

Thinking Outside the Black Box *Research Priorities for the 21st Century*

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INTRODUCTION

The last quarter of the 20th century signaled the public awakening on issues related to alcohol, drugs and transportation. Indeed in most countries, in the early 1980s drinking drivers represented about half of all fatally injured drivers. The good news is that we have seen a worldwide decline in drinking-driving fatalities, although in recent years some countries have plateaued or even shown increases (Sweedler, 1997). Thus, if we could speak to eras and public agenda issues, we would have to say the 1980s was the era of drinking-driving prevention.

However, the 1990s have brought new issues, new social problems and impaired driving has become more of a back burner issue. Recently, TRB sponsored a workshop entitled "Combating Impaired Driving in an Era of Diminished Resources and Shifting Priorities." The purpose was to identify strategies to rekindle interest in impaired driving. Yet, in many ways we have come as far as we can within the context of legislation, enforcement, adjudication, and sanctioning of impaired driving. Certainly in Canada, for example, there is no evidence that enforcement of impaired driving will become a priority any time soon (Jonah et al., 1997).

If there is one criticism of research in the alcohol, other drugs and transportation field that is that we have cast our net too narrowly. We have not looked at the larger picture and we have not used the research of other fields to advance our own knowledge base and to develop more innovative interventions as much as we could. In other words, there has been little that has been substantially new in our field in the last 20 years. A colleague recently stated to me that this field is "boring" and indeed it is. In 1983, as guest editor of a special issue of *Accident Analysis and Prevention* on drinking driving countermeasures, I wrote in the Introduction: "by and large, we have not been adventuresome in our research, nor have we been particularly hasty in learning from our past mistakes" (Vingilis, 1983, p. 405). I feel very much like one of my long-since retired colleagues, Dr. Wolf Schmidt, who commented after reviewing one of the papers for the 1983 *Accident Analysis and Prevention* special issue: "I have learned a lot from reading it, but feel disappointed that so little has been achieved since I last worked in the field. But this seems to be a general feeling and may simply mean that I am getting old" (Vingilis, 1983, p. 405).

Alcohol, other drugs and transportation, as a discipline, crosses many other disciplines; sociology, psychology, criminology, epidemiology, public health, etc. Yet, we have not milked the advances made in these other disciplines for our own use. In sociology multivariate modeling techniques are ever advancing, and are allowing for the development of sophisticated models to explain trends and behavior. In criminology and psychology, research is continuing on the development of a thorough understanding of devi-

ant behavior and the testing of various interventions. The addictions field is similarly developing a psycho-sociobiological model of addictions and is testing various multiple modality treatments. Clearly, if there is to be a key theme for research in the next decade, it should be to start thinking outside of the alcohol, drugs and transportation black box. So I am challenging the alcohol, other drugs and transportation research community to start casting wider nets. The following are some key areas, within the epidemiological, experimental and program/policy development, evaluative fields that need to be addressed if we are to further our knowledge and understanding related to alcohol, other drugs and transportation.

Epidemiology

There are five epidemiological research priorities, four of which reflect “emerging trends,” that should be addressed in the future. Three are “situation-related” issues associated with global trends and the two are “person-related.”

Global Accident Trends

Problem Area: We have observed trends in reductions of drinking-driving fatalities, plateaus and in some jurisdictions, increases. We still do not have the conclusive research to explain the variations within countries and across countries.

What We Don’t Know: We cannot assess how much variance is accounted for by individual jurisdictional countermeasures and how much is due to other factors. For example, the United States experienced reductions in alcohol-related fatalities among youth, which has been attributed to the 21-year drinking age. Yet, Canada experienced virtually the identical downward trend among their youth—indeed slightly greater reductions. However, the drinking age has remained at 18-19, depending on the province. This Canadian paradox, in relation to the American minimum drinking age laws, is but one example of a trend that begs inquiry.

