitreous fluid samples from 253 accidental deaths in New Mexico indicated that Indian crash victims had high blood-alcohol levels. The 68 Indian crash victims autopsied in 1986 who were positive for alcohol had a mean blood alcohol level of 0.201, compared to 0.183 for Hispanic positives and 0.126 for comparable non-Hispanic whites⁵ (Guerin, in process).

Solutions and Partial Solutions

Given all the data that indicate that alcohol and driving are tragically linked in American Indian populations, with more severe consequences than among other groups in the United States, a comprehensive, multivariate prevention strategy must be planned and launched. Because the available information is not as complete as public health professionals might desire, more research to further specify the relationship between alcohol, injury, and Indians is needed in the future. However, current knowledge is clearly adequate for a solid beginning in prevention and intervention.

Below, general trends and/or ideas in prevention are highlighted, using as a guide the usual scheme of primary, secondary, and tertiary levels of prevention. Primary prevention attacks root causes of a problem in its basic environmental, social, cultural, and political structure. Secondary prevention is directed at eliminating the onset of a problem and/or taking action in the early stages of manifestation. Tertiary prevention seeks to provide curative and remedial action to deal with and minimize the illness, injury, and other negative outcomes of a major health problem.

⁵ The legal intoxication level in New Mexico is 0.10.

Primary Prevention

The social, economic, and educational status of many American Indians can undoubtedly be improved to the overall benefit of many tribes and individuals alike (Dozier 1966). As several authors have pointed out, many Indian groups are undergoing epidemiologic transition (Omran 1971; Kunitz 1983; Broudy and May 1983), and this movement from traditional to modern is related to the high accident rates now prevalent, particularly on Western reservations (Hackenberg and Gallagher 1972; Stull 1972, 1977, 1973; Omran and Laughlin 1972). As Omran and Laughlin (1972) pointed out, people in transition "exhibit many insecurities and inabilities to cope with their changing way of life," and this results in the accident and violence complex among particular segments of Indian societies. Therefore, assisting Indian groups and individuals in their efforts at economic, social and educational enhancement will ultimately benefit many areas, including alcohol abuse and accident and violence rates.

In the Native American Adolescent Injury Prevention Program (unpublished data) run in the rural areas of New Mexico, rural Indian youth were found to have the lowest scores on social psychological scales, such as locus of control and self-esteem, that are predictive of accident susceptibility. However, these scores are highly influenced by the educational level of the parents of the Indian children (see also Liban and Smart 1982). Indian children from families of high educational attainment not only score better on social psychological scales, but they also report less substance abuse and risk-taking behavior common to accidents. Therefore, broad social enhancement, such as education, which may strengthen the family, also enhances the individual in ways that should reduce the accident rate over an extended period (Mail 1985; Dozier 1966).

Other primary prevention is being, and can be further, pursued. The IHS, Office of Environmental Health, is now working at national, State, and local levels to improve roads, encourage seatbelt use, and promote injury control and state-of-the-art highway safety all over the Indian lands of the Nation. It appears likely that some of this road improvement has already begun to reduce the accident fatality rates in some reservation areas.⁶

A final area of primary prevention concerns tribal and community law and policy. Tribes have great legal power to control alcohol policy, taxation, and enforcement on their reservations and communities. More than 60 percent have retained prohibition but are reluctant to enforce strong penalties to support it (May 1975, 1976, 1977; May and Smith 1988). Tribes need to strictly examine and change alcohol and social policies so that they influence new norms and guidelines of behavior regarding alcohol and substance use, particularly for the minority who abuse alcohol. Whether the policy adopted is a more strict, comprehensive, and effective approach to prohibition, or whether it is legalization that is comprehensive and specific in its prescriptive qualities, a new, more explicit set of policies is needed to guide behavior (see May and Smith 1988; May 1986).

Secondary Prevention

Alcohol and health education with youth must continue and be further expanded. Recent years have seen a great increase in this area, but more has yet to be done. Youth need to be educated, not only about alcohol abuse, but also taught in a social learning mode that emphasizes self-esteem enhancement, values clarification, coping, and problem-solving skills (Bach and Bornstein 1981; Winfree and Griffiths 1983; May 1986).

⁶ For example, the motor vehicle accident death rate for the Crow and Northern Cheyenne Indians appears to have declined in 1981-85 (IHS unpublished statistics) from what it was in 1959-75 (see May 1976). Some of this reduction may be due to the construction of Interstate Highway 25 from Crow Agency to Billings, Montana, for the old road was a notoriously narrow, hilly, winding, and dangerous stretch of more than 60 miles.

Health education with adult Indians should take a different approach. Most adult Indians are well aware of the health implications of alcohol abuse but could benefit greatly from education and exposure to public health principles and the possibilities of public policy for alcohol abuse and accident prevention (May and Smith 1988).

A continuing and open forum on alcohol policy needs to be pursued, and widespread public education will feed this. Policies, laws, and campaigns that are specific to accident and alcohol abuse hold great promise for a tribe. Positive action in this area is now beginning with safety campaigns, but routinizing the dialog and concern regarding these issues is necessary. Recently, for example, the Navajo Tribe took a major step in this direction by passing a mandatory seatbelt law for their reservation, the largest in the United States (Landon 1988). The enforcement of such laws and the perception of sure and swift penalties must be emphasized as well (Ross 1982).

Safety programs such as infant car-seat purchase and rental have been promoted by the IHS and a number of tribes. Generally, these programs seem to be well received, for most Indians are particularly responsive to child health and welfare issues. The programs, however, need to be expanded to all babies of all tribes. Targeting youth in safety programs may produce a whole new generation of Indian seatbelt users. Currently, surveys of the New Mexico Native American Adolescent Injury Prevention Program (unpublished data) indicate that young Indian males have the lowest seatbelt use of any group in New Mexico. But these data also indicate that increasing seatbelt use is the most common and significant change in behavior of the injury prevention program.

Tertiary Prevention

Until the middle 1970s, few reservations had any emergency medical resources such as ambulances and trained and employed emergency medical technicians. Now, most reservations and many rural Indian communities have some level of emergency medical services, and these small programs may well have had an influence on the drop in Indian motor vehicle crash fatality rates registered since 1976. However, these services greatly need to be continually upgraded, improved, and expanded so that more accident victims can be saved and/or their injuries minimized, and the high disability rate of Indians can be lowered. Further, emergency room capabilities need to be enhanced, so that accident victims receive state-of-the-art trauma care whenever possible. New Mexico has only one level-one trauma center and some western States have none.

The most desirable tertiary prevention would be improved interdiction of drunk drivers before they cause crashes and expanded alcohol treatment capabilities. Tribal, Bureau of Indian Affairs, local sheriff, and police forces in Indian country are notoriously understaffed and in need of further assistance of all kinds. Increasing their training and, particularly, their manpower and resources should be a priority. Further, if the laws and policies regarding alcohol and driving under the influence (primary and secondary prevention) were improved so that the police efforts were facilitated, then enforcement would be greatly aided. For example, on many "dry" reservations, bootlegging is so common and institutionalized that the tribal police can tell you who sells and how much it costs, and can even estimate their income. But to eliminate the practice would require considerably more manpower, time, and new, stronger, and more explicit laws than currently exist on reservations and in most western States.⁷

Alcohol treatment programs in Indian country are characterized by too few resources and capabilities of all kinds (manpower, money, level of training for the counselors, and

⁷ On the Navajo reservation, for example, the maximum penalty for bootlegging is 6 months in jail and a \$500 fine. Police report, however, that to charge a person with bootlegging takes a number of officer manpower days to build a case, search, collect evidence, and bring it to court. Seldom, however, is any major jail time spent by the accused, and the maximum fine for conviction (\$500) is little more than an overhead expense in the cost of doing a profitable business.

treatment regimens). A total upgrading and new commitment is needed in this arena, so that all first-time driving-under-the-influence offenders can be screened and placed in an appropriate treatment modality (May 1986).

Conclusion

In summary, then, the problem of alcohol abuse and accidents exists in many Indian communities. It takes a tremendously large toll in terms of injury and lives lost. Since it has multiple causes and related factors, its solution must also be multivariate. Any program designed to reduce alcohol-related motor vehicle accidents among Indians must be comprehensive and must address both general conditions and specific prevention and intervention tasks.

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Drunk Driving Among Blacks and Hispanics

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Blacks comprise about 12 percent of the U.S. population, and Hispanics about 8 percent (Bureau of Census 1987). Research suggests that problem drinking and associated mortality rates are higher in these two minority groups than in the general public (Herd 1985; NIAAA 1982a). Yet, few studies have investigated the issue of drunk driving among blacks and Hispanics. This chapter summarizes relevant characteristics of these two groups, their drinking practices, and available information on their drunk driving behavior.

Demographic Characteristics

Such factors as age, socioeconomic status, and rural/urban distribution may have significant effects on overall consumption patterns and drinking and driving behavior. Thus, the alcohol problems noted among blacks and Hispanics may be partially a function of their particular demographic profiles.

On average, the black and Hispanic populations tend to be younger than whites and underrepresented among persons 65 years of age and older (Bureau of Census 1987). For both blacks and Hispanics, socioeconomic status (as measured by income and education) is significantly lower than that for whites (Bureau of Census 1987). Among civilians age 16 and older, 54 percent of blacks are employed, versus 59 percent of Hispanics and 62 percent of whites (Bureau of Census 1987). Compared to whites, blacks and Hispanics are much less likely to live in rural areas (Bureau of Census 1984) where driving is a necessity.

The Hispanic population in the United States is a very heterogeneous group, with diverse national and sociocultural backgrounds (NIAAA 1987). According to the 1980 census, approximately 60 percent of the U.S. Hispanic population is of Mexican origin; 15 percent are considered Puerto Rican, 6 percent Cuban, and the remaining 20 percent are linked to other countries, including those in Central and South America (NIAAA 1982a; NHTSA 1987; DHHS 1986b). The black population of the United States is also heterogeneous, reflecting different cultural, regional, and socioeconomic perspectives.

Consumption Patterns

Blacks

The data on drinking practices among blacks are somewhat inconsistent and difficult to interpret. Blacks are at high risk for alcohol-related medical problems, especially liver

cirrhosis and esophageal cancer (NIAAA 1987), and their cirrhosis mortality rate is nearly twice that for whites (Herd 1985). Yet, blacks of both sexes report higher abstinence rates than whites; and among drinkers, black men are less likely than white men to drink heavily (NIAAA 1987). Among female drinkers, the pattern is reversed; black women are more likely than white women to drink heavily (NIAAA 1987).

The relationship between age and drinking practices appears to differ by race. Alcohol consumption among white males age 18-29 is high, with a decline after age 30 (NIAAA 1987). Consumption among blacks, however, is relatively low in the 18-29 age group, rises dramatically among those in their 30s, and declines after age 39 (NIAAA 1987; NIAAA 1982*b*). According to a recent report prepared for the National Highway Traffic Safety Administration (NHTSA), black males in younger age groups "are at substantially less risk for high rates of heavy drinking than younger whites" (NHTSA 1987). Moreover, studies of adolescents consistently show lower rates of problem drinking and related arrests among blacks than whites (DHHS 1986*a*). On the other hand, data suggest that blacks enter alcohol treatment programs at younger ages than whites, the peak age for blacks being 35-44 compared to 45-54 for whites (NIAAA 1987).

The relationship between income level and drinking practices also appears to vary by race. For white men, increased income has been associated with increased heavy drinking (NIAAA 1987; Herd 1985). For black men, the reverse is true; increased income has been associated with decreased heavy consumption (NIAAA 1987; Herd 1985).¹ With respect to women, however, the two races are similar: increased income is associated with more frequent (as opposed to heavy) drinking (NIAAA 1987).

Drinking practices among blacks may differ by geographic region. In the Northeast, for example, the proportion of blacks in alcohol treatment is reported to be two to three times higher than their proportion of the regional population (NIAAA 1987; DHHS 1986*a*). But in the interior South, the number of blacks in treatment is generally proportional to their representation in the population (NIAAA 1987; DHHS 1986*a*).

Hispanics

Compared to the general U.S. population, Hispanics in the aggregate have relatively high rates of heavy drinking and alcohol problems (DHHS 1986*b*). Yet, differences can be observed within the Hispanic population. As an example, Hispanic men in this country have relatively high rates of alcohol use and abuse (NIAAA 1987) as well as cirrhosis mortality (NIAAA 1982*a*), while Hispanic women show high rates of abstinence (NIAAA 1987). As is true for whites in general, consumption for both sexes seems to increase with increased income and educational levels (NIAAA 1987; Wilson and Williams 1983). With respect to age-related drinking problems, Hispanics are more similar to blacks than to whites. Whereas drinking problems among whites decline abruptly from their 20s to 30s, for Hispanics (and blacks) problems increase from their 20s to 30s and then decline gradually in their 40s (NHTSA 1987). First-generation American-born Hispanic men tend to drink more heavily than Hispanic-American men born abroad (NIAAA 1987).

