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**LA THÈSE A ÉTÉ  
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**SOCIOLOGICAL AND LEGAL ASPECTS OF DRINKING AND DRIVING**

by

**Nosratollah Mohammadhossein**

L.L.B. (Honours), Tehran University, Tehran, Iran 1969

L.L.M. (Honours), Tehran University, Tehran, Iran 1973

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS (CRIMINOLOGY)

in the School

of

Criminology

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APPROVAL

Name: Nosratollah Mohammadhossein

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Title of thesis: SOCIOLOGICAL AND LEGAL ASPECTS OF DRINKING  
AND DRIVING

Examining Committee:

John W. Ekstedt, Chairperson  
Associate Professor, Criminology

Ronald M. Roesch, Senior Supervisor  
Professor, Criminology and Psychology

Raymond R. Corrado, Associate Professor

Vincent Sacco, External Examiner  
Associate Professor, Sociology Department,  
Queen's University, Kingston, Ontario

Date Approved: *November 12, 1985.*

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## ABSTRACT

The repeated presence of alcohol in traffic accidents has led a large number of investigators to the conclusion that impairment is a major factor for the involvement of individuals in highway crashes.

Based on a review of the literature, including empirical studies, the following hypothesis was examined: Alcohol is one of the most important contributing factors in traffic accidents and the probability of being responsible for road collisions rises as blood alcohol concentration increases.

This thesis consists of five chapters. Chapter I (introduction) is devoted to some preliminary definitions of drunkenness and alcoholism; alcohol consumption levels; the impact of alcohol on brain, nervous system, driving ability, reaction time; and finally alcoholic drivers. In Chapter II, the problems of reliability and validity of drinking and driving research are examined. Studies referred to in this research are evaluated and problems in data collection process are discussed. Chapter III reviews statistics on alcohol-related traffic accidents at an international level, as well as in Canada and British Columbia. In Chapter III I have also indicated that the single cause explanation is naive and misleading. Rather, a number of variables (such as drivers' age, sex and experience; exposure; time of the accidents; and vehicle related factors) need to be examined in order to predict the effects of drinking

and driving. Chapter IV focuses on the legal aspects of drinking and driving. Three important issues are investigated: first, the effect of legal sanctions on drinking driving behaviour; second, the deterrent effects of police spot checks on drunk drivers' behaviour; and third, the impact of reducing or raising the minimum drinking age on traffic accident rate. Chapter V consists of suggested directions and recommendations for social policy regarding drinking and driving, based upon a three level (primary, secondary, tertiary) model of prevention.

**DEDICATION**

To Afsar, my beautiful wife  
who is the essence of patience and self-sacrifice.



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## CHAPTER I

### INTRODUCTION

According to 1982 statistics published by Statistics Canada (1984b) of the 158,091 persons charged with Criminal Code traffic offences, 132,023 or 83% were reported charged with driving while impaired. At a national level, the number of alcohol-related traffic offences has grown steadily from 1970 to 1980 in Canada. (Toronto Addiction Research Foundation, 1983). During the year 1980, 157,492 persons were charged with traffic offences of which 141,742 or 90% were charged with driving while impaired. The same reports show that 3,612 persons were killed in traffic accidents in Canada in 1979. The blood alcohol concentration (BAC) levels of 2167 or 60% of individuals involved in those fatal accidents were tested. The test results on fatalities indicated that 1257 (58%) had alcohol presence. On the basis of U.N. Statistics of Road Traffic Accidents (1982) in the United States in 1981, 23,137 were killed in alcohol-related traffic accidents.

It is generally believed that alcohol is an important contributing factor in traffic accidents. This thesis will provide a review of the literature to show the extent to which this belief is accurate. It will be shown that alcohol is, indeed, a significant contributing factor in road collisions. The final chapter will discuss policy implications, particularly focusing on the creation of policies which may reduce the incidence of alcohol-related traffic accidents.

This chapter focuses on some preliminary definitions and discussions related to alcohol and driving. This will include a brief account of alcohol consumption levels; the effect of alcohol on brain, nervous system, and driving ability, especially reaction time; a definition of drunkenness; and finally a review of the particular problem of alcoholic drivers.

#### *Alcohol Consumption Levels*

The World Health Organization (WHO) has had an intensive and long standing concern with alcohol problems since the 1950s when E.M. Jellinek WHO consultant, announced his approach to alcoholism as a disease and as an important social problem. Joy Moser (1980) with the help of contributors from more than 80 countries, in an international review, shows that there have been considerable increases in alcohol consumption over the period between 1950 to 1972. According to Moser during this period alcohol consumption levels have doubled in Australia and the U.S.A., and almost tripled in Austria. Moser notes that consumption of wine has increased fivefold in Canada, eightfold in Finland and twentyfold in the Netherlands. Beer consumption has at least doubled in several countries including Canada, Finland and USSR, quadrupled in Italy and increased eightfold in the Netherlands. In Canada and Italy, consumption of spirit tripled. On the basis of statistics compiled by the Statistical Information Section of the Toronto Addiction Research Foundation (1983) as a collaborating center of the World Health Organization, of the 164 countries reporting figures for the eight-year period from 1970 to 1977, two thirds reported an

increase in per capita alcohol consumption.