Research Issue: Conduct multivariate analyses, using techniques such as structural equation modeling or other techniques, in order to develop a more comprehensive understanding of the determinants of fatality trends. Furthermore, test whether or not the models developed are transferable to other jurisdictions, in terms of the fit of the models and the strength of the associations found.

Likelihood of Success: Will depend on the quality and quantity of data available, and on the ability to model the trends with predictors. Votey and Shapiro (1983) had modelled highway accidents in Sweden, Mann and Smart have modelled American and Canadian consumption, mortality and accident trends, but few others have followed suit. Although there are clear limitations with modelling techniques, they still represent additional sources of knowledge by which to develop a more comprehensive understanding of trends. The likelihood of success is quite high.

Effects: The “French paradox” of why the French have lower cardiovascular disease than North Americans, despite the seemingly higher intake of fatty foods, etc., has been shattered, and has shed light on both the disease process and intervention approaches. Similarly, comparative analyses should shed light on variations and trends in impaired driving fatalities.

The bottom line is that we have not as yet, developed any models to assess and predict trends in traffic fatalities in general, and in impaired driving fatalities, specifically. Clearly, any research that would move away from a theoretical approach to fatality trends and attempt to understand them, would allow for enhanced planning and programming.

Impact of Globalization

Problem Area: Probably no sector is experiencing a greater impact from free trade and globalization than the transportation sector. The transportation sector is a key infrastructure element necessary for globalization (Mather, 1993). Three major consequences of free trade agreements relating to the transportation sector have injury implications.

1. Free or liberalized movement of goods, services, capital and (in the case of common markets) labor.
2. Deregulation of the transportation industries.
3. Standards and legislative harmonization.

What We Don't Know: We have no understanding of whether or not the above three consequences are having an impact on alcohol, drugs and transportation. For example, “homogenization” of alcohol consumption trends has been occurring in the European Union (EU), whereby higher consuming countries have been lowering their alcohol consumption, while lower consuming countries have been increasing their consumption. Is “homogenization” occurring among jurisdictions in North America, and if so, how is it playing out with regards to trends in drinking-driving fatalities?

Research Issue: This then is related to the previous issue of developing models to understand international patterns and trends in alcohol-related collisions. Collaborative, international research questions on the impact of global forces could be developed and investigated. Numerous questions exist. For example, cross-border traffic has been increasing dramatically, yet, we have no information on how frequently drivers convicted of driving while intoxicated (DWI) or other serious traffic-related offenses in cross-border jurisdictions, have their convictions registered with their local department of motor vehicles. Is it an issue of concern? Is it an increasing trend? Vingilis et al. (1998) in a review paper, have identified a number of research issues related to globalization. They include issues related to the commercial transportation and alcohol control policy sectors. For example, the trucking industry, because of increased international competition, has been lobbying to increase the driving hours of long-distance commercial truck drivers, which, if passed, could hypothetically increase stimulant use. Jurisdictions with tighter alcohol control policies, such as minimum pricing policies, are being challenged as having unfair trade practices. Reductions

in alcohol prices could see increases in alcohol consumption which could affect road safety. These are issues that need monitoring and research.

Likelihood of Success: Other disciplines have been engaging in international research projects. The EU has been engaged in collaborative research and the fact that this workshop is being sponsored by both American and Canadian sectors, speaks to the possibility of increased joint research programs.

Effect: Trend data have shown us, that worldwide declines have occurred in drinking-driving fatalities. However, we have little understanding for why these worldwide changes occurred. All research in the political and economic fields have been pointing to the diminution of nation-state powers and increases in global pressures. It will be important to monitor the impact of globalization on road safety. Rather than “thinking globally and acting locally,” we have been thinking locally and may eventually have to begin acting globally. Without understanding the big picture, we will be limited in our future capacity to intervene successfully to reduce alcohol, other drug and transportation problems.