Mexican Americans appear to consume more alcohol and report more drinking problems than the other Hispanic groups (Caetano 1988). The rate of "frequent high maximum" drinking is relatively large for Mexican-American women as well as men (Caetano 1988). Both sexes, however, also show high rates of abstinence (NIAAA 1987; Caetano 1988). Compared to the other Hispanic females, Puerto Rican women have the lowest abstinence rate, but data suggest that they are largely moderate drinkers with very few heavy drinkers among them (NIAAA 1987).

¹ Yet data from the 1983 National Health Interview Survey show similar income effects for black and white males (Wilson and Williams 1983).

Among Hispanic-American men born abroad, Mexican Americans have a low rate of abstention and a rate of heavy drinking six times that of any other national subgroup (NIAAA 1987). Conversely, Mexican-American women born abroad have a relatively high rate of abstention and virtually no heavy drinking (NIAAA 1987).

Drunk Driving Behavior

One of the barriers to obtaining information on drunk driving among racial and ethnic minorities is the failure of the records system to collect appropriate data. Depending on the purpose for which drunk-driving information is gathered, ascertaining race and ethnicity may be deemed unimportant. Political and legal considerations may further limit the availability of relevant data. Drunk driving is a criminal and civil offense that can have severe personal consequences for the driver involved. Moreover, the stigmatization of individuals accused of drunk driving can also taint the groups to which they belong. Under these circumstances, government authorities may be reluctant to collect pertinent information on specific ethnic groups, or they may decline to release data that has been collected.

The use of death certificates to determine the proportion of traffic fatalities attributable to drunk driving grossly underestimates the contribution of alcohol to such deaths (Dufour et al. 1985). The physician who completes the death certificate may not be the one who provided medical care to the patient and would not necessarily be aware of alcohol involvement (Dufour et al. 1985). Another problem is that some physicians do not recognize the importance of death certificate data for advancing medical and scientific knowledge and fail to record complete information (Dufour et al. 1985). And even when they have the full picture, they may wish to protect the deceased person's family from the stigma and financial liability associated with an alcohol-induced accident.

A more appropriate national data system for investigating alcohol involvement in traffic fatalities is the Fatal Accident Reporting System (FARS), which contains detailed information on the driver, vehicle, and environmental characteristics associated with each traffic death (Dufour et al. 1984).² Unfortunately, FARS does not include data on the race of persons involved in these fatal accidents. Death certificates indicate the race of the deceased, but not FARS. Thus, to generate statistics on racial differences in alcohol-related traffic deaths in the United States, FARS has been linked with the Multiple Cause of Death (MCD) data system, which is based on death certificates (Dufour et al. 1984).

This linkage makes it possible to investigate the effects of race on alcohol-related traffic fatalities for the country as a whole. With respect to Hispanics, however, missing data are still a problem, because the majority of States do not currently include the category "Hispanic" on their death certificates. Beginning in 1989, 10 States will pilot test a new death certificate that does contain a Hispanic category, and it is hoped that by 1990, all 50 States will collect such information (personal communication M. Dufour, NIAAA, January 1989).

Despite these various limitations, important relationships have been observed between race or ethnicity and drunk driving. Blacks and Hispanics both appear to be at high risk for alcohol-related driving problems.

² A FARS accident is one that involves a motor vehicle moving on a roadway customarily open to the public and resulting in the death of a person (occupant or nonoccupant of the vehicle) within 30 days of the accident (Dufour et al. 1984).

Blacks

The report prepared for NHTSA concluded that blacks are at greater risk than whites for traffic accidents due to drinking (NHTSA 1987). Germane to this conclusion is the Grand Rapids, Michigan study which showed that nonwhite drivers were involved in proportionally more collisions than whites (Zylman 1972; Hyman 1968a). Among those experiencing collisions, a greater proportion of nonwhites than whites had been drinking, and the BAC levels for nonwhites were considerably higher than those of whites (Zylman 1972; Hyman 1968a; Cosper and Mozersky 1968). According to Hyman's analysis, the higher accident vulnerability of the nonwhite males extended across every BAC and educational category. Even in the control group (who were not involved in accidents), nonwhites were overrepresented in the high BAC categories.

Linkages between FARS and the Multiple Cause Mortality records were effected for 2,700 Oklahoma residents who died in motor vehicle accidents in the late 1970s (Dufour et al. 1984). This facilitated the investigation of relationships between race and alcohol involvement in these deaths. Results indicated that 46 percent of the black deaths and 41 percent of the white deaths were alcohol-related. Alcohol involvement was determined by BAC testing for 91 percent of the blacks and 78 percent of the whites. In the remaining cases, it was determined by the judgment of the investigating officer. A much stronger relationship between race and alcohol involvement in fatalities was reported by Waller and his colleagues (1969). They found that 76 percent of black drivers killed in traffic crashes in California had been drinking, compared to only 56 percent of whites. Moreover, 53 percent of the blacks had BACs above a level of 0.15 percent compared to only 34 percent of the whites.

As recently as 1973, the drunk-driving arrest rate for black adults in the United States was nearly twice as high as that for whites, but since then the two rates have converged (Herd 1985). Thus, in 1981 the DUI arrest rate among persons 18 years of age and older was 951 per 100,000 population for blacks and 917 for whites (Caetano 1984). And for persons under 18 years of age, the blacks actually showed a much lower DUI arrest rate than the whites—6.5 arrests per 100,000 population for blacks compared to 47.7 for whites (Caetano 1984).

Further data on arrests come from studies in specific localities. In a 1968 report, black males in Columbus, Ohio were twice as likely to be arrested for driving while intoxicated as were other men in the 20-64 age range (Hyman 1968b). But over the 1972-75 period, Rabow and Watts (1982) found no significant correlation between the percentage of black households in 51 California counties and arrest rates for misdemeanor or felony drunk driving.

A recent analysis of recidivism patterns in Mississippi (Wells-Parker et al. 1988; Anderson personal communication 1988) suggests that blacks in that particular State are at higher risk of being rearrested for drunk driving than whites. The study found that 61 percent of black offenders under age 25 and 50 percent over age 25 were rearrested for DUI during the 6- to 9-year tracking period beginning in 1976. Recidivism rates for whites in the same age groups were 46 percent and 41 percent, respectively. When the investigators controlled for other offender characteristics such as age, level of education, and severity of drinking problem, the blacks were approximately 1.4 times more likely to recidivate than the whites.

For reasons that are unclear, limited survey data indicate that blacks are less likely to report driving while drunk than are whites (NIAAA 1987; Herd 1985). Among men, the reported rate for whites is more than two and a half times higher than that for blacks. And among women, the white rate is more than five times higher than the black rate

(Herd 1985).³ The possible influence of differential car ownership on these relationships has not been discussed.

Hispanics

Caetano's analysis of FBI statistics for 1981 indicated that among persons 18 years of age and older, the arrest rate for driving under the influence was more than twice as high for Hispanics as non-Hispanics (Caetano 1984). Specifically, the rate per 100,000 population was 1,712.2 for Hispanics and 742.6 for non-Hispanics. Yet, the DUI arrest rate among persons younger than 18 years of age was only slightly higher for Hispanics than non-Hispanics (39.8 per 100,000 population compared to 34.2 (Caetano 1984)). An examination of *total* arrests for Hispanics and non-Hispanics in the 18-plus age range showed that 19 percent of the Hispanic arrests were for driving under the influence, compared to 17 percent of the non-Hispanic arrests (Caetano 1984).

Studies of California populations support Caetano's finding that Hispanic arrests for drunk driving are relatively high. Hyman (1968*b*) reported an overrepresentation of Spanish surnames among persons arrested for drunk driving in Santa Clara County. After controlling for urbanization and income, Rabow and Watts found a significant correlation (.42) between misdemeanor arrests for drunk driving and the percentage of Spanish Americans in 51 California counties (Rabow and Watts 1982). However, there was no significant correlation for felony drunk-driving arrests. Consistent with these findings are three other California studies summarized by Caetano (DHHS 1986*b*). All showed an overrepresentation of Hispanics among arrestees for drunk driving (also see NIAAA 1982*a*).

In addition, several studies indicated that Hispanics are disproportionately involved in alcohol-induced crashes. During the 1970s, May and Baker (1974) found an overrepresentation of Hispanic drivers in alcohol-related traffic accidents in New Mexico, and Alcocer reported that the rate of traffic accidents resulting in injuries or fatalities was higher for Hispanic than non-Hispanic neighborhoods of Los Angeles (DHHS 1986*b*). Moreover, a higher proportion of the Hispanics than non-Hispanics who had been arrested for DWI in Hyman's Santa Clara study had been involved in accidents (Hyman 1968*b*; Hyman et al. 1972). The BAC levels also tended to be higher for the Hispanic than non-Hispanic arrestees (Hyman 1968*b*).

Interpretation

Drunk driving can be measured directly through roadside surveys, including breath-alcohol tests of drivers. It is indirectly measured by crashes ("accidents"), especially fatal crashes, which are strongly correlated with drunk driving, and by arrests, although the latter is a weaker index because of its sensitivity to the level of police activity. In general, the available evidence suggests that black and Hispanic drivers are more likely than members of other groups to be impaired by alcohol.

Roadside survey data obtained in the Grand Rapids study (Zylman 1972; Hyman 1968*a*; Cospers and Mozersky 1968) revealed that blacks were more likely than whites to drive with high BACs and to have crashes. The study stands alone, as more recent roadside surveys have failed to gather racial and ethnic data. Unfortunately, the Grand Rapids study cannot be considered recent, but its conclusion of black overinvolvement in drunk driving is supported by independent studies of involvement in fatal crashes

³ Data from Cospers and Mozersky's study of Grand Rapids and "Greentown" respondents are consistent with these patterns (Cospers and Mozersky 1968).

(Dufour et al. 1984; Waller et al. 1969). These latter studies show that when blacks have fatal crashes, they are more likely than whites to have alcohol in their blood. However, these investigations do not in themselves demonstrate a higher fatal crash rate for blacks on a per capita basis. The studies using arrest (Herd 1985; Caetano 1984; Hyman 1968b; Rabow and Watts 1982) and rearrest (Wells-Parker et al. 1988) data have produced inconsistent findings in the matter of black overinvolvement, perhaps related to the weakness of the criterion variable (arrests).

Since 1965, both whites and blacks have shown dramatic increases in DUI arrest rates among persons 18 years of age and older, but whites have shown the greater change over time, thereby closing the gap between the races (see figure 1). Although the reasons for these patterns are unclear, several other trends suggest that increased law enforcement (DHHS 1986a) is the explanation rather than increased drunk driving. The mileage-based highway mortality rate has been declining over time (National Safety Council 1986) as has the proportion of fatal crashes in which alcohol is implicated (NHTSA 1988), and roadside surveys are finding proportionately fewer alcohol-impaired drivers than in earlier years (Wolfe 1986).

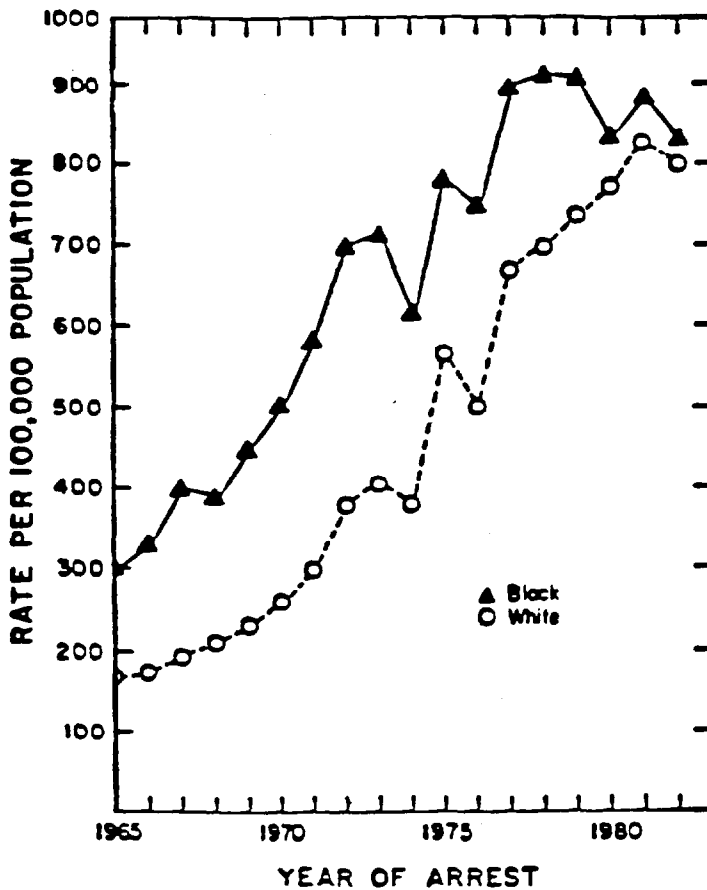


Figure 1. U.S. arrest rates for driving under the influence: Persons 18 years and over, by race, 1965-1982

Source: This figure was reproduced from Herd (DHHS 1986a, page 101). The data sources for arrest rates were the Uniform Crime Reports and Current Population Reports. The 1981 arrest rates portrayed here are lower than those reported by Caetano (1984) because the two authors used somewhat different estimates of the relevant 1981 populations. However, in both cases the arrest rates for blacks and whites were quite similar.