The Expert Committee on Alcohol Statistics, Statistics Canada (1981), in a special report on alcohol statistics, reported that :

By 1978 the average adult Canadian (15 years and older) was annually consuming 2.56 gallons of absolute alcohol compared with under two gallons in 1970. This represents an increase of one-third in national per capita consumption. ...Canadians have not only been using a greater amount of alcohol, but have also been consuming more drinks of higher content(p.1).

On the basis of the sales records during 1975-80, British Columbia has been among the four highest alcohol-consuming regions in Canada (Working Group on Alcohol Statistics, 1984).

According to the report of Toronto Addiction Research Foundation, the production, control and sale of alcoholic beverages are among the important economic activities in Canada and provide a substantial amount of government revenue. During the fiscal year 1978-1979, this revenue was in excess of \$2.8 billion and 2.3 percent of total government revenue. This amount represented \$89.60 per capita for the population of Canada (Statistics on alcohol and drug use in Canada and other countries, 1983). On the basis of the same report in 1981, eight percent of all advertising in Canada was alcohol-related and its estimated cost was \$91 million. It is clear that alcohol consumption has increased. It is a reasonable assumption that the incidence of drinking and driving would also increase; indeed, the literature review presented later in this thesis will provide evidence that as alcohol consumption in general

increases, so does the incidence of drinking and driving.

### *The Effect of Alcohol on Driving Ability*

An enormous amount of research has been conducted by numerous investigators both in Canada and abroad concerning the extent to which alcohol has an effect on driving ability.

According to Sivak (1981) the relevant driving skills can be divided into four categories: I-attentional/scanning skills, II-perceptual/sensory skills, III-cognitive/ decision/ information processing skills and IV- motor skills. Sivak argues that:

The driving task is a series of simultaneous and continuous chains involving essentially serial and iterative utilization of various skills from these categories. Therefore, an interruption anywhere in any of the chains is potentially dangerous (p. 62).

Sivak argues that any correlational study (of alcohol and driving ability) should obtain the performance measures in a real life setting. He suggests:

Optimally, such measures would be gathered by stopping motorists and testing them at the side of the road by means of a portable tester (p. 62).

Warren (1954) found that alcohol lengthens visual reaction time. Carpenter (1962) reviewed the psychological literature since 1940 and found that every report indicates that alcohol impairs automobile driving performance and increases reaction time. According to Carpenter heavy drinkers have been found more resistant to intoxication, as measured by motor performance, than abstainers and light drinkers. Talland (1966) examined alcohol addicts and control subjects by experimental tasks to



determine the effect of moderate doses of whisky on performance demanding continuous attention over relatively long periods. He found in an experiment involving signal detection requiring rapid search that subjects showed a sizable drop in performance as a result of alcohol. Chiles and Jennings (1970) examined the effects of moderating high levels of blood alcohol on complex performance and found that moderate to high blood alcohol levels produce performance decrements. Moskowitz and Burns (1971) studied the effect of alcohol on the psychological refractory period. The purpose of their experiment was to determine whether alcohol slows the rate at which information is processed by the brain. To determine whether alcohol affects processing time in the brain, alcohol was administered to subjects and its effects on the reaction times were observed. The subjects were ten men, aged 21 to 40 years, who were occasional or social drinkers, college students or professionals who volunteered for this experimental study. They found that alcohol slows the information processing by the brain and increases the reaction time. According to Moskowitz and Burns:

this experiment represents both confirmation of a deficit in divided attention under alcohol and suggests that one reason for this occurrence is a slowing of the brain's ability to process information(p.789).

They argue that because driving a motor vehicle is intrinsically a divided attention task with responsiveness to a wide range of signals, surely alcohol affects reaction time in driving. Moskowitz and Burns also found that due to the detrimental effect of alcohol, information processing is slowed with increasing age. According to American Medical Association

(1973), most drivers are not perfectly aware of how drinking affects their higher centers of the central nervous system, blunting perception, impairing coordination and diminishing the power of evaluating's one own performance. According to the studies conducted by the same Association (1973), fusion and convergency are considerably impaired between 0.05 and 0.15% blood alcohol level. Visual acuity losses occur at levels as low as 0.08 percent. Resistance to glare and also decreases in distance judgement occur and alcohol also lengthens reaction time. Sturgis and Mortimer (1973) noted significant decrements in performance of drivers with BACs of 0.10 percent. Levine, Kramer and Levine (1975) evaluated 41 studies on the effects of alcohol on human performance and concluded that alcohol impairs the human performance. Hicks (1976) studied the relationship between highway sign brightness and alcohol impairment under night driving conditions and found that alcohol impaired drivers require significantly brighter signs. Laurell (1977) studied the effects of alcohol on driver performance in two contexts:(1) in a critical car driving situation involving emergency braking and evasive maneuvers and (2) in a "surprise" situation that followed the first one and featured the sudden appearance of a man-shaped obstacle blocking the roadway. The results indicated significant increase in reaction time in emergency situations. Bragg and Wilson (1980) and Willumeit, Kramer and Neubert (1981) studied the effect of alcohol on driving ability and found that alcohol increases reaction time. Sutton (1983) studied nine male volunteer drivers, all graduate students at the University of

Pittsburgh, who were selected on the basis of self-reports of at least weekly use of alcohol and marihuana and of having driven under the influence of both drugs. He found that the combination of marihuana and alcohol, even at low levels of the drugs, had a potentially dangerous effect on the driving task.