Health-Care System

Problem Area: During the past two decades, Western countries have experienced large increases in health care expenditures, which account for between 6 to 14 percent of a country's gross domestic product. Concerns over cost escalation in the past 5 years have driven virtually every country in the Organization for Economic Development to launch major reforms of its health care systems (Evans, 1993). In recent years, health ministries and departments have become interested in injury prevention, in no small measure because of the health-care costs equated with injuries. For example, in Canada, injuries have jockeyed for second and third place in terms of total health-care costs. When these economic burden data came out, injury prevention began to appear in public health documents.

However, health-care restructuring, managed care, the aging population, advances in medical technologies and pharmaceuticals could have impact on injuries. Reducing hospital days of stay, day surgeries, and deinstitutionalization of the chronically ill and frail elderly means that many more of the general public are using transportation under the influence of medicinal drugs. For example, in Ontario, the average senior citizen has an average of 38 prescriptions filled a year.

Another emerging, managed health care problem related to cost-cutting, is the reduction of alcohol and drug abuse programs. McLellan et al. (1996) write that based on findings from the National Institute on Drug Abuse's Drug Abuse Treatment Outcome Study, “there has been a systematic deterioration in the number, range, professionalism and duration of treatment services that are available to patients for the treatment of alcohol and drug problems” (p. 8).

What We Don't Know: The mobility of health-compromised, medicinal drug-using, individuals has not been examined to any extent, despite its emerging trend. In fact, de Gier (1993) estimates that at least 10 percent of all people injured or killed in road crashes

were taking some type of psychotropic medication that may have been a contributory factor, a problem which could be exacerbated with the aging population and changing health-care practices. With regards to alcohol and illicit drugs, the impact that reductions in alcohol and drug treatment services could have on impaired driving is unknown.

Research Issues: Within the health-care sectors are a number of emerging trends that need attention. Changing health care practice effects, such as day surgeries and de-institutionalization, the elderly, and the impairing properties of medicinal drugs are important areas of research and intervention. Similarly, it would be important to monitor the trends between reduced treatment availability and impaired driving fatalities. Mann and Smart have conducted regression analyses on the impact of increased treatment and Alcoholics Anonymous membership as factors in traffic fatalities (Mann et al., 1988; Mann et al., 1996).

Likelihood of Success: These are straightforward epidemiological issues to tackle.

Effects: These emerging trends need to be monitored for planning and intervention purposes.

Pedestrians

Problem Area: Related to the issues mentioned above of elderly, medicinal impairment, de-institutionalization, etc., one could anticipate a greater number of pedestrians who are impaired by drugs and/or alcohol.

What We Don't Know: We have little information available on the role of alcohol and other drugs in pedestrian casualties.

Research Issue: To gather alcohol and drug information on pedestrian casualties, with eventual case-control studies.

Likelihood of Success: Basic epidemiological issue.

Effects: We will have a better understanding of the prevalence of alcohol and drug use among pedestrians, which could lead to interventions, if needed.

Etiology of Impaired Driving

Although I have been asked to address the "general public" as opposed to "special populations," I feel some preamble regarding the concept of general public is needed. One of the problems that has existed in the past is that interventions, both preventive and rehabilitative, generally have been developed on some belief that impaired drivers represent the "general public." For example, many, if not most, DWI rehabilitation programs have been developed with the assumption that offenders have reasonably normal personalities, normal cognitive processes, middle-class lifestyles and values, are well employed and

have stable lives, with no other problems, except maybe some problem drinking. Interestingly, the Addiction Research Foundation (ARF) of Ontario treatment research historically had just such types of exclusion criteria of co-morbid personality disorders, learning disorders, unstable lifestyles, multiple drug use, etc. Unfortunately it meant that only 4 percent of all clients seeking treatment at ARF were eligible for their research studies. Clearly this had serious implications for the generalizability of their research findings. Traffic safety interventions may be suffering from the same lack of appropriateness. Donovan, Jonah, Wilson and others have engaged in some exploration of DWI offenders and Wells-Parker has studied the differential effects of sanctions of DWI offenders with different demographic characteristics. But more research is needed to understand thoroughly impaired drivers (Donovan and Marlatt, 1982; Jonah, 1986; Wells-Parker et al., 1990; Wilson and Jonah, 1985).