Concerning the drinking and driving of Hispanics, no roadside survey-based studies are available. However, several studies reported overinvolvement of Hispanics in alcohol-related crashes (DHHS 1986b; Hyman 1968b; Hyman et al. 1972), and large excesses of drunk-driving arrests are reported in the literature (Caetano 1984; Hyman 1968b; Rabow and Watts 1982). The consistency of these findings leads to the conclusion that Hispanics are unusually likely to engage in drinking and driving.

One possible interpretation of the findings concerning arrests of Hispanics, and also blacks, is that police are disproportionately likely to arrest minority-group members (DHHS 1986b). If so, the reported overinvolvement of minorities in drunk driving would be misleading (see Morales cited in DHHS 1986b). However, the only study on the issue (Hyman et al. 1972) reported that a higher proportion of Hispanic than non-Hispanic drunk drivers are arrested as a consequence of accidents rather than moving violations, a fact inconsistent with the idea that the excess of arrests stems from police bias. Studies showing excess alcohol-related crashes for minorities may have to contend with different proportions of blood-alcohol testing (Dufour et al. 1984), which again could produce misleading conclusions. However, the finding that fewer of the majority group are tested suggests that their relative rate of impaired driving may be overestimated (assuming that testing is first done on those most reasonably suspected of drinking, and that the rate is calculated on the basis of the population tested). Thus, the estimate of excessive involvement of the minority is likely to be conservative rather than overstated.

If the conclusion of minority overrepresentation in drunk driving is valid and not merely a measurement artifact, it requires further explanation. Two straightforward interpretations are that minority status is related to more heavy drinking and to more frequent driving. However, the latter possibility (excessive driving exposure) could potentially explain only population-based indexes, like ordinary arrest rates. A third possible interpretation is that minority-group members, though neither disproportionately drinking nor driving, are more likely to combine these behaviors.

The first explanation, heavier drinking, is clearly supported for Hispanics, though not so clearly for blacks. Why Hispanics, in particular, should be disproportionately heavy drinkers may be explicable on cultural grounds. The "machismo" (manliness) attitude of Hispanic men (Ames and Mora 1988) may contribute to their higher rates of alcohol-related arrests and accidents by leading to an increase in risk-taking behavior. Relevant also is the "cruising" practiced by Hispanic men (and occasionally women) in the Southwest. This cultural practice involves driving slowly while drinking alcoholic beverages and flirting with the opposite sex. It is facilitated by a social network that encourages and sanctions the simultaneous use of automobiles and alcohol. It also makes these men more visible to police and more vulnerable to arrest (J. Cuellar, Prevention Research Center, Berkeley, CA, personal communication October 1988).

The second explanation—that minorities drive more than other people—has no empirical support. Rather, minority-group family automobile ownership and individual driving appear to be lower, and mileage less, at least among blacks (Cosper and Mozersky 1968; Hyman 1968b). The relatively high urbanization of both blacks and Hispanics may reduce their need and opportunity to drive. Thus, the excess of minority arrests for drunk driving would seem to be conservatively stated.

Zylman's (1972) suggestion that black overrepresentation in accidents may be due to residing (and hence driving) in congested areas must be regarded as merely speculative. A related speculation, also not yet empirically grounded, is that minority-group members have less access to transportation alternatives when drinking; these could include formal alternatives such as mass transit and taxis, or informal ones such as the practice of accepting designated drivers in drinking groups.

Indirect support for the third explanation, mixing drinking and driving, comes from the Grand Rapids study finding that, compared with others, blacks offer a larger estimate of the safe number of drinks that can be consumed before driving (Cosper and Mozersky

1968). Moreover, the suggestion has been made that minority-group members may disproportionately drink in locations away from home, such as bars and parking lots, presenting the inducement to drive while impaired. However, a recent national survey found only equivocal support for this idea (Caetano and Herd 1987). In any event, the need to use automobiles for nearly all social purposes is so fundamental in American life that such differences would probably be only marginal in their effect.

Both blacks and Hispanics are disproportionately youthful groups, which leads to the suggestion that their overinvolvement in drunk driving may merely reflect their demographic characteristics. However, among young people in both groups, the differences from the majority in arrest rates are either reduced or reversed (Caetano 1984), a finding that contradicts the demographic explanation.

A commonly offered explanation of minority involvement in drunk driving hinges on the low socioeconomic status of blacks and Hispanics in America. However, controls for occupation, education, and income, although possibly successful in reducing the linkage between minority status and indexes of drunk driving, do not seem to eliminate the relationship (Zylman 1972; Hyman 1968a; Rabow and Watts 1982).

In brief, the excess involvement of minorities in drunk driving seems to be real and not a statistical artifact. It is not merely the reflection of age or class differences related to race and ethnicity. Rather, it is best interpreted as a consequence of minority-group members' excess involvement in drinking, especially in heavy-drinking episodes. This may be marginally compounded by a relatively greater conjunction of drinking and driving behaviors in the groups discussed. The development of appropriate policy countermeasures would thus seem to be served by a more thorough understanding of the definitions of drinking and of driving in the black and Hispanic subcultures of the United States.

Research Priorities

The data on black drinking patterns suggest inconsistencies between self-reported consumption practices and medical problems induced by alcohol. Research is needed to clarify the reasons for the apparent inconsistencies—whether, for example, self-reports of blacks are distorted in the direction of social desirability, or whether a longer duration of drinking among blacks (DHHS 1986a) increases the risk of medical problems.

Since the full extent of the drunk driving problem is also not clear in either of these minority groups, more precise and complete measures are needed of alcohol use and abuse among blacks and Hispanics, with particular reference to drunk driving.

In addition, it is important to determine the extent to which the higher DUI arrest or rearrest rates among these two groups reflect real differences in drunk driving or differential law enforcement by police. The relationship of other variables to drinking patterns and drunk driving among blacks and Hispanics should also be more extensively explored. Such variables include age, income level, geographic and urban/rural distribution, and car ownership.

Perhaps most important, researchers should develop and test prevention strategies tailored to specific subcultures in which alcohol contributes to social bonding, social status, social integration, and coping with misfortune. The appropriate choice of intervention strategies will be enhanced by a better understanding of the cause of drunk driving problems among blacks and Hispanics. However, the evidence at hand is sufficient to begin the process of prevention research.

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Treatment

Rehabilitation Countermeasures for Drinking Drivers

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The primary goal of rehabilitative programs for drunk driving offenders is to reduce the probability of subsequent drinking and driving. Punishment, such as licensing penalties, fines, and incarceration, is also designed to prevent subsequent drinking and driving either by making the consequences of arrest so unpleasant and costly as to discourage the offense or by eliminating the offenders' capacity to drive (by putting them in jail or by invalidating their drivers' licenses).

Rehabilitation is based on one of two assumptions: That offenders drink and drive because they lack knowledge about the effects of alcohol, the potential consequences of drinking and driving, and strategies for avoiding drinking and driving; or that drinking and driving results from an abusive, addictive, or otherwise uncontrolled pattern of alcohol consumption. Therefore, offenders must receive education to help them rationally choose not to drink and drive or they must receive treatment so they can eliminate abusive drinking and thus stop drinking and driving.

The goals of rehabilitation are certainly important—almost one-third of convicted drinking drivers have a previous offense (Sweedler and Smith 1984). Preventing some part of this recidivism is desirable. From the perspective of individual offenders, gaining information and skills and receiving treatment to allow them to avoid drinking and driving can save them from additional expense, humiliation, inconvenience, and potential tragedy. Rehabilitation can also have positive effects on other areas of the offenders' lives if abusive drinking is reduced.

It is important to emphasize that even programs that are extremely effective in reducing recidivism *cannot* be expected to have major effects on traffic safety. Reed (1981) estimated that even if all persons arrested for drunk driving were prevented from ever combining drinking and driving again, fatal crashes would decrease by only 3 percent. Other efforts aimed at prevention or general deterrence such as well-publicized enforcement crackdowns have the potential to save many more lives.

Characteristics of Rehabilitation Countermeasures

There is wide variation in what are referred to as rehabilitative programs. Programs can vary in length, format, content, and structure. Programs may be quite brief (8 to 10

hours) or more lengthy (50 or 100 hours). They may be presented in a concentrated form over a few days or stretched over several weeks or months or even years. The format may be didactic with offenders sitting through a series of lectures, or the program may include more active participation by the offender. Some programs include group or individual counseling. Some programs involve spouses or other people close to the offender.

The content of programs also varies greatly. Some programs focus on information about the effects of alcohol, the law, potential consequences of drinking and driving, and strategies for avoiding drinking and driving (including both strategies for decreasing drinking and strategies for avoiding driving while intoxicated, such as appointing designated drivers). Other programs focus more heavily on helping offenders to identify abusive or addictive drinking patterns and providing (or persuading participants to seek) alcoholism treatment. Programs also exist that emphasize development of the right hemisphere of the brain as a way of reducing problem drinking or that teach assertiveness skills in hopes that these skills will help participants avoid drinking and driving.

Rehabilitative programs also vary considerably in the ways they are used. For example, in some States, offenders go through an assessment process to determine the nature and severity of their alcohol problems and are assigned to one of a number of rehabilitative programs based on the outcome of the assessment. In other States, offenders are assigned to programs based on other criteria such as blood alcohol concentration at the time of arrest or the number of previous alcohol-related offenses. The manner in which compliance with rehabilitative orders is enforced also varies, as well as other penalties that are applied along with rehabilitation.

States vary in the way these programs are administered. Some programs are delivered by State agencies while others are carried out under contract with a wide variety of private agencies (everything from alcoholism treatment facilities to driving schools). The amount of control that the State exerts in determining program content, format, and standards also varies. States monitor program quality and adherence to standards in varying degrees as well.

Issues in Rehabilitation Program Evaluation

Assessment of the effectiveness and value of rehabilitation programs is at best a complicated endeavor, and a number of important issues must be considered in evaluating such programs and in considering the results of evaluation studies. The criterion issue, or the explicit definition of program success, is a pervasive problem for any complex applied program, but is particularly difficult for rehabilitation programs operated within a larger traffic safety context. In this context an alcohol treatment program would be successful if rehabilitation reduced the probability of subsequent involvement in alcohol-related crashes, or at least, if the frequency of the behavior assumed to lead to such crash involvement (i.e., drunk driving) was diminished.

Measures such as alcohol-related crash involvement or driving while intoxicated (DWI) or driving under the influence (DUI) arrests and convictions are frequently chosen as criteria of success. But these measures pose at least two important methodological problems. First, and perhaps most importantly, being arrested for DUI or even being involved in an alcohol-related crash should probably be considered as only incidental to the drinking problems toward which many treatment programs are directed; these measures are certainly not comprehensive indicators of the intended effects of treatment. Second, despite the fact that alcohol-related crashes and drunk driving arrests occur frequently enough to justify countermeasures, the probability of these recidivist events is so low that statistical comparisons between treatment and no-treatment groups are usually not sensitive to treatment effects (the comparisons

usually have low statistical power). That is, the sample size must be very large or the group differences in recidivism very substantial for these differences to be empirically identified.

To address these methodological problems, some evaluations of rehabilitation programs have used other measures of success such as self-reports of drinking behavior, indices of personal adjustment, and other indicators tied more closely to the expectations of the treatment programs. Such measures are not without their methodological shortcomings, including their frequent reliance on unsubstantiated self-reports.

Another methodological problem, which has constrained assessments of treatment effectiveness at least as much as measurement shortcomings, concerns the adequacy of the experimental or quasi-experimental designs for contrasting treatment against no-treatment effects. In an ideal case, treatment evaluations would be conducted under carefully controlled experimental conditions, with individuals randomly assigned to treatment and no-treatment conditions, and the posttreatment performance of treatment and control groups compared. These conditions have not been uniformly available in rehabilitation evaluation studies, and many of the results reported in the literature represent less than rigorous experiments.

Evaluation Results

Keeping in mind the variability in the nature of rehabilitative programs and the difficulties in accomplishing a full and fair assessment of their effectiveness, we may proceed to a discussion of the results of evaluations of rehabilitation programs conducted during two distinctly different periods. The Alcohol Safety Action Projects (ASAP) of the 1970s introduced rehabilitation modalities as part of an integrated set of alcohol/traffic safety countermeasures. The 1980s brought a number of locally tailored programs, including a program based on skills-building tested in California, the Weekend Intervention Program originated at Wright State University in Ohio, and programs to provide court-mandated alcoholism treatment.