From the studies examined in this section it may be concluded that alcohol impairs driving ability, especially reaction time.

#### *Definition of Drunkenness*

The words "drunk" and "drunkenness" have been frequently used in the literature, the holy scriptures and the law texts, but we can rarely find explicit and comprehensive definitions of drunk or drunkenness. Non-legal definitions usually contain both "internally oriented" and "externally oriented" or "behavioural" effects of drunkenness. Legal definitions focus on conducts which are labelled "offences for public drunkenness", and consequently do not consider drunkenness by itself as an offence unless disorderly behaviour or nuisance accompany drunkenness. In other words, legal texts refer to "manifest" effects of drunkenness. According to Chafetz (1974):

Of all the many physiological, metabolic, and pharmacological effects of alcohol, the commonest and yet most important is intoxication. Depending on severity and duration, alcohol intoxication, although usually lightly regarded, can be a serious illness, even fatal. Yet, incredible as it may seem, there is no generally accepted explanation of how alcohol induces intoxication. This ignorance directly affects the problems of both prevention and treatment (p.93).

## *Alcoholic Drivers*

The terms "heavy drinker", "problem drinker", "excessive drinker", "alcohol abuser", "alcoholic", "alcohol addict", and "chronic alcoholic" are usually used interchangeably in the literature. Professionals and laymen alike in all these terms refer to an imperfectly conceptualized malady that is either a cause, an effect, or a correlate of excessive use of alcohol. Each specialist seems to have his or her own definition and classification system based on various symptoms. However labelling people on the basis of these definitions and classifications and symptoms sometimes serves no useful purpose to prevent the drinkers who drink too much. To separate an alcoholic (alcohol addict and chronic alcoholic) from other types of drinkers, experts and relevant organizations have attempted to define alcoholism. The American Medical Association (1962) has defined alcoholism as a "disease which is characterized by a compulsive drinking of alcohol in some form. It is an addiction to alcohol" (p.34). The World Health Organization's Expert Committee on Alcoholism (1955) defines alcoholism as:

...any form of drinking which goes beyond the traditional and customary dietary use or ordinary compliance with the social drinking customs of the whole community, irrespective of the etiologic factors leading to such behavior, and irrespective also of the extent to which etiologic factors are dependent upon heredity, constitution or acquired physiopathologic and metabolic influences (p. 49).

However from a clinical perspective, there are three major groups of alcoholics: (1) primary alcoholics (2) depressive alcoholics and (3) sociopathologic alcoholics (Winokur, Rimmer

and Reich 1971).

Blinder and Kornblum (1972) note that five million Americans, five percent of the adult population, are alcoholics and the majority of them drive. Departmental Committee's report on drinking and driving (1976), shows that "in England and Wales, between 300,000 and 400,000 people are affected, in some degree by alcoholism. Many of these people drive, and present a more serious threat to road safety than other potential offenders, since they can not control their frequent and heavy drinking" (p.28).

The role of alcoholism in traffic accidents has been investigated by numerous investigators at least since the 1950s. Selzer, Payne, Gifford and Kelly (1963) in their studies noted that 57% of drivers charged with impaired driving were alcoholics, 15% probably alcoholics and 6 percent probably pre-alcoholics. In another study, Selzer and Weis (1966) found that of 72 drivers responsible for fatal traffic accidents in Washtenaw County, Michigan between 1961-1964, 40% were alcoholics and 10 percent pre-alcoholics. Waller (1965) noted that alcoholic drivers have accident rates about twice as high as non-alcoholic drivers in California. Perrine (1971) who examined the state of the livers of fatally injured drivers to identify the problem drinkers, found that of 67 drivers (over the age of 25), 26 had a BAC greater than 0.20% and of those 26, 15 drivers (around 58%) had a liver indicative of chronic alcohol use. Mozdierz, Macchitelli, Planek, and lottman (1975)

found that alcoholics with high records of traffic accidents and violations may contribute more to fatal collisions than other alcoholics (see also Edelman and Walker, 1977).

These studies examining the relationship between alcoholism and driving while impaired show that drivers considered to be alcoholic are responsible for a significant portion of alcohol-related traffic accidents (35% to 58%). This conclusion supports the author's hypothesis that alcohol is a major contributing factor in traffic accidents.

From the studies reviewed in this chapter it may be concluded that alcohol consumption has dramatically increased in recent decades in Canada and various areas of the world. It may also be concluded that alcohol impairs human motor skills and alcoholic drivers are more involved in road crashes than other drivers. These conclusions confirm the author's hypothesis which is based on the great importance of the role of alcohol in traffic accidents.