Problem Area: Research suggests that the “general public” does not engage in much impaired driving. Rather impaired drivers represent a subset of individuals, at risk for numerous problems. There are personality factors, environmental factors, economic factors, etc., that play major roles in the development of health-compromising behaviors, such as alcohol abuse, and risk-taking and deviant behaviors, such as impaired driving. For example, antisocial behavior in childhood has been linked to alcohol problems in adolescence and adulthood. Adolescents who have been abused or traumatized are at risk for alcohol problems. Indeed a certain proportion of “the hard-core” impaired drivers are probably sociopathic personalities. Educational status and literacy tend to be lower. Researchers tend to forget that based on the latest international surveys, 44 percent of Americans and 32 percent of Canadians aged 16-25, read at the level 1-2 literacy level, meaning that they are functionally illiterate (Dasgupta, 1996). The illiteracy rate is even higher for older citizens. Furthermore, those who have difficulty with reading and absorbing basic information are not the “general public” but are over-represented among those with lower income, education, employment status, and particularly among those who are involved in deviant activities. In other words, those individuals most likely to be DWIs are also of similar profile to low literacy, low comprehension, citizens. Yet, programs are developed and evaluated based on the mistaken belief that DWIs are the “general public” who can read, write, comprehend, and act accordingly.

Furthermore, recent research from the alcoholism field and some initial work Dr. Mann has done at ARF with DWIs indicated that drug abusers and DWIs seem to be over-represented with learning disabilities, attention deficit, hyperactivity disorder and other possible neurological problems. As long as we assume that DWIs are simply the “general public” with weak moral fibre, we probably will not develop the types of interventions that could be appropriate.

What We Don't Know: We do not have a thorough understanding of impaired drivers—“etiology,” “development” and “natural history” of the behaviors. Nor do we have a good understanding of co-morbid, problem behaviors.

Research Issues: To develop a comprehensive and thorough understanding of impaired drivers and driving within the broader context of etiology, natural history, and co-morbid

problem behaviors. In addition, importance should be placed on studies examining social and environmental issues related to both impaired driving and mortality. In recent years, the criminological, sociological and public health fields have been exploring the importance of “social capital” and other broad determinants of health, such as poverty and income disparity, on morbidity and mortality. For example, Kawachi et al. (1997) in a cross-sectional ecologic study on social capital, income inequality and mortality, based on data from 39 states, found that poverty played a major role in explaining state variations in deaths due to unintentional injuries. Yet, these broader, environmental factors have been rarely investigated by traffic safety researchers.

Likelihood of Success: Other disciplines have been exploring these issues already. Unfortunately, our field has not kept abreast of the research and innovations to the same extent.

Effects: Most DWIs are not fine upstanding citizens with no problems who just happen to drink and drive. Rather they have problems with alcohol, drugs, and more often than not, engage in other criminal activities. Understanding the etiology of deviant behaviors, such as impaired driving, should lead to innovative preventive and treatment approaches.

EXPERIMENTS

Medicinal Drugs and Driving

I will not belabour this issue because it is being addressed by Drs. Burns and Jones, but in light of some of the emerging trends discussed above, more research is needed to understand the relationship between various medicinal drugs and impairment.

PROGRAM/POLICY DEVELOPMENT AND EVALUATION

There are three general areas in program/policy development and evaluation where we could cast a wider net to broaden our scope of understanding and to engage in more innovative programming initiatives.

Prevention: Early Intervention Programs

To date, much of our prevention activities and research has focussed on public or school-based education, or on alcohol control policies, such as server intervention. Yet, the research of Jessor (1987) and others has indicated that impaired driving, is but one of many risk-taking activities of troubled youth. Interventions that start early, and focus on ameliorating the development of problem behaviors, if successful, should impact on all deviant activities, including risky and impaired driving. Clearly there is the need for collaborative research activities in developing and evaluating innovative interventions.