The ASAP Era

In June of 1970, the National Highway Safety Bureau (later to become the National Highway Traffic Safety Administration—NHTSA) of the new U.S. Department of Transportation introduced nine traffic safety countermeasure demonstration projects, which came to be known as Alcohol Safety Action Projects or ASAPs. Twenty additional ASAPs were funded in 1971, and a final six projects were initiated during 1972. Each ASAP was designed to operate as a local drinking/driving control system (Joscelyn and Jones, 1971) which coordinated the efforts of traditional traffic safety and driver control agencies such as traffic courts, police departments, motor vehicle departments, and community health resources. Some of the ASAPs operated in single metropolitan areas, others covered large city/county regions, and still others operated as statewide projects.

The NHTSA intent in funding these local projects was to provide for a demonstration (or rather, 35 replications of a demonstration) of the feasibility of an integrated systems approach to the alcohol traffic safety problem. The goal of each project was to reduce alcohol-related motor vehicle crashes by reducing the number of persons who drive while intoxicated or impaired. Rehabilitation modalities shared this project goal with law enforcement agencies, judicial systems, and public information and education components of the ASAPs. The conceptual model that prescribed the general role of rehabilitation in the ASAPs is shown in figure 1.

ASAP rehabilitation countermeasures were conceived of as a bridge between the

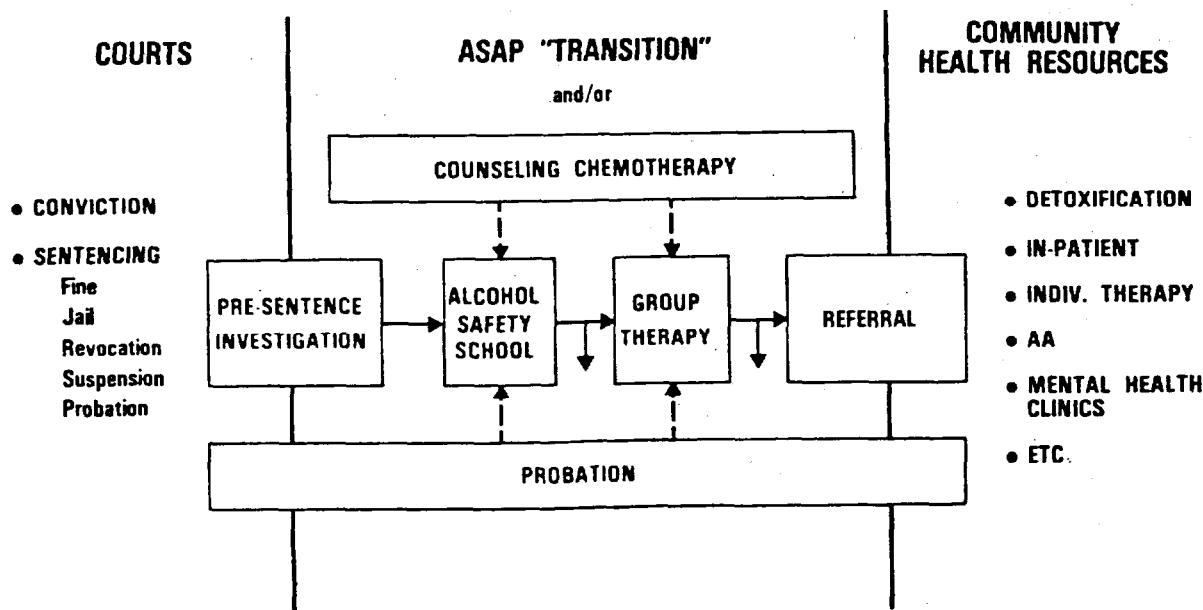


Figure 1. ASAP rehabilitation: A court-referral system

traffic court systems that adjudicated drunk driving offenses and various community health and mental health resources that provided alcohol treatment. As demonstration projects, the ASAPs were expected to provide rigorous assessments of all countermeasures employed by the projects, including rehabilitation. Each project included an evaluation function to accomplish this purpose.

ASAP Rehabilitation Countermeasures

ASAP rehabilitation systems were, in each of the 35 projects, designed to supplement the driver control functions of the police, courts, and licensing agencies. A fundamental assumption of ASAP rehabilitation countermeasure programs was that a significant proportion of individuals arrested and convicted of drunk driving offenses were "problem drinkers" whose control over their drinking behavior (and thus drinking/driving behavior) was limited. This assumption created a systems requirement to perform at least a minimal diagnosis to discriminate "problem" from "nonproblem" drinkers among the ASAPs' drunk driver clientele, and presentence investigations represented a primary liaison between the traffic courts and each project's rehabilitation countermeasures program.

A substantial number of rehabilitation programs were conducted by the projects, or received referrals from the ASAPs. Thirty-two of the thirty-five projects used an "alcohol safety school" as a rehabilitation modality. Most of these schools were conducted by the ASAPs themselves. Some projects used the alcohol safety school as a re-education/rehabilitation modality for nonproblem drinkers, some as a treatment alternative for problem drinkers, and still others as a rehabilitation countermeasure for both problem and nonproblem drinkers. The schools were short-term (2-6 sessions), educationally oriented programs designed to handle a substantial number of drunk driver referrals. The school was frequently the sole rehabilitation assignment for nonproblem drinkers while for problem drinkers, schools were often used in conjunction with other treatment alternatives.

In 10 ASAPs, special group therapy programs were developed and conducted by the projects themselves. Generally, these programs used weekly or biweekly sessions of an hour or two in length that extended over a period of a month to 6 weeks. The primary source of alcohol rehabilitation services across the ASAP sites was, however, the existing rehabilitation system of the community, and most ASAP treatments were provided by community treatment agencies. Outpatient treatment services provided by these agencies included both group therapy and individual counseling. Some projects established cooperative arrangements with local Alcoholics Anonymous chapters and utilized AA as a referral resource. Limited use was made, across projects, of inpatient treatment referrals. A few projects used chemotherapy (primarily disulfiram) as a treatment modality, usually in combination with some kind of group or individual therapy.

Analyses of treatment effectiveness were conducted at the individual project level and also at the overall program level (Ellingstad and Springer 1976). The general approach taken to the evaluation of rehabilitation effectiveness at both levels involved comparing the performance of individuals who had been exposed to ASAP-sponsored or -coordinated treatment with the performance of individuals who were not referred to rehabilitation. Unfortunately, with but two exceptions (Nassau County, New York and Phoenix, Arizona), the demonstration projects were not structured to provide robust experimental tests of rehabilitation with random assignment of clients to treatment and no-treatment conditions. The "no-treatment controls" at most ASAP sites were of individuals excluded from treatment because there was no room in the treatment programs when they entered the system, they refused to participate, or for one reason or another they were judged to be unsuitable for entry into treatment.

Project-level analyses of treatment program effectiveness were reported to NHTSA annually in *Analysis of Alcohol Rehabilitation Efforts*, a mandated analytic study prepared by the local project evaluation component. A number of summaries of these studies have been reported (see, for example, Ellingstad, 1976; Spiegel and Struckman-Johnson 1978). Evaluations included overall assessments of rehabilitation system effectiveness (all treatment modalities combined) as well as assessments of individual rehabilitation countermeasures. Criteria on which these analyses were based included crash recidivism, arrest recidivism, and in some cases, other measures obtained by testing or interviewing program participants. The most common criterion of program success was alcohol-related arrest recidivism. While isolated reports of treatment impact on traffic safety criteria (crash or arrest recidivism) came from some of the 35 projects, an inverse relationship was also apparent between the methodological adequacy of the analytic study and its likelihood of reporting significant results.

Despite the generally pessimistic results of these analyses when critically evaluated, some indications of success were present. Process-oriented studies of alcohol safety schools almost universally demonstrated them to be capable of altering levels of knowledge and attitude, even though the effects of these treatment programs on recidivism was equivocal. Most analyses of the more intensive treatment programs showed no clear evidence of treatment effectiveness. A notable exception concerned the Disulfiram Clinic operated by the Los Angeles ASAP. This program demonstrated a statistically significant reduction in recidivism associated with disulfiram treatment in a well-controlled and statistically sound analysis.

Program-level analyses of ASAP rehabilitation countermeasure effectiveness were also performed by pooling data (mostly arrest recidivism data) submitted by the individual projects (Ellingstad and Springer 1976). Comparisons of survival rates (proportions of clients avoiding rearrest) over a 3-year followup period for nonproblem drinkers (as determined in presentence investigations) showed the pooled across-project treatment group to have outperformed the pooled no-treatment group. This program-level result was at least suggestive that treatment may have had some of its intended effect on nonproblem drinkers. A similar comparison for problem drinkers did not show sig-

nificant differences in survival rates between individuals who had been referred to ASAP treatments and those who had not received treatment.

It seems fair to conclude that, on balance, the results produced by the ASAPs in identifying effective alcohol rehabilitation countermeasures were disappointing. Significant methodological problems constrained both project- and program-level analyses of rehabilitation system effectiveness and prevented clear tests of treatment effect. The absence of adequate experimental controls seemed to be the principal issue.

The Short-Term Rehabilitation Study

It became apparent after the first few years of ASAP operations that the methodological problems alluded to previously were likely to seriously handicap assessments of rehabilitation effectiveness within this program. Because of this concern and because of project-level interest in a relatively new alcohol treatment program called Power Motivation Training (PMT), a series of important changes in the implementation and evaluation of ASAP rehabilitation countermeasures were introduced beginning in 1973 (Ellingstad 1976b). PMT, developed by McBer and Company, alcohol treatment researchers, was based on a distinct set of theoretical principles and consisted of a well-defined and carefully described set of therapeutic procedures. Moreover, PMT was a short-term modality that did not depend on highly trained professional therapists and could be readily implemented within the ASAP rehabilitation systems (Cutter, et al. 1975). The PMT program was formally begun in eight sites in early 1975. McBer and Company, under contract with NHTSA, trained therapists at the participating sites (Boyatzis 1976). In addition, an evaluation function was created to develop a system to collect, monitor, and process data from the PMT sites and to develop instruments to provide measures of relevant indices of treatment effectiveness. The name was changed to the Short-Term Rehabilitation (STR) Study to reflect the fact that several treatment alternatives in addition to PMT were to be included in the experimental designs at some of the sites, and that an additional three ASAPs that did not use PMT but did employ random assignment procedures and no-treatment control groups were to be added to the study.

Each site in the STR study used its presentence investigation procedures to identify a pool of mid-range problem drinkers considered to be the most appropriate clients for PMT and related treatment programs (both social or nonproblem drinkers and alcoholics were excluded). From this pool, clients were randomly assigned to either treatment or control conditions. A comprehensive data collection procedure involving extensive interviews, questionnaires, and record checks was conducted at the time of assignment, as well as at 6-, 12-, and 18-month followup contacts.

A total of 3,663 clients were randomly assigned to treatment and no-treatment conditions at the 11 sites, with 2,462 clients exposed to various short-term rehabilitation modalities and 1,201 clients assigned to no-treatment or "minimum exposure" control groups (some sites required a minimal treatment such as the distribution of literature about alcohol and driving instead of a true no-treatment control condition — this affected only four sites).

The extensive data collection employed within the STR study provided for a large battery of outcome criteria including: traffic safety outcome measures such as crash and arrest recidivism; direct indices of drinking behavior such as duration of abstinence, average level of alcohol consumption, and incidence of abusive drinking; life status measures such as current drinking problems, physical health problems, and employment/economic stability; and measures of personality characteristics (Ellingstad and Struckman-Johnson 1978).

Detailed analyses were conducted for each set of dependent variables within the experimental designs of each of the 11 STR sites individually (Struckman-Johnson and Ellingstad 1978a). No compelling evidence of treatment effectiveness was found in any

of these analyses and, in fact, statistically significant negative effects were observed in two or three instances.

Program-level analyses were also performed on data pooled from the 11 sites (Struckman-Johnson and Ellingstad 1978b). A large number of statistical comparisons revealed some evidence of treatment effectiveness for alcohol safety schools (employed as a treatment alternative by four of the STR sites), and some evidence suggested a negative treatment effect for PMT as a single modality treatment assignment.

The CDUI Project

Despite the fact that the STR study had involved thousands of drunk driver clients and had been able to achieve the methodological requirements (random assignment and control groups) of a true experiment, the fact that the study encompassed 11 very different jurisdictions presented organizational difficulties that may have prevented as powerful a test of rehabilitation countermeasures in the traffic safety context as might be desired. In late 1976, a massive, single site experimental project called the Comprehensive Driving Under the Influence of Alcohol Offender Treatment Demonstration (CDUI) Project was initiated in Sacramento, California.