In chapter two the problems of reliability and validity of drinking and driving research will be examined. Studies referred to in this thesis will be evaluated and problems in data collection process will be discussed. Chapter three will review statistics on alcohol-related traffic accidents at an international level, as well as in Canada and British Columbia. In chapter three, I will also indicate that in the context of drinking and driving single cause explanation is naive and misleading and a number of variables interact with alcohol in

traffic accidents. Chapter four will focus on the legal aspects of drinking and driving. Three important issues will be investigated: first, the deterrent effects of drinking driving legal sanctions on drunk drivers' behaviour; second, the deterrent effects of police spot checks; and third, the impact of reducing or raising the minimum drinking age on traffic accident rates. Chapter five will give a number of suggested directions and recommendations for social policy in the context of drinking and driving.

## CHAPTER II

### PROBLEMS OF RELIABILITY AND VALIDITY IN ALCOHOL RELATED TRAFFIC ACCIDENTS RESEARCH

The degree of influence of alcohol on traffic accidents is complicated and difficult to understand and analyse. Information upon which decisions regarding the alcohol related road collisions are to be based, must be gathered in a dedicated and careful way. The picture obtained by using the data collected must reflect the real world.

#### Instrumentation

Wilson (1980) explains how the analysis of accident data is usually made complicated by changes in requirements for reporting accidents. The effects of evaluation and safety programs which are based on those accident statistics can be obscured or magnified. In other words, the criteria for reportable accidents may change during the process of study. Campbell and Stanley (1963) refer to the process of change as "instrumentation" which covers the problem of the measuring instrument changing during the process of an experimental study as a threat to the internal validity of research. In traffic safety research, investigations are frequently susceptible to changes in the legal definitions, for instance, the criteria for determining what constitute a reportable accident. The main and usually the only source of information on alcohol-related traffic accidents is police department records. Such records are



affected by a variety of differences in recording standards and practices, for example between federal and provincial procedures. For this reason Zylman (1968) describes the police department records as containing notoriously inaccurate information. Some police departments report only the important or more serious alcohol-related traffic crashes, while other departments report all road accidents. Since there is no clear cut universally accepted definition of an "alcohol-involved" accident and often this term is used arbitrarily by police forces and individual officers, the data obtained usually are not reliable and may be misleading. The data collected in this way can not be considered to describe reliably the conditions of traffic accidents in the area in which the data were collected, and their validity for other communities may also be questioned. As a consequence, research based on these statistics should be interpreted with caution.

#### Blood Alcohol Level

In his studies and analyses, Noordzij (1983) noted that investigations into the BAC of accident-involved road users are usually restricted to those seriously or fatally injured. Noordzij argues that this situation may lead to the problem that in multi-vehicle accidents the injured road user may have been sober, while an uninjured road user in the same accident had been drinking. In such cases, the accidents would not be registered as being alcohol-related.

As Simpson and Heayn (1975) note, in cases of traffic accident injured victims, many are not able to give consent to be tested for an alcohol level in their blood, and naturally the hospital personnel are more concerned with treatment. For these reasons, the information regarding the alcohol level in victims' bodies is unreliable. In case of performing the related blood tests, the results are not sometimes available for analysis. In fatal crashes, coroners or other medical examiners ask blood tests merely for the drivers involved and consequently only the drivers will be included in the alcohol-related traffic accident statistics. When the alcohol levels of other victims such as pedestrians are not recorded, the conclusions about the accidents may be inaccurate. The same argument can be made regarding the court records, since they too tend to be a product of provincial and local justice systems and may be deficient or inaccurate. As Browning and Wilde (1975) have pointed out:

as a result, attempts at conclusive answers on the state of knowledge about drinking and driving and the successes or failures of countermeasures must be prefaced with a warning that solid facts and figures...are few and far between (Edelman and Walker, 1977, p. 16).

It should be noted that in some parts of the world, such as Sweden, the problem of variability in data collection practices has been resolved by having only one central national laboratory responsible for the analysis of alcohol level of drunk drivers and requires that uniform standards be used by police officers and medical examiners (Edelman and Walker, 1977).

Two major approaches have been reviewed regarding the contributory role of alcohol in traffic accidents. One approach relies on the frequency of alcohol in collision populations and the other approach tries using a risk-factors methodology to evaluate the frequency of impairment in collision populations relative to the frequency of impairment in the driving population at risk: To estimate the contributory role of alcohol in traffic accidents, the researchers usually study the frequency of BACs among collision populations. The researchers rely on secondary data obtained from the police reports or their alternative, toxicologists' reports on fatalities. It is evident that reliance on secondary data creates some problems. Actually a small proportion of drivers are tested for BAC and consequently the presence of alcohol is judgemental. In other words, BAC tests are conducted only when the drivers are suspected of impairment. However, what are available to the investigators are the reports which contain the police judgement of alcohol involvement of the drivers, that is, whether the driver was normal, had been drinking or impaired by alcohol consumption. This judgement is able to substantially change the result of the investigation. Estimations of alcohol-related damage based on toxicologists' reports which accompany coroners' files also have fundamental deficiencies. These data do not cover the persons involved in non-fatal accidents or the survivors of the fatal accidents, consequently the fatal collision populations are not usually representative of the larger non-fatal accident population. Although many of those who

are impaired survive the collision, there is no information regarding their BACs. Moreover, some of the drivers who are injured in accidents are not tested for BAC. However, considering all these problems, the group of drivers or pedestrians who are tested for BAC, form a biased sample and this sampling affects the estimates of the contributory role of alcohol. Even if we were able to test all fatalities for BAC, the result should be interpreted with caution, since most of the alcohol in victims' bodies will be metabolized a few hours after their death. Furthermore, transfusion can alter the status of the blood.