Problem Area: Certain childhood behaviors, psychiatric disorders, parenting styles, family environments, peer relationships, expectancies, and trauma have been linked to alcohol

problems in adolescence and adulthood. Various interventions have been developed to reduce these risk factors. For example, schools have developed social skills and violence prevention programs. Communities and public health units have introduced effective parenting programs, home-visiting programs, head-start programs, and so on.

What We Don't Know: Few of these programs have been evaluated for their impact of subsequent health-compromising and risk-taking behaviors. Thus, we do not know if various programs can reduce overall problem behaviors, including impaired driving.

Research Issue: To conduct large-scale, longitudinal research on the impact of various promising interventions to reduce problem behaviors.

Likelihood of Success: Evaluation research is a challenge, at the best of times. To engage in longitudinal research, with large sample sizes and adequate methodology, will require the sustained commitment of funders and researchers. It would be important that alcohol, other drugs and transportation research be part of larger studies which measure a wide-range of lifestyle behaviors. In this way, we could develop a better understanding of prevention of at-risk behaviors, including impaired driving.

Effects: Early intervention programs can be highly successful in reducing problem behaviors. For example, a long-term follow-up of the randomized controlled trial of children enrolled in the Head-Start program called High/Scope Early Childhood Enrichment Program, from the 1960s in Ypsilanti, Michigan, found that the intervention group continued to do better than the control group in a number of ways. Although Head-Start programs were deemed to be a failure in their initial evaluations because the intervention children did not maintain their I.Q. advantage over the controls once both groups entered primary school, the evaluation by Schweinhart et al. (1985) found that the intervention adults were significantly more likely to have completed secondary school, to be working, to having reduced criminality, reduced teen childbirth, etc. With the cost-benefit calculation that for every dollar spent in the Head-Start program, \$7 were returned because of reduced social costs.

Prevention: Community Interventions

Problem Area: The persistent focus of drinking-driving prevention has been on changing behavior of individuals with less consideration on the environment that shapes the behavior. The importance of the inter-relationship of the individual and the environment is chronically ignored (Vingilis and Mann, 1986). Social forces, cultural patterns, economics, values, and norms are generally not included in many equations of drinking-driving prevention.

As Wallack (1984) writes, the linear analytic-reductionist method of searching for a simple cause of public health problems has led to research comparing individuals with "the problem" with individuals who do not have the problem. The research invariably concludes that the problem individual has too little or too much of something and programs can therefore be developed that will give individuals what he/she needs. As many

suggest, this approach of only defining the problem as within the individual is popular because it clearly indicates the direction of research, programming, and policy (Vingilis, 1987; Wallack, 1984). It is politically and economically safe because the problem has been placed only on the individual and not on the money making products, industries, and systems that support impaired driving.

As Wallack (1984) and Mosher (1985) write, the strong focus on the individual is particularly salient in the United States, where the market-justice concept which emphasizes individual responsibility and the pursuit of self-interest so solidly based on traditional American ideals further supports the belief that impaired driving is a matter of individual responsibility. Yet, community-based initiatives can be powerful tools.

What We Don't Know: Community/jurisdictional policies that reduce the availability of alcohol and drugs should, theoretically, reduce impaired driving. Furthermore, successful programs that reduce drug use, violence and other problem behaviors could possibly have spin-off effects in reducing other delinquent behaviors, such as impaired driving.

Research Issue: Graduated licensing, alcohol pricing, physician medical prescriptions for less impairing psychotropics are all examples of interventions to reduce availability of alcohol, drugs and driving. Other broader interventions, such as early childhood interventions, violence prevention programs, and alcohol and drug prevention programs need to be evaluated for broader outcomes, such as impaired driving.