The CDUI Project operated from September 1977 through January 1981 in Sacramento County, receiving its referrals from the Sacramento County Municipal Court. The project employed two separate experimental designs, one for first-offense drunk drivers, the other for drivers convicted of multiple DUI offenses. The first-offender design provided random assignment of 4,639 individuals convicted of DUI to one of three treatment alternatives: (1) an in-class education program consisting of four classroom sessions of 2 1/2 hours each over a 4-week period, using a standard alcohol education program patterned after others in use around the United States; (2) a home study program consisting of an organized set of reading materials designed as a self-study package, which was presented to the clients in a 1-hour orientation session; and (3) a control group who received no treatment. All clients were placed on 2-year informal probation and received a reduced fine as an incentive to participate. In addition to the treatment assignments, one-half of each treatment group was randomly assigned to receive quarterly monitoring letters to remind them of their probation status and to encourage them to drive soberly. Half the clients were also randomly assigned to receive followup interviews designed primarily to collect life activities data for treatment outcome analyses.

Both the in-class and home study education programs were shown to produce significant reductions in DUI recidivism relative to the no-treatment control group. Neither program, however, had significant impact on crash involvement or on the variety of life status measures collected at followup intervals 10 and 20 months subsequent to treatment entry (Reis 1982).

The principal CDUI multiple offender design involved a postconviction presentence (PCPS) procedure under which a guilty plea to DUI was accepted prior to referral, but final disposition and sentencing was postponed 13 months to permit participation in the assigned treatment condition. Those clients who successfully completed the assigned treatment then had the charge reduced to reckless driving, thereby avoiding the mandatory licensing action that would have resulted from the DUI conviction. The 1,103 clients available to the PCPS multiple offender design were randomly assigned to the following conditions: (1) Control (341): No educational or rehabilitative treatment, no educational counseling, no chemotherapy, and no biweekly contacts; (2) Biweekly contacts only (326): Twenty-six 15-minute individual interviews with a probation officer every other week for 1 year; (3) Skills workshop (110): A group educational counseling approach developed for the CDUI project consisting of 34 2-hour group counseling sessions with the first 16 sessions meeting weekly and the final 18 sessions every other

week for the remainder of the year of treatment; (4) Skills workshop and chemotherapy (109): Three supervised administrations of disulfiram per week for the first 6 months of the assignment were combined with the skills workshop group therapy program; (5) Educational eclectic therapy (109): Counselors conducting eclectic groups had complete freedom to organize group therapy sessions according to their preferred style. The first four 2 1/2-hour sessions were alcohol education classes identical to the first-offender classes. They were followed by 28 weekly 2-hour group therapy sessions; and (6) Educational eclectic therapy and chemotherapy (108): Three supervised administrations of disulfiram per week for the first 6 months of the assignment were combined with the educational eclectic therapy program.

Followup of multiple offender clients over a 20-month period showed both counseling programs to produce significant reductions in DUI recidivism in comparison to the no-treatment control group. Adding chemotherapy to counseling programs did not improve the recidivism performance of these rehabilitation programs. Chemotherapy was shown to be effective in reducing levels of alcohol consumption for up to 14 months beyond the termination of disulfiram treatment in clients who completed a counseling program. None of the multiple offender treatments affected crash involvement (Reis 1982).

In contrast to the earlier ASAP and STR experiences, the CDUI results provided considerably more encouragement with respect to the efficacy of alcohol rehabilitation programs operated within the context of a traffic safety system.

Post-ASAP Rehabilitation Programs

Despite the mixed and disappointing results of evaluations of the various rehabilitative programs carried out in the ASAP era, the concept of rehabilitation still generated interest. Additional program models have been tested in recent years.

Skills Building

While some ASAP programs were able to show some reduction in recidivism and subsequent crashes, the magnitude of the reductions was disappointing. However, many of the program models evaluated seemed rather weak and not well grounded in theoretical or empirical knowledge about alcohol abuse or behavior change (Kunkel 1983). Moreover, little attention seemed to have been paid to the quality of implementation. Programs as they occur in actual practice often bear little resemblance to programs as they appear on paper (French and Kaufman 1981). It seemed possible that the disappointing outcomes might be due in part to weak program models or poor implementation.

To give rehabilitation countermeasures the best chance of showing effectiveness, the State of California sponsored an evaluation effort that included an extensive program model development effort and careful attention to quality of implementation (Stewart et al. 1987). The model program that was developed resembled traditional first-offender programs implemented in the ASAPs in many respects. It included information on the effects of alcohol, on drinking and driving laws, on symptoms of alcohol addiction, etc. It also had several distinctive features, including a focus on the development of skills to enable the offenders to separate drinking from driving. This aspect of the program was based on Bandura's Self-Efficacy model (Bandura 1977) in which participants develop strategies for dealing with a series of risky situations of increasing difficulty.

Over the course of the program, offenders were helped to develop, rehearse, and practice realistic strategies to avoid drinking and driving. In addition, rather than

attempting to deal with serious problems such as alcoholism within the constraints of the program, a strong emphasis was placed on assessing the offenders' problems and referring them to other helping resources in the community. The program was structured to include a great deal of enforced participation so that the offenders were compelled to be actively engaged in the program. Staff at the program sites received extensive training and ongoing technical assistance and monitoring to ensure that the quality of implementation would be high.

The program had two segments. The first segment was a 6-week (15 hour) educational program and the second was a 7-week (11 hour) counseling program. Offenders were randomly assigned to the education-only or the education-plus-counseling segments to determine whether programs of differing lengths and intensities would have different effects.

The two versions of the model program were compared to two existing California programs and to a control group (which participated in community service projects but received no formal program content). Participants were randomly assigned to these program conditions. The driver records of the participants in the four groups were followed over 5 to 11 months to determine recidivism rates. In addition, a sample of participants was interviewed before program entry and again 6 months later to include more sensitive indicators of program success by broadening outcome measures to include drinking behavior, symptoms of alcohol dependency and undetected drinking and driving. Close associates of a sample of the respondents were also interviewed to validate self-reports of drinking and drinking/driving.

Even given this carefully designed, well-implemented program, no differences could be detected between the self-reported drinking behavior and drinking/driving behavior of first offenders randomly assigned to the four program conditions, including the control condition. Though some decreases in drinking and in frequency of drinking and driving were reported, these decreases were reported equally by respondents in all program groups. Thus, no evidence was found of the superiority of any program type over any other, including the control group, which received no program at all. In fact, the observed changes could be due to the natural reaction to any intervention or could be the result of a statistical artifact (regression to the mean). The followup time for recidivism was quite short, but no significant differences in recidivism were detected.

Thus, the modest effects demonstrated by other evaluations of rehabilitative programs were not improved upon by altering program content and format. Within the range of standard programs, no program type appears to have any outcome advantage over any other, and the potential traffic safety effects of any program are very small indeed.

The Weekend Intervention Program

The Weekend Intervention Program (WIP) (Siegal and Moore 1985) was based on the assumption that it is unrealistic to expect a long-term pattern of problem drinking to be altered after a short period of treatment or education. The intervention approach does not try to treat the problem drinker. Instead, it is designed to identify whether a problem exists, to assess its extent and severity, and to refer offenders in need of treatment to appropriate facilities. The offenders follow through on the referral on their own, sometimes with the encouragement or order of the court.

As the title implies, the program takes place over the weekend. Educational and counseling activities takes place in a medical school, and clients are housed in a nearby motel in the evenings under police supervision. The goals of the program are to carry out an assessment or diagnosis, to break down denial in those participants who have a serious problem, and to prepare offenders to accept treatment if needed.

An evaluation of WIP indicated that the program was effective in lowering the recidivism rate as compared to nonequivalent comparison groups who received a suspended sentence or who were sentenced to jail. The effect was strongest for repeat offenders. During a 1- to 2-year followup of repeat offenders, 21.8 percent of WIP participants recidivated compared to 26.8 percent of jailed offenders and 30.4 percent of offenders with suspended sentences. For first-time offenders, the recidivism rate for WIP participants was 9.2 percent while the rate for all other first offenders was 12.7 percent (Siegal 1987).

The program was acceptable to the community in Ohio. It was easily understood by the public and was acceptable to law enforcement and judicial personnel. It was less expensive than traditional incarceration and, apparently, had a more positive effect on subsequent drinking and driving (Siegal and Moore 1985). Clearly, however, the effects on recidivism were modest. The program may serve a function in the community by providing an acceptable form of punishment that may also be advantageous to the offender, but its effects on traffic safety were negligible.

Compulsory Treatment Models

Some more intensive program models have been tried to deal with habitual offenders or those with severe alcohol problems. One intervention is court mandated alcoholism treatment for offenders who are addicted. Questions have been raised about the appropriateness or efficacy of compulsory treatment. Some research indicates that the outcome of treatment for patients receiving treatment as part of a suspended sentence for drunk driving compare favorably with improvements in alcoholics treated voluntarily (Ben-Arie et al. 1983). A 7- to 9-year followup was carried out with 50 offenders who had been diagnosed alcoholic (most of whom were multiple offenders) and who received compulsory treatment. At the time of followup, 14 of the offenders had been convicted of further driving offenses. Thus, the treatment cannot be considered highly successful in terms of reducing recidivism. Forty percent of the offenders were either sober or generally sober, indicating that the treatment may have been useful in overcoming alcoholism (Ben-Arie, et al. 1986).

A second model that has been implemented in several locales is the combination of incarceration and treatment. Special facilities are set up to incarcerate drunk driving offenders, usually repeat offenders. During their incarceration, inmates participate in a highly structured education and treatment program, usually including detoxification (if necessary), educational sessions, and group and individual counseling. A program of this type carried out in Massachusetts reported a recidivism rate of 6 percent compared to a statewide rate of 25 percent and a 19-percent rate for low security institutions similar to the program's (LeClair 1987).

In the Netherlands, an educational program for incarcerated drunk drivers used volunteers from various areas of the drunk driving system to teach sessions on the nature and impact of alcohol abuse and provide information on community alcoholism treatment services. Positive effects were reported on knowledge, attitudes, and driving behavior when it was evaluated (Bovens 1987).

These studies provide some preliminary support for compulsory treatment programs, either as mandated by the courts or as a component of incarceration. Here again, however, while some individual offenders may be helped to overcome addictive drinking or to avoid later drinking and driving, the impact on traffic safety is quite small.

Conclusions

Because of the nature of the alcohol-related crash problem, rehabilitative approaches can only have a very small effect on traffic safety, even if maximally effective. A wide

variety of rehabilitative programs based on a variety of theoretical models, and delivered in a variety of settings have never been able to achieve more than modest effects on recidivism. Although many evaluations of these programs suffered from methodological weaknesses, the conclusion seems inescapable that to achieve improvements in traffic safety, other strategies must be employed.

Rehabilitative programs may serve other purposes, such as providing an additional appropriate and acceptable form of punishment to offenders, enforcing a general societal message that drinking and driving is unacceptable behavior, and providing a mechanism for intervention into the drinking problems of individuals. It is important to keep in mind, however, that these possible benefits must be weighed against the costs of the programs. Rehabilitative programs are not free. In many States, a substantial industry (often a for-profit industry) supporting hundreds or even thousands of employees has grown up to provide these mandatory programs. Usually, the direct cost of the programs is borne primarily by fees paid by offenders. These fees can be viewed as just another part of the fines and other monetary penalties offenders are required to pay. From this perspective, the effectiveness of the programs may not be an issue. However, the extent to which these fees are purchasing services valuable to the individual or to society may be called into question.

While possible benefits to individuals have been discussed, these beneficial effects have not been thoroughly evaluated. A number of evaluations report attitude changes in offenders (Foon 1988). However, evaluations that measured drinking levels or improvements in other life areas, found very few effects (Stewart et al. 1987; Reis 1982). The possibility that some programs may actually have harmful effects cannot be ignored. In some States, rehabilitative programs are not closely monitored, and the appropriateness of program content and the qualifications of staff may not be carefully evaluated. Programs must deal with content that is highly charged emotionally. There is risk of harmful effects if these areas are not handled with skill and caution.

It is important to compare the effectiveness of rehabilitative programs to other sanctions—specifically license penalties. A 1984 study (Sadler and Perrine) compared the impact of alcohol treatment programs to that of license suspensions on subsequent crash rates and drunk driving recidivism. The study found that license suspensions have a significant positive impact on traffic safety, more so than did the treatment programs (although treatment programs had a greater impact on alcohol-related crashes and arrests). Hagen et al. (1980) found that license suspensions and revocations produced significant reductions in subsequent convictions and crash rates for multiple offenders. In a review of a number of evaluations of the effectiveness of license actions, Peck et al. (1985) drew this conclusion: "... there is no question that license suspensions have a significant effect in reducing the accident and drunk driving frequency of convicted DUI offenders."

Recommendations

Given the weak traffic safety benefits of rehabilitation countermeasures, it is very important that the continuation of rehabilitative programs not be allowed to deflect attention or resources away from drinking/driving countermeasures that have more powerful effects.

Strategies that primarily attempt to bring about specific deterrence will necessarily be limited in their ability to improve traffic safety. Even within that limited realm, licensing penalties have been shown to be more effective in reducing recidivism than rehabilitative programs, whatever their form. In many States, participation in a rehabilitative program is offered as a substitute for license suspension or revocation.

Such substitution is clearly *counterproductive* from the standpoint of traffic safety. If the positive effects of rehabilitative programs are sufficient to justify their continued existence, these programs *must* be used *in addition to* rather than instead of license penalties.