#### Bias in Data Collection

Bias is the other process which affects the reliability and validity of a study. Bias may affect the techniques of data collection or the process of analysis. Sometimes those who fund and direct research designs and programs for alcohol-related traffic accidents may try to influence the direction of the research to justify their own ideas and hypotheses. It is even difficult for skilled and well versed investigators to determine to what extent bias affects the results. It is an easy job to check and evaluate, for example, a questionnaire and find out whether it contains direct, short and simple questions, or assess the social desirability of the items. It is also not difficult to verify the badly drawn samples but it is a difficult job to control the process of data collection which is under the influence of bias.

McGuire (1973) designed a study to identify how the official motor vehicle records, as sources of criteria in the field of accident research are inaccurate. Comparing information obtained in confidential interview with those obtained from official motor vehicle records, he found that not only did the official records underrepresent actual frequency, but they contain sex, age, and occupational biases. He concluded that the nature of biases existing in official records should first be established before they are used for research purposes.

### Research Methods

The most frequently used research methods for studying impaired drivers are the experimental and survey methods. In an experimental situation, an intervention is applied to individuals or subgroups randomly. The individuals or subgroups experiencing the intervention are called an experimental group. A control group is an equivalent group which is created by withholding the intervention from randomly chosen subgroups or individuals (Ross, 1983). In the context of drinking and driving, the experimental method is usually used for studying variations in law enforcement including the problem of determining the deterrent effect of police activities. However in an experimental investigation the experimenter's bias may influence the subjects of research. As Mottin (1973) has explained, the scoring of the degree to which someone is impaired by drinking may be contaminated by the scorer who knows the amount of alcohol consumed by the subjects and consequently

affects the experimental results. Browning and Wilde (1975), evaluating the results of the experimental method, refer to four factors which limit its reliability and validity:

1-The complexity of the real world is lost in the laboratory so that the driving context, reason for driving and mood of the driver are not considered. 2-Subjects will react differently to the 'pseudo-risk' experienced in a laboratory versus the real risk involved in driving. 3-The use of volunteer subjects may bias the results, in that they may not be representative of the 'normal' drinking driver who does or does not become involved in an accident. 4-Artificial controls and decisions (i.e. the quantity and rate of alcohol consumed), are introduced which would normally be made by the subject in a real life situation (Edelman and Walker, 1977, p.22).

As Edelman and Walker (1977) have pointed out, among the factors which affect the data collection (and it is difficult to control or assess them), reference can be made to "the subjects' perception of, and response to, features such as the purpose of the performance and experiment, as well as their prior ideas as to what should occur when one drinks and drives" (p.22). In quasi-experimental research due to extraneous variables, control is more difficult. However, as Edelman and Walker (1977) point out, in the context of drinking and driving serious problems surround the making of valid causal inferences in experimental and quasi-experimental studies. In the present investigation effort has been made to include studies which are not contaminated by most of the serious problems such as, instrumentation and bias. OECD's studies (1974 and 1978); Zylman's studies (1973b and 1974); and Ross's works (1976a and 1983) are among the elegantly controlled investigations appeared in the drinking driving literature. The problems of reliability

and validity can be borne in mind when considering the findings of survey research (Denzin 1970). Surveys are usually concerned with the attitudes, opinions, activities, behaviour and social environment of the subjects. Festinger and Katz (1953) have defined survey technique as the systematic collection of data from populations or samples of populations through the use of personal interviews or other data gathering devices. In recent decades, in the field of driving behaviour, roadside surveys have been conducted by specialists on a worldwide basis. They have attempted to find out the BAC levels of drinking drivers and the time and place of their drinking while driving. Information obtained by survey techniques aids the researchers to have a more accurate comparative estimation of the role of alcohol in traffic accidents. The main dangers which threaten the findings of survey techniques are: the surveyor's bias, interviewer's errors of interpretation, and leading and double-barreled questions. To avoid some of these dangers and to provide more accurate, especially cross-cultural data, the Organization for Economic Cooperation and Development (OECD) has attempted to unify the techniques of data collection in roadside surveys throughout the member countries. But still some of the problems have remained. One of the main problems which produces sampling error is the drinking drivers' fear of prosecution and therefore their refusal to give any factual information to the officers concerned. To remove this problem, assurance should be given to the drivers who participate in a study that confidentially information will be maintained and that they will

be immune to prosecution.

From the studies reviewed in this chapter and the author's evaluation of numerous investigations (referred to in this chapter and other chapters) it may be concluded that serious problems surround the making of valid causal inferences in drinking driving experimental and quasi-experimental studies. In the present investigation the author has attempted to include studies which are not contaminated by most of these serious problems discussed in this chapter.