Likelihood of Success: Collaboration and "piggy-back" research are possible in community-based initiatives. Pairing up with large-scale interventions and evaluations would be the answer.

Effect: To reduce deviant behaviors, including impaired driving, a sustained multifactorial approach is more successful than any single approach. As impaired driving is part of a larger behavioral and environmental system, research is needed to understand the bigger picture.

Early Intervention: The Medical Community

Problem Area: The medical community, particularly in Canada has become interested in moderate drinking, alcoholism, screening, early intervention and treatment. Numerous medical journals have dedicated issues to the topic. For example, the Canadian Family Physician in April 1997 published a special issue on moderate drinking and health. Definitions of moderate drinking are debated, and the epidemiologic evidence of the relationship between drinking and a range of positive and negative consequences, including the association with physical illness, accidents and violence, with adverse social consequences and with all-cause mortality is presented. For example, Ashley et al. (1997) present some health risks related to moderate drinking, including motor vehicle casualties. However, the mention of accident risk in relation to discussions of moderate drinking is not the norm among the medical community. In a study in the same journal, Herbert and Bass (1997) surveyed general practitioners and their patients on how they define early at-

risk alcohol intake. The patients' defined limits for a 75-kg man was 2 drinks per day and 11 drinks per week; doctors' estimate was 1.5 drinks per day and 9 drinks a week. Furthermore, both groups were asked under which situations people should completely avoid alcohol: driving ranked at the top, above pregnancy, taking medication, and medical condition. However, only 55 percent of patients and 58 percent of doctors felt that alcohol should be completely avoided while driving. Thus, the good news is that drinking and driving is most unacceptable; the bad news is that a sizeable minority finds that it is acceptable. Importantly, 85 percent of patients and 97 percent of doctors think doctors should ask about drinking behavior; yet only 42 percent of these patients recalled ever being asked how much they drank.

There still is a lack of awareness of medicinal drugs and impairment.

What We Don't Know: What effect increased medical early at-risk detection and interventions could have on reducing alcohol consumption and thus, impaired driving. Research on smoking cessation has shown positive results with physician inquiry and intervention. Medicinal drugs and impairment is an emerging issue, as was described above.

Research Issue: Working more closely with the medical community on a variety of alcohol and drug related interventions and evaluations.

Likelihood of Success: Probably will require sustained effort to effect change.

Effects: Physicians in a number of Canadian provinces must, by law, report to their provincial Ministry of Transportation, any patients who have conditions which could impair their driving. Clearly alcoholism and drug abuse are conditions that should be reported. Furthermore, doctors could be held negligent, where patients with the above mentioned problems were involved in motor vehicle collisions. Finally, physicians are an untapped source of assessment and intervention.

CONCLUSIONS

The above research priorities move beyond the focus on specific alcohol-other drugs and transportation questions. This is not to deny that there is value in conducting research on specific alcohol and drug-related transportation issues. However, I suggest that the research in our field has been too linear reductionist, with the consequence that at times, we have missed the forest for the trees. For example, drinking and driving is not a pressing hot topic for the general public today, and we simply cannot go back to re-kindle the single issue interest on the topic that occurred in the early 1980s. Rather, it is critical that we read the current *Zeitgeist* and consider analysing emerging trends. Furthermore, we need to think of new innovative interventions that tap into the *Zeitgeist* and to collaborate and piggy-back on other interventions designed to enhance positive behaviors among our society. For example, increasing youth violence is a major concern for Americans, while in other countries, such as Canada, youth violence has been diminishing. The behaviors of seriously at-risk youth are manifested in many ways, including alcohol and drug use and driving. Thus, compartmentalization of problems behaviors for intervention and research purposes seems unwise,

unless we have evidence that they are indeed compartmentalized in society. As a discipline, we may have needed to be inward-looking to consolidate our knowledge-base within our own area. However, the time is now right, with the excellent foundation, we have in the field of alcohol, drugs and transportation, to broaden our research questions.

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