A larger question can be raised about all drinking/driving strategies that focus on individual behavior with little consideration of the environment that shapes that behavior (Wallack 1984). It is easier for society to blame the problem of drinking and driving on a defined group of individuals rather than on money-making products, industries, and systems that support drinking and driving and amplify its destructive potential (Vingilis 1987). In our zeal to deal with the population of identified drinking drivers, we should not lose sight of social forces such as the political and economic climate, cultural patterns, and values and norms that all combine to determine how alcohol is used and what consequences that use will have for our health and safety.

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Independent Citizen Advocacy: The Past and The Prospects

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During the last decade, a widespread movement of citizen advocate groups has emerged whose members, many of whom are victims of drunk drivers, work to reduce the level and consequences of drunk driving. Their efforts are widely seen by a variety of observers as having had some success. For instance, Senator John Danforth in recent congressional hearings said of MADD,

This organization has made the public realize that drunk driving is not a victimless crime. This change in public attitude has made it possible for those of us in Congress and in State legislatures to pass stronger drunk driving laws. (1988)

Franklin Zimring (1988), a consistently skeptical social observer, discussing these local advocacy groups says, "...the mobilization [by the groups] of public opinion has been partially responsible for the increased prominence of drunk driving as a public policy issue" (p. 374), and goes on to say, "My guess is that citizen action groups are a more important explanation [than others] of the passage of legislation in the 1980s" (p. 380). Finally, Mark Wolfson (1988) concluded in his systematic evaluation of the effects of local advocacy that the efforts of these groups positively affected State legislative initiatives and "may have [had] some influence on fatalities" (p. 9).

Any organized effort to encourage the continued growth and vitality of this independent citizens' movement must depend upon an adequate description and understanding of its emergence, the community support and attention it receives, its typical structural forms, the personal lives of its activists, and the nature and extent of its organized activities. It must depend, too, upon an understanding of the typical difficulties that such movements encounter in maintaining continued high levels of citizen advocacy.

The Development of the Local Movement²

The citizens' movement against drunk driving consists of a number of different national and local organizations. At the national level are two umbrella groups, Mothers

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² Most of the evidence upon which this description is based was gathered during the 1985-86 period and refers to the experience within the United States. Any changes the movement has undergone since then are, therefore, not reflected in this account.

Against Drunk Driving (MADD), headquartered in Hurst, Texas, and Remove Intoxicated Drivers-USA (RID), headquartered in Schenectady, New York. Both groups have a large number of local chapters spread across many States. In addition to MADD and RID, there are a number of regional and local citizens' groups that are not affiliated with any national umbrella group, which we call "outliers." After an exhaustive attempt to generate a census of local groups, we estimate that 458 local groups, including MADD chapters, RID chapters, and outliers, existed in 1985. The pattern of foundings of these groups and their present distribution across the United States is described below.

Remove Intoxicated Drivers (RID). The citizens' movement against drunk driving began in 1978. During that year, three local groups formed in New York State. These groups were later to become affiliated with a national umbrella group, Remove Intoxicated Drivers (RID), started by Doris Aiken in Schenectady, New York in 1979. In 1979, four more groups started in New York that were to affiliate with RID. In 1980, two more RID chapters formed, both in New York State.

In 1981, 14 RID chapters formed, including four in New York. That was the first year in which RID chapters formed outside of New York State—in Oklahoma, Massachusetts, Tennessee, New Jersey, Wisconsin, Colorado, Connecticut, Pennsylvania, and Texas. The growth of RID peaked in 1982, when 18 new groups formed (see figure 1). As of 1985, RID had 70 active chapters in 23 States, although the majority were in New York (22 chapters), Illinois (6 chapters), and Tennessee (5 chapters).

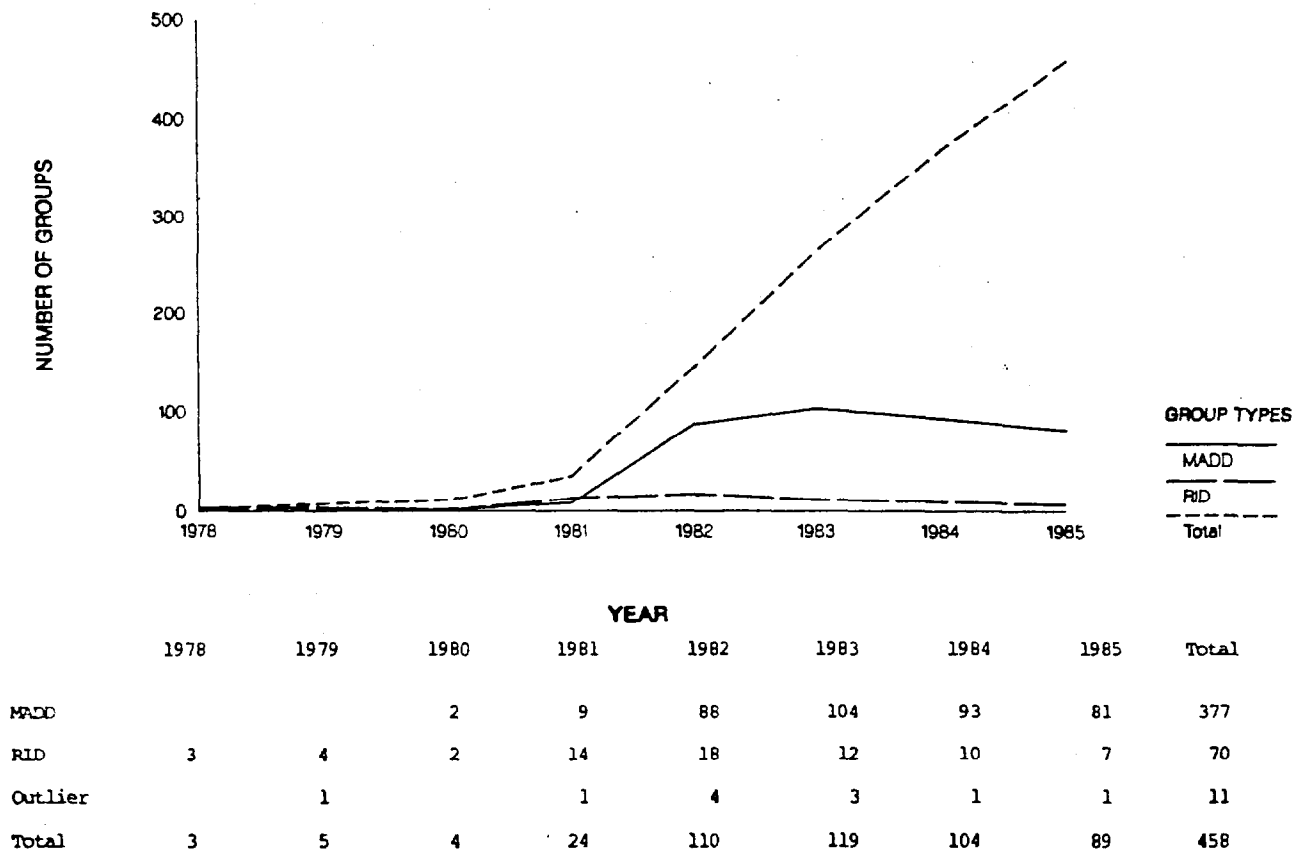
Mothers Against Drunk Driving (MADD). Candy Lightner and others formed a group called Mothers Against Drunk Drivers (later to become Mothers Against Drunk Driving) in Sacramento, California, in 1980 after Candy's daughter was killed by a drunk driver. A second MADD chapter formed in California in 1980. In contrast to RID, MADD was quick to diversify geographically: the nine MADD chapters formed in 1981 were in California (2 chapters), Florida (2 chapters), Ohio (2 chapters), Pennsylvania, Texas, and Kentucky (1 chapter each). The growth of MADD accelerated at a breathtaking pace over the next few years (see figure 1). As of 1985, an estimated 377 MADD chapters existed, with at least one chapter in every State except Idaho and Montana. Chapters of MADD were most heavily concentrated in California (29 chapters), Florida (25 chapters), and Texas (26 chapters).

Outliers. The pattern of founding of groups that are not affiliated with any national organization has been somewhat harder to estimate. Since they are not affiliated nationally, no comprehensive listing of these groups is maintained. Information could be collected directly from only 11 groups, although this is almost certainly an underestimate of their actual number. One outlier group, Concerned Citizens and Victims of Drunk Drivers, of Reno, Nevada, was one of the earliest groups, having formed in 1979.

As of 1985, outliers included a number of regional coalitions, such as the Alliance Against Intoxicated Motorists (AAIM), which is concentrated in Illinois, and Rid Arizona of Intoxicated Drivers (RAID), which, as the name suggests, is limited to Arizona. In all, outliers were found in Arizona, California, Illinois, Nevada, New Hampshire, North Carolina, Oregon, Utah, and Virginia.

Thus, the citizens' movement against drunk driving began with the formation of a few local groups, two of which developed first into primarily regional movements in New York State and California. However, by 1985 the movement had become truly national in scope, with an estimated 458 local groups and at least one in every State but Montana.³

3 We have not included certain kinds of groups that devote extensive efforts to the issue of drunk driving in our analysis of advocacy groups. Such groups include locals of Students Against Driving Drunk (SADD) and Boost Alcohol Consciousness Concerning the Health of University Students (BACCHUS), which are, respectively, high school and college student groups.

Figure 1: New Foundings and Cummulative Number of Groups by Year

Patterns of Local Group Founding

The aggregate temporal pattern of local anti-drunk driving advocacy group founding through 1985 can be seen in figure 1. Only a few groups formed between 1978 and 1980, while a burst of foundings occurred in 1981. The peak year for new foundings was 1983, with the number of new groups founded dropping off through 1984 and 1985. While the rate of new group formation declined during these years, the total number of local groups continued to expand.

The pattern of emergence of these local groups was uneven between 1978 and 1985. Many communities lacked a local advocacy group dedicated primarily to the issue of drinking and driving in 1985, while other communities saw a group form rather late in the period. Our analyses (McCarthy et al. 1988; McCarthy and Wolfson 1988) of this process indicated that neither a high rate of alcohol-related motor vehicle fatalities nor the prior existence of an Alcohol Safety Action Project, each of which might be expected to do so, predicted the formation of an advocacy group by 1985 in a local community. Community size was important because larger communities were more likely to see groups formed and formed early than were smaller communities. We concluded that this founding pattern is similar to the diffusion of other kinds of innovations (see Hamblin et al. 1973). To the extent that common understandings concerning drinking and driving as a soluble problem and specific models for citizen advocacy are available, the more citizens in any community, the more likely a local group will emerge. Given that most groups are formed by a single highly motivated individual, family, or small cluster of friends, group foundings are quite unpredictable events.

Some observers have interpreted the decline in the rate of founding new local groups to mean that this movement has begun to lose its vitality and general community support. We interpret the pattern, however, to reflect the natural limit on new group formation. First, the majority of large American communities had a local group in 1985. Second, MADD has limited new group formation to a single group in each county, with a few exceptions. Finally, many local groups see the community they serve as broader than just the city or county where they reside. Our analysis showed that, in 1985, 55 percent of the American population lived in a county which had a local advocacy group; 67 percent lived in a county in which such a group recruited members; and 95 percent lived in a media market that included such a group (McCarthy et al. 1987). These figures strongly support our assessment that local groups had come close to saturating local communities across the United States by 1985.

Patterns of Local Group Dissolution

Many emergent local advocacy groups do not get off the ground, and others leave almost no trace after very short corporate lives. Our analyses were based upon groups which existed during 1985. As a result, we have no information on those groups that emerged earlier but failed to survive, although we estimate a 5- to 25-percent failure rate. Frank Weed (1988a) found a failure rate of about 20 percent for local MADD chapters over the 25 months ending in June 1987. This rate is consistent with our upper limit estimate. Weed's analysis showed, similar to studies of other types of local groups (Freeman et al. 1983), that younger groups fail at much higher rates than older groups. He also found that groups with more independent local leadership and with wider and deeper local community support were more likely to survive than groups without these features.

The population of local advocacy groups addressing drunk driving in any period, then, is the result of previous patterns of group founding and group dissolution. As a consequence, any effort to maintain a large number of active groups in this movement requires an understanding of the processes of both organizational formation and dissolution.

Community Support and Public Attention

Strong, consistent national governmental support is demonstrated in several ways, including the efforts of the Presidential Commission on Drunk Driving, wide congressional support for legislation such as encouraging States to raise the drinking age and to employ "administrative revocation," and Federal executive agency initiatives on drunken driving demonstrate consistent and strong national governmental support. Local group leaders report wide and deep community-level support for their efforts. The national and local media attention to the issue of drunk driving and the activities of citizen advocates has been extensive as well.

National and Local Support

Several notable aspects of national and local support exist. One is the flow of *resources* from Federal Agencies to local citizens' groups. Such resources can be expected to increase the local capacity to mobilize around the issue. These resources take several forms.