## CHAPTER III

### SOCIOLOGICAL ASPECTS OF DRINKING AND DRIVING

#### Statistics on Alcohol-related Traffic Accidents

Since the 1930s, alcohol has been recognized as a major factor in traffic accidents. The evidence of intoxication was at one time based on the behavioural characteristics of the driver, but recently, tests of the blood alcohol concentration (BAC) have been used more and more as judicial evidence of impaired driving.

In recent years much more attention has been paid to drinking and driving. Since the 1960s hundreds of investigations have been conducted in different areas of the world regarding the injury and fatal effects of impaired driving. Birrell (1967) showed that 60% of drivers killed in single-vehicle accidents had blood alcohol levels greater than 0.1 percent. Older and Sims (1965) examined the blood-alcohol levels in more than 800 drivers involved in fatal accidents, in England, Wales and Scotland, during two months (December 1964 and January 1965) and found that 41% of the drivers had been drinking ; 34% had blood alcohol concentration more than 0.05. Whitelock (1971) in his study "Death on the Road" refers to some of the European investigations concerning the alcohol-related traffic accidents. According to Whitelock, in Romania in 1967, it was found that 128 of 457 drivers suspected of driving under the influence of liquor had been involved in accidents. Vamosi (1960) in

Czechoslovakia concluded that persons with blood-alcohol concentrations greater than 0.15 percent had a 124-fold greater risk of being involved in accidents when compared with those with lower alcohol levels in their blood. Alha(1966) in Finland estimated that 14.6 percent of 964 road deaths were due to alcohol, and in Poland in 1961 the proportion was 19 percent, falling to 15 percent by 1964. Anderson and Bonnicksen (1966), in Sweden noted a sharp fall in accident rates in 1963 when, for two months, a strike in the liquor trade led to restricted supplies. OECD's report(1978) shows that 30 to 50% of deaths from road accidents in industrialized countries are alcohol-related. According to Somogyi (1980) in the first half of 1979 more than 1500 accidents were caused by 1244 drunken drivers in Hungary. During February 1980, 157 traffic accidents were caused by drunken drivers occurred in that country; twelve were killed, 62 suffered severe and 82 minor injuries. According to Raekallio (1980) during 1971-74, in 1430 fatal traffic accidents in Finland, alcohol was present in the blood samples of 393 persons, around 27.5% of the victims (with BACs of 0.15 percent or more).

Johnston (1982) using, for the most part, Australian data in his study, argues that alcohol is the single most prevalent contributing factor in serious road crashes. He notes that in Australia, approximately one in every three persons killed and one in every five persons injured in road accidents has a BAC of at least 0.05 percent. Johnson notes that these figures confirm that alcohol is the single most prevalent factor in serious

traffic accidents. He also notes that these figures reveal that the incidence of alcohol involvement in less severe road accidents is not as prevalent as commonly thought. But Johnston finally argues that the high incidence of alcohol in traffic accidents is not by itself evidence of causation and its presence could be accounted for in terms of exposure to risk.

A comprehensive study of alcohol-related traffic accidents and property damage was conducted by Borkenstein and his associates (1964), in Grand Rapids, Michigan. They studied the BACs of 4,570 drivers involved in road accidents without injury and found that 5 percent of the drivers had BACs of at least 0.10 percent. According to Mason and Dubowski's analyses (1974) based on medical-examiner records during 1960's, nearly 2,000,000 persons were injured and around 40,000 were killed per year in traffic crashes in the United States. McCarrol and Haddon (1962) noted that in 73% of fatal crashes, the responsible person had a significant amount of alcohol in his body. According to Waller (1967) traffic accidents were responsible for almost 50,000 fatalities and two million disabling injuries a year in the United States. He noted that 5 to 20% of accidents were alcohol related crashes. Traffic accidents killed 5123 drivers in California between 1962-1969 and 44% of them had a blood alcohol concentration of 0.10 percent or greater (Nielson 1969). Fatal accidents killed 309 drivers in Wayne County Michigan, between 1967-69 and 55% of them were impaired driving with a BAC higher than 0.10 percent (Filkins, Clark, and Rosenblat 1970). According to Zung (1979)

approximately 37% of all traffic deaths in U.S. are alcohol-related. On the basis of NCSA's (National Center for Statistics and Analysis) data for 1979-80, 24,000 to 27,500 persons were fatally injured in 45,000 reported alcohol-related traffic accidents and 708,000 persons were injured in less than 2,900,000 crashes (Fell, 1982).

Baker and Fisher (1977) studied the motorcycle fatalities in 1975 in the State of Maryland and found that 50% of fatally injured motorcycle drivers had BACs of 0.10 percent and higher. Farris, Malone and Lilliefors (1976) conducted a study in 1974-1975 in Huntsville, Alabama and San Diego, California, and found that 25% of the injured drivers had positive BACs of at least 0.10 percent and 13% were legally intoxicated (with a BAC of at least 0.10 percent). Terbune and Fell (1981), in a study conducted in Rochester, New York, noted that 25% of the drivers injured in traffic accidents had positive BACs with 20% at BACs of at least 0.10 percent. According to Fell (1982) pedestrian fatalities in 1978 accounted for about 18% of the U.S. traffic fatalities. Eighty four percent of all pedestrians killed in traffic accidents were adults (defined as 14 years and older). Blomberg, Fell and Anderson (1979) studied the pedestrian fatalities and pedestrian injury accidents in 1978 in New Orleans, Louisiana and found that 45% of adult pedestrians (14 years and older) killed in accidents had a BAC of at least 0.10 percent, with 27% at BACs of 20% or higher. Blomberg and his associates also found that 36% of non-fatally injured adult pedestrians had BACs of 0.10 percent or higher, with 23% of

these injured pedestrians at BACs of at least 0.20%.

According to the report of the Working Group on Alcohol Statistics (Health and Welfare Canada, 1984) motor vehicle accidents and offences place a considerable burden on enforcement agencies and the legal system. Road crashes are a major cause of violent premature deaths and serious injuries among Canadians. The link of alcohol to fatal road accidents in Canada is between 45 and 54% of fatalities investigated (near to the 50% estimate in the United States). Approximately 5400 persons were killed in traffic accidents in Canada during the year 1980, of which around 2700 (50%) were alcohol-related. The same Working Group also reports that while some progress has been achieved in reducing the number of fatal road accidents, the proportion of drinking drivers has not decreased. In a study conducted by Cimbura, Lucas, Bennett, Warren, and Simpson (1982), 1031 drivers and pedestrians (768 drivers and 263 pedestrians) fatally injured in traffic accidents in the Province of Ontario between April 1978 and March 1979 were investigated. Alcohol was found in 57% of the victims and 49% of all drivers had a BAC higher than 0.08 percent. According to Bako, Mackenzie, and Smith (1976) in 1970-72, 465 of 854 drivers (53.4%) responsible for traffic accidents in Alberta had been drinking beforehand. Approximately 82% of drinking drivers were legally impaired. In his study Mercer (1984) found that from January 1977 to June 1983, approximately 1,631 person were killed and 46,739 were injured in alcohol-related traffic accidents in B.C. However multidisciplinary investigations

demonstrate that alcohol impairment is one of the most important contributing factors in road crashes and probability of being responsible for road collisions rises as blood alcohol concentration increases.

### Factors Interacting with Alcohol in Crash Occurrences

Although in ever growing studies of drinking-driving, alcohol has turned up as an important factor contributing to the occurrence of different sorts of traffic accidents, it would be simplistic to ignore other other factors which may interact with alcohol in traffic accidents. In other words it would be insufficient and possibly misleading to concentrate exclusively on alcohol in the analysis of road collisions and let other considerations be neglected. Therefore, in determining traffic accident responsibility the role of other factors and interaction between alcohol and those factors must be controlled and examined. Factors contributing to the occurrence of traffic accidents besides alcohol (and drugs) can be classified into three categories: driver related factors; condition related factors; and vehicle related factors.

Driver related factors include age; sex; experience; marital, occupational and economic status; driver's education and training; and other factors such as fatigue, sleep, illness, suicide, sudden loss of consciousness, driving without due care, unsafe speed and backing unsafely. Condition related variables are factors such as weather and road situation (obstructions on

road such as animals, sunshine, glare, etc.). Vehicle related factors include type, and age of the vehicle; engine failure; and brakes, lights, windshield defectiveness etc. In subsequent sections, some of these factors will be discussed.

### Age

The relationship between alcohol-related traffic accidents and driver age is a question that warrants attention. Accident statistics on young drivers show that young drivers are disproportionately involved in traffic accident fatalities and injuries (U.S. National Safety Council, Accident Facts, 1965-1971; Pelz and Schuman, 1971; Brezina, 1969; Campbell, 1966; Penn, 1963; Schuman and Pelz, 1968; Karpf and Williams, 1983; Kudlicza, 1972). But the interpretation of these accident statistics is not clear. Two issues should be discussed. The first is whether young drivers are overly exposed to accidents in which alcohol plays a role. The second issue is, whether a given amount of alcohol produces higher impairment of driving in young drivers than in other drivers?

On the basis of National Safety Council's road accident statistics for the U.S. in 1971, the age group 15-24 years had the highest fatality rate (46.1%). This proportion was 28.6% for the age group 25-44 and 24.2% for the drivers aged 45-64 (U.S. National Safety Council, Accident Facts, 1972). The same statistics show that although the age group of 15-24 years constituted 21.6% of the general driver population, they were

involved in 35% of all reported traffic accidents and 33.8% of fatal road accidents.

In his analysis Campbell (1966) found that the young drivers (under 25) in U.S. had a higher proportion of traffic accidents; 46.4% compared with 34.4% for old drivers (60 and over).