1. Literature designed to help organize a local citizens' group against drunk driving has been produced and widely disseminated by the National Highway Traffic Safety Administration (NHTSA) (1982, 1983). One packet of materials consisted of well-organized and simply presented steps to be followed and goals to

be pursued in beginning a local citizens' group. Analysis of information collected from local groups suggested that nearly 80 percent of them received some of the literature they used in their activities in 1985 from NHTSA (McCarthy et al. 1987).

2. Financial support has been provided to local groups attempting to organize around the drunk driving issue. During the early days of the movement, NHTSA provided funds to support the development of a few local citizens' organizations (Mann 1983). Since then, NHTSA has continued to provide some level of indirect support. This is evident, for example, in NHTSA's 1984 budget which requested the appropriation of funds for

Citizen Support: generating community support for comprehensive programs, thus providing a political base for increased counter-measure activity. As shown recently in New York, Maryland, West Virginia, California, and elsewhere, an organized and informed body of individuals can bring about major change in State laws and alcohol programs. (NHTSA 1984)

This description of the activities of NHTSA makes clear its practice of encouraging the growth of citizens' groups focusing on the drunk driving issue.

3. Extensive efforts were made by a number of Federal Agencies, especially the National Institute on Alcoholism and Alcohol Abuse (NIAAA) (Vejnoska 1982), to create networks of citizens concerned about drunk driving and to encourage them to organize. In addition, NHTSA, in concert with the National Safety Council and others, has continued to help organize the annual "Lifesavers" conferences that bring together local activists; Federal, State, and local officials; industry representatives; and researchers.
4. Early organizers of the anti-drunk driving movement were employed by NHTSA to generate local activity and additional technical support (Golden 1983).
5. The ongoing regional workshops for local advocacy groups sponsored by NHTSA continue one important form of national support for the movement.

The national public opinion evidence also shows widespread support for the general goals of these advocates. In 1977, 84 percent of the American population agreed with the statement, "There should be stricter laws on drinking and driving;" and in 1982, 92 percent of the population agreed with that statement (*Public Opinion* 1983). In June of 1984, almost 80 percent of the American population favored a national law raising the legal drinking age to 21 years, and even larger majorities of people over the age of 30 supported such legislation. In 1984, 30 percent of the public favored laws fining drivers and front seat passengers \$50 for not wearing seat belts (*Gallup Poll* 1984). Even broader support was shown for such laws among younger citizens.

A national telephone survey of adults carried out for MADD by a research and consulting firm (Epsilon 1985) provided additional evidence of the wide public support for this movement. Large majorities of the respondents believed that MADD:

- should be involved in victim assistance programs (81 percent),
- should be involved in promoting *preventive* legislation (77 percent),
- should be involved in promoting *punitive* legislation (83 percent),
- should be involved in reviewing court decisions (67 percent),
- should be involved in educating youth (92 percent), and
- should be involved in educating the public at large (90 percent).

Finally, leaders of the local group reported widespread contact and support from local community organizations. Groups working on drinking and driving issues came into contact with a wide variety of individuals and groups, but primarily with the local police,

the central offices of MADD and RID, high schools, judges, and State police. Numerous contacts were also reported with churches, legislators, civic groups, and NHTSA. More than 85 percent of the leaders reported that, overall, their communities supported their activities and goals. Over half the groups reported that the State and local police, NHTSA, the national central offices, and other MADD groups were very supportive. Churches and high schools were seen as very supportive for about half of the groups.

When asked to choose the community organization that had been the *most supportive* of their work, leaders overwhelmingly chose the local police and the State police. After police, the most supportive groups were the central offices of MADD or RID. Both offices have worked closely with their local groups, providing support and advice. Local prosecutors were also seen as the most supportive by a large number of groups.

Only a few local groups have opposed the work of the anti-drunk driving advocates, and even these groups (e.g., bar and restaurant owners, alcoholic beverage distributors and retailers, and the trial lawyers bar) were mentioned as being antagonistic by only a small minority of local leaders. Moreover, opposition to the movement tends to be issue specific. For example, representatives of the beer industry actively opposed the efforts of these groups in some States to pass 21-year-old drinking age legislation (Wolfson 1988). Nevertheless, this opposition does not extend to the overall goal of the movement—the reduction of drunk driving—nor to many of its specific objectives that do not threaten the economic interests of the industry. In fact, segments of the beer industry have at times provided resources, in the form of literature and financial support, to some of the local groups, and have recently supported national legislation aimed in part at facilitating administrative revocation of drivers' licenses (Rumbaugh 1988).

National and Local Media Attention

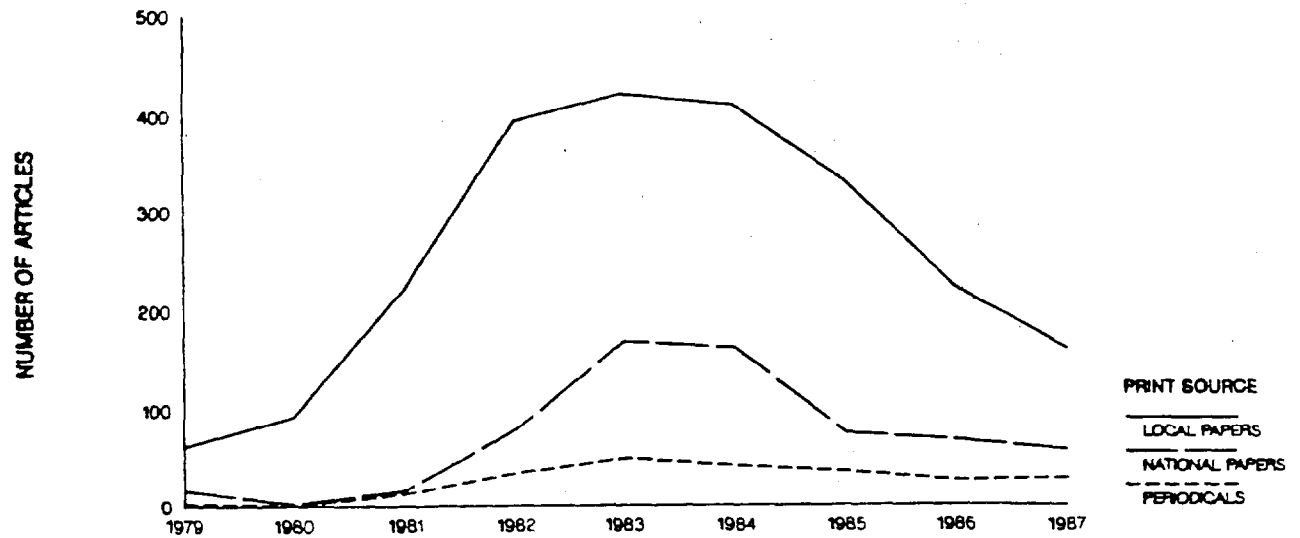
Access to the mass media, in particular to print and broadcast news, is an important resource for any advocacy movement. The mass media represent a potential mechanism for “communicating with movement followers, reaching out to potential recruits, neutralizing would-be opponents, and confusing or otherwise immobilizing committed opponents” (Molotch 1979, p.71). Knowing this, advocates invest extensive effort in attempting to gain positive coverage of their issue and their advocacy.

We have been systematically monitoring national and local print media coverage of the drinking and driving issue. We obtained counts of the number of *national newspaper* stories devoted to the issue from the National Newspaper Index, 1979-1987, which indexes stories in *The Christian Science Monitor*, *The Los Angeles Times*, *The New York Times*, *The Wall Street Journal*, and *The Washington Post*. We obtained counts of periodical stories on drunk driving from Magazine Indexes, 1979-1987. This data base consists of an index of 370 popular periodicals. Our *local newspaper* counts of drunk driving stories were obtained from Newsbank, a service that indexes more than 500 daily newspapers, including at least one in every State of the United States.

Figure 2 shows the trends in coverage of the drunk driving issue derived from these three sources between 1979 and 1987. The peak year of coverage for each type of print medium was 1983. Coverage of the issue declined quite consistently after 1983. It is unknown whether this trend was also reflected in local and national broadcast media. Nevertheless, the decline in coverage can be seen as handicapping efforts by advocates to generate continuing community awareness of the issue of drunk driving. Whether the trend reflects declining vitality among advocate groups or is responsible for increasing alcohol-related fatalities, as some (Stevens 1987; Dukakis 1988) have suggested, cannot be easily determined.

We asked local leaders to give us their evaluations of the extent of media coverage of the drunk driving issue in their communities. We also looked at the local newspaper coverage in 96 communities. Both perceptions of the level of local coverage and actual

Figure 2: Print Media Coverage of Drunk Driving



	YEAR								
	1979	1980	1981	1982	1983	1984	1985	1986	1987
Local Newspapers	63	94	223	395	423	411	331	224	163
National Newspapers	17	3	17	81	169	162	76	68	58
Periodicals	3	1	13	35	50	42	36	26	29

print coverage were strongly related to how active the local group was in attempting to get such coverage. We also found that the more general community support the leaders saw, the more support they saw from the media. Activities related to getting media attention were fundraisers, speeches, and an active membership (as opposed to groups primarily dependent upon leaders). Likewise, when the news was perceived favorably, the leaders reported high levels of recruiting from media sources.

Local Groups, Activists, and Activities

Information gathered from local advocacy groups across the country allowed us to describe their typical dimensions and the characteristics of their leaders. While a few of the groups were very large and resource rich, the typical group was small, with an average of 35 members and a mailing list of 100 names. About six people beyond the leaders did volunteer work for the typical group during an average month. Seventy percent of the groups had annual revenues of \$2,500 or less in 1985, with the median revenue being \$1,229.

Most of these local groups relied primarily on leaders, volunteers, and donations of money and other resources (e.g., telephones, postage, and supplies) to carry on their

work. Though they were widely supported by their communities (Ungerleider et al. 1986), they depended primarily upon their members for labor and financial support (Weed 1989). Given that we have counted more than 450 groups, this adds up to about 2,250 leaders, 2,700 regular volunteers, 15,750 group members and 45,000 people on local mailing lists in 1985.

The profile of the typical activist in this movement was quite similar to activists in other advocacy movements (Verba and Nie 1972; Eitzen 1970). Because of the size of the groups, the officers typically did much of the work. Not surprisingly, the typical chapter officer was a woman. She either did not work outside of the home or worked part-time. Often she was married with school-age children at home. Though all officers tended to be highly involved (Weed 1987), the chapter president tended to be the most active (McCarthy, et al. 1987). She was, typically, about 43 years old and had had some college education. Weed (1987), in his survey of the MADD chapters, wrote "Presidents were less apt to be in the labor force than other officers, and when they were employed they tended to hold slightly higher status jobs" (p. 265).

Victims were heavily represented in all leadership positions in local groups, but the presidents were the most likely to report being victims (McCarthy et al. 1987). About one-fourth of the typical local group members were victims. The majority of presidents were also at least partly responsible for starting the organization. This was consistent with other studies (Weed 1987; Ungerleider et al. 1986) on the leaders of MADD chapters. Further, many leaders were already involved in other volunteer groups. This led Weed to conclude that "MADD tends to be run by activists who have been victimized rather than victims who have become activists" (1988b, p. 19).

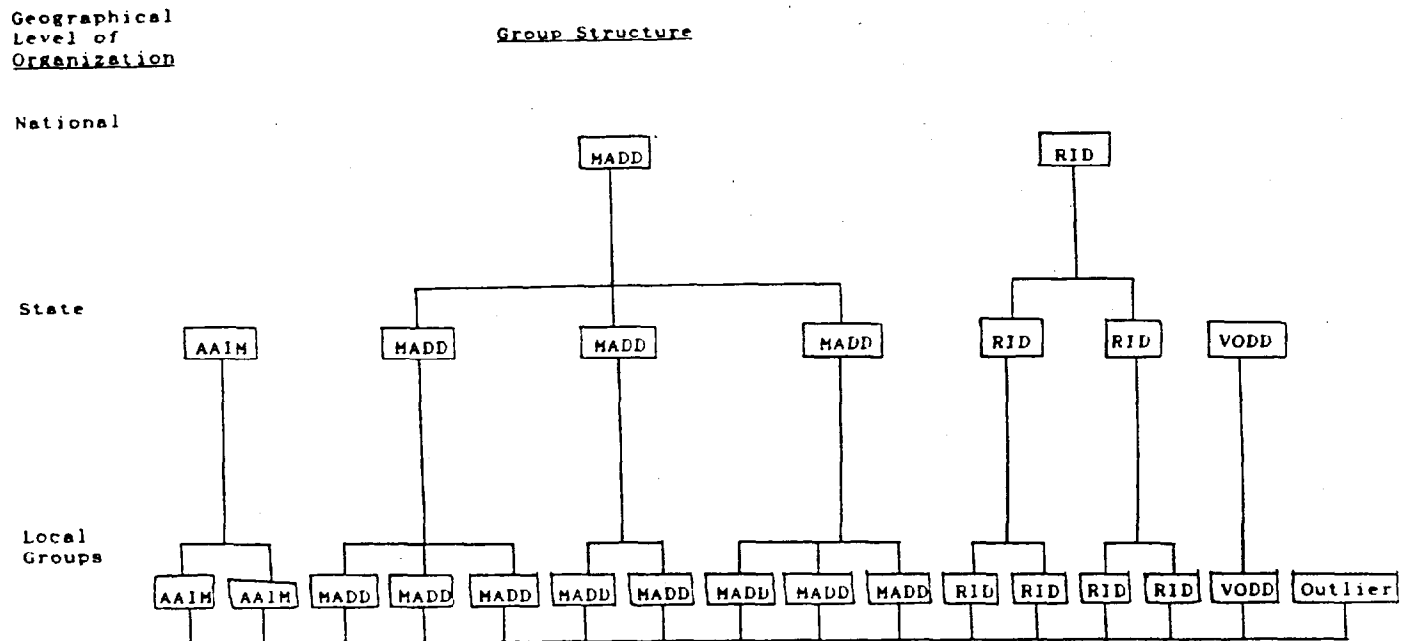
The most important program emphases at the local level were public awareness, youth education, and attitude change on the issue of drunk driving (McCarthy et al. 1987). Victim support and changing laws were emphasized less, as was recruiting new members. When asked to rate the program area in which they were most successful, the leaders overwhelmingly chose public awareness and changing public attitudes. About a quarter of the groups indicated that they had been very active in attempting to change laws during 1985. The groups used activities such as candlelight vigils, public booths, project graduation,⁴ safe rides, and poster contests extensively. Leaders spoke widely and gained substantial access to the broadcast media.

The Structure of the National Movement

National advocacy movements exhibit wide variations in form. Some, for instance, have very large and strong national advocacy operations but very little organized, local, grassroots strength, while others have the obverse. In some movements, local groups are under the very close control and supervision of a national organization, while in others, these ties are very weak. Figure 3 represents the national structure of the citizens' movement against drunk driving in 1985. Both RID and MADD national offices provided support services of many kinds to their local groups, although MADD had substantially more resources for doing so. Both groups had organized intermediate levels of coordination at the State level. The formal tie between MADD national and local groups was, at least in theory, tighter than that between RID groups because of the Internal Revenue Service status of MADD. Each local group was a subgroup of a single national 501(c)3 organization. This status meant that the national organization bear some level of financial responsibility for local groups. Frank Weed reported that "The opera-

⁴ Project graduation is a variety of activities that may include offering high school students free rides to and from graduation parties or arranged overnight lodging to sponsoring alternative alcohol-free parties.

Figure 3: The Structure of the National Citizens' Advocacy Movement Against Drunken Driving



tions of the local chapters are virtually autonomous and the central office of MADD has some difficulty getting reports from all its chapters in a clear and timely manner" (1987, p.7). Local RID chapters, on the other hand, were not linked to RID national in this way, and each group made its own decision about its I.R.S. status. In fact, in 1985, the majority of local RID groups, as well as the outliers we contacted, had already received or had applied for formal nonprofit status.

Regardless of the formal nature of the tie between locals and nationals, however, local leaders reported extensive contacts and high levels of support from their national group as well as from State coordinators where they existed. Likewise, lateral contacts and support were common at the grassroots level; that is, local leaders reported high levels of contact and support from other local groups working on the drinking and driving issue in their areas regardless of the national affiliation of the other group. The majority of local leaders reported some contact with local SADD groups, and about a third reported extensive contact (McCarthy et al. 1987).

The major strength of the anti-drunk driving advocacy movement lies in its extensive local groups. Weed's analysis of the failure of local MADD chapters between 1985 and 1987 demonstrated that local groups are more likely to survive when they are more independent of the central office on operating policies but cooperative in carrying out common activities (1988a). This suggests that the typical fierce independence of the local groups throughout this movement is also one of its major strengths.

Lessons from Independent Citizen Advocacy Movements

Observations across many citizen advocacy movements make obvious the difficulties in predicting their emergence and their ebbs and flows. Many thousands of fatalities in

alcohol-related automobile crashes occurred, for instance, before the first citizen advocacy group emerged to address this problem. It took the development of a widespread belief that the number of these incidents could be reduced by collective efforts before local groups began to form (Gusfield 1975, 1981). The continuing formation of new groups, the continuity of older groups, and the perseverance of the individual activist leaders and volunteers who staff them depend upon a variety of factors beyond the objective extent of the drinking and driving problem itself. These factors are central to an understanding of how advocacy movements grow and decline. A number of them are particularly important for assessing the future prospects for growth, stability, or decline of the citizens' advocacy movement against drunk driving.

Activist lives. Few activists understand the potentially massive level of commitment of time and energy they are making when they begin their advocacy careers. We know (McCarthy and Zald 1977; McAdam 1987) that one's ability to devote such large amounts of time to advocacy are, for most people, constrained by other obligations such as jobs and parenting. Movements that depend on leaders who have little available time to devote to activism are handicapped. The drunk driving movement benefits from its heavy reliance upon women leaders who do not work outside the home. Our research showed that local leaders who were employed full-time devoted substantially less time to the activities of their local group than those who were not. Having children in the home did not seem to hinder activism in this movement, however, since many of the local groups were physically based in the home of the president and integrated family members into the activities of the group (Harvey and Wolfson 1987).

The temporal and spatial dimensions of victimhood. Most advocacy movements form around a commonly timed victim experience. The citizens' movement that formed in response to the Three Mile Island nuclear "accident," for instance, depended upon many citizens responding in unison to a common event (Walsh and Warland 1983). Such movements experience common cycles of increasing and then declining enthusiasm among victim activists. The anti-drunk driving movement, on the other hand, given the discrete and disconnected nature of the victim experience, can expect to see a constant replenishment of the pool of new victims who might become activists. This is so because alcohol-related fatalities continue at high rates in most communities. To the extent that new pools of victims and other concerned citizens can be integrated into the activities of ongoing local advocacy groups, this movement should transcend the pattern of decline that results from the typical common timing of victimization.

Bureaucratization and goal displacement. A typical pattern of transformation characterizes the history of many citizen advocacy groups. As such organizations acquire more and more resources, leaders, who have a financial and personal stake in their operations, begin to lose track of their original goals (Perrow 1979). This pattern is especially likely to result from wide success. At the local level, the citizens' movement against drunk driving seems likely to avoid these consequences since most groups depend almost exclusively upon volunteer labor and are resource poor. Our evidence in 1985, however, showed that the vast majority (72 percent) of the presidents of the local groups were original group founders (McCarthy et al. 1987). Since most of the groups were then very recently founded, this may not represent a problem of too long-entrenched leadership.

Centralization and decentralization. A lively debate continues among observers of citizens' movements about the relative advantages and disadvantages of decentralized and centralized organizational structure (Gamson 1975; Piven and Cloward 1977). Centralization allows more national coordination and the concentration of local energies toward common goals. However, it has the disadvantages of bureaucratization described above. But decentralization—that is, a movement composed of quite autonomous local groups—has certain advantages, too (Gerlach and Hine 1970). Most important is the likelihood of more creative innovation in goals and tactics. If a centralized organization undertakes an innovative campaign that is poorly conceived, an entire movement can suffer the consequences. This is part of the reason why large, national advocacy groups

become cautious. However, if an autonomous local organization does so, the costs of its failure are minimal. If such innovation is successful in one locale, it can be tried in others. This way, new successful forms and goals of advocacy spread rapidly across local groups. Another advantage of decentralization is that an entire movement is less responsible, in the eyes of the public and potential supportive groups, for "rogue" locals, that is, local groups that deviate widely from the common goals and tactics of the larger movement.

The movement against drunk driving is highly decentralized in comparison with many other advocacy movements. This feature of its structure seems to have been responsible, in part, for the constant development of new programs and approaches in local communities. To the extent that solutions to the problem of drinking and driving can be achieved at the local and State levels, its decentralized form can be seen as an advantage. To the extent that solutions to its problems lie at the national level, this feature of its national structure may represent a disadvantage.

Support by nonvictims. Many advocacy groups are made up, primarily, of individuals who are not the direct victims of the problem for which the groups seek solutions. At the grassroots level, the drunk driving movement is, as we have seen, heavily peopled by victims. To the extent that their commitment to continued efforts for solutions to the problems of drinking and driving are greater than nonvictims, this movement will benefit from such heavy levels of victim involvement.

Likewise, the range and level of support by elite groups is crucial to the success of advocacy movements. This movement has benefited greatly from the strong support of such outside groups as we have shown, and, probably, would have been far less vital without that extensive support. NHTSA has continued to be supportive in many ways. The annual "Lifesavers" conference, supported by a number of outside groups, has been important in networking local leaders with one another as well as with researchers, police representatives, and industry supporters, especially insurance companies, which have a special stake in the issue of drinking and driving. To the extent that the past levels of such support continue, this factor suggests that the movement will not decline in vitality.

Media cycles and advocacy movement cycles. Many factors contribute to understanding the extent of media coverage of any issue at a particular time. These include, importantly, major events that focus attention on the issue, concerted campaigns to focus attention on the issue by advocates, and processes internal to the production of the media outcomes themselves. Consequently, media attention to any social issue does not necessarily reflect its objective importance or the strength and efforts of the advocates concerned about the issue (Graber 1984). The rapid decline in print media attention to drinking and driving during the last several years, therefore, does not necessarily reflect a decline in public concern about the issue or a declining effort by local groups to continue to generate public awareness around the issue.

Cycles of media attention like the one we see here are typical and have drawn the attention of many observers. Anthony Downs (1972) argued that social problems will suddenly become prominent, grasp the public attention for a short time, and then gradually lose public attention. This cycle, he explained, is embedded in the nature of both problems and media. Problems, once understood, are difficult to solve. And, since the public consumes news partially as entertainment, a problem must be exciting, and continue to be exciting, to maintain the public's interest.

Our research, which linked the extent of local leaders' activities in 1985 to the extent of local print media coverage in their communities in 1985, demonstrated that the more effort local leaders invested in attempting to gain such coverage of the issue, the more coverage they actually got. Yet, to the extent that the declining media attention to the issue of drunk driving is the result of general processes of media coverage rather than the level of effort and skill of advocates to bring the issue to public attention, it will be more difficult to reverse the cycle we have observed.

Consensus and conflict. Most advocacy movements meet substantial public and organized opposition. The anti-drunk driving movement is unusual in that it has achieved wide and deep support for its goals. But advocacy movements can rapidly gain or lose public support depending upon how they frame the issues and propose their solutions. For instance, Lo (1984) explained how the previously unpopular advocates for property tax reform in California altered their goals and, as a result, became the successful "tax revolt" movement.

The anti-drunk driving movement could easily frame its goals in ways that would substantially narrow the breadth of its community support. If it is seen as a "prohibitionist" movement, declining support could be expected. The Epsilon Survey (1985) presented evidence showing that citizens who perceived the movement as "anti-alcohol" were far less likely to support its instrumental goals than those who viewed it otherwise. Most organized elements of the movement have insisted on defining the issue of drunk driving to preclude public perceptions of "anti-alcoholism." To the extent that this framing of the problem continues to dominate the goals and rhetoric of the movement, it will probably continue to garner the wide and deep community support it has seen in the past.

Encouraging Advocacy Movements

Individuals and organized groups can facilitate or, alternatively, attempt to inhibit, the efforts of advocacy groups (Marx 1979; Wolfson 1989). Members of the general public, governmental actors, and representatives of all types of private groups at the national, State, and local level have many avenues for encouraging or discouraging the efforts of advocacy movements. The effectiveness of such efforts depend, in an important part, upon the characteristics of the movement in question, such as its organizational form, its level and location of community support, its leaders, and its typical tactical approaches.

The three main types of facilitating efforts aim at (1) increasing the level of general community support, (2) indirectly improving the opportunities for organized advocacy efforts, and (3) making direct support available to organized advocacy groups. Each type of facilitation has been common in the movement against drunk driving. Examples of specific forms for each type follow.

- Creating general community support for
 - Advocacy and advocacy groups
 - Concern for the general issue
 - Specific goals of advocacy (e.g., "administrative revocation")
 - Specific advocacy actions (e.g., a Surgeon General's Conference)
- Indirectly improving advocacy effectiveness
 - Make general models for advocacy available
 - Facilitate communication among advocates
 - Set broad legislative and regulatory agendas
 - Provide new opportunities for advocacy (e.g., task forces)
- Direct support of advocacy
 - Provide useful materials (e.g., literature)
 - Provide expertise
 - Provide training (e.g., use of volunteers)
 - Provide direct support (e.g., money or space)

These examples of specific forms of facilitation of advocacy do not exhaust the possibilities. Conclusions about the most effective relative mix of the three types of facilitation and their most effective specific forms for the citizens' movement against drunk driving demand serious deliberation.

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