Karpf and Williams (1983) studied the information on motor vehicle crashes for the year 1978, in the U.S. in which one or more fatalities occurred. They found that sixteen year old drivers had the highest proportion of single vehicle crashes (around 39%). Karpf and Williams also found that the death rates of the drivers themselves were highest at ages 16-21. They concluded that the disproportionate contribution of teenagers to traffic fatalities has been confirmed by the data analyzed in their study. Mercer (1984) studied the data available for the year 1982 and found that in British Columbia, age is a very powerful prediction of traffic accident involvement even with the effect of alcohol removed. A study by Waller (1970) in North Carolina showed that young drivers 15-24 were responsible for approximately 50% of all traffic accidents. Although youthful drivers aged 15-24 comprised about 21% of the U.S. driving population in 1970, they were responsible drivers for 34% of fatal accidents (U.S. National Safety Council, Accident Facts, 1965-71). Another study in Canada by Brezina (1969) showed that the same age group (15-24) had the highest road accident rate per 1,000 drivers. Road statistics indicate that the involvement of young drivers (17-24) in traffic accidents in Britain during



1970 was four times higher than other drivers (Transport and Road Research Laboratory, 1971). Road traffic accident statistics in Norway, during 1970 showed that while car and motorcycle young drivers formed approximately 20% of the driver population in 1970 in that country, they constituted 42% of the road accident fatalities (Norwegian Central Bureau of statistics, 1971). Kudlicza (1972) analyzed the official statistical records of Austria on road accidents and noted that the age groups of 15-24 years had the highest rates of traffic accidents in 1970 in Austria. Foldvary's studies (1969) in Queensland in Australia, covering the years 1963-64 showed that age contributed most towards the accident risk. According to those studies the youngest drivers under 20 years were the most exposed drivers to accidents.

In explaining the reasons for the overrepresentation of youth in alcohol and non-alcohol-related traffic accidents, Smart and Schmidt (1969) mention that young drivers are the least experienced drinkers and easily undergo the impairing effects of alcohol, while older people have more alcohol tolerance. The young drivers have less experience in driving and are not as cautious as older drivers in avoiding the hazards or the negligence of other drivers. The young drivers are more involved in leisure activities outside the home at parties and in pubs, mostly at evenings and weekends and consequently more exposed to those moments at which alcohol-related accidents occur. O'Day (1970) in his analysis of Michigan fatal accidents in 1968-69 found that fatal road accidents peaked at 18, but

alcohol-related fatal collisions peaked at 21-22. O'Day suggests that it takes a couple of years for the young drivers to get sufficient experience in driving, until they reach the legal drinking age and again it takes a couple of years to learn how to drink. Goldstein (1972), in explaining the causes of youthful overrepresentation in traffic accidents, argues that:

It is not news that youth is a time of turbulence. It is not new that learners of a task make more errors, have less dependable skill and judgement and foresight than older, experienced hands....It is well recognized that a loaded gun in the hands of a troubled person represents high danger, to himself and others(p.183).

In effect, Goldstein is suggesting that not all young people constitute a danger to society but rather that the drivers aged 15-24 are more involved in traffic accidents than older drivers because they are more likely to experience many kinds of difficulties, including considerable stress. Goldstein shows that only six percent in this age group (15-24) are killed as pedestrians and 94% are operators or occupants. Goldstein shows also that this age group are over involved in highway alcohol-related fatalities. He finally argues that the behaviour of young drivers "is a part of their more general behavior. Their highway accident problem is embedded in a matrix of other social, personal, economic, educational, and other problems" (p.184).

Vingilis, Adalf, and Chung (1982) argue that the youth may be more impulsive than older ones in general, and in particular when driving a motor vehicle. The young drunk drivers are more likely to behave in a manner that attracts the attention of the

police. Vingilis and his colleagues argue that ability to drive after drinking without attracting attention of the police increases with age. This could be due to more experience in drinking, and driving. In other words they argue that young drivers have the least experience with and tolerance for alcohol and might appear more impaired than indicated. They also argue that some police officers might feel more uncomfortable asking older drivers to submit to breath tests, unless they are quite sure of impairment.

Several other investigations conducted in the 1960's and 1970s indicated that younger drivers were more involved in impaired driving than older drivers (Borkenstein, Crowther, Shumate, Ziel, and Zylman, 1964; Waller, King, Nielson and Turkel, 1970; Perrine, Waller, and Harris, 1971; Farris, Malone and Lilliefors, 1976; Bako, Mackenzie and Smith, 1976; Warren and Simpson, 1978). Kowalski, Rose, and Fiorese (1967) in a study in Illinois found that over 57% of the drivers aged 15-20 and involved in traffic accidents had BACs of 0.10 percent or higher. In a study conducted by Minnesota Department of Public Safety (1970), data on drivers aged 16-24 indicated that over 79% of the drivers who had measurable blood alcohol, had BACs of 0.10 percent or higher. In an analysis of fatal accidents in Michigan in 1968, O'Day (1970) found that around 50% of 427 drivers between 20 to 24 years of age, had been drinking. According to Bako, et al., (1976) in 1970-72, of 456 drivers involved in alcohol-related traffic accidents in Alberta, 44.5% had 15 to 24 years of age. Preusser, Oates, and Orban (1973) in

their study in Nassau County found that young drivers were overrepresented in alcohol-related accidents. Drivers aged 24 years or under were involved in 40% of alcohol-related traffic accidents. Perrine, Waller, and Harris (1971) found that younger drivers who were involved in alcohol-related accidents had lower average BACs than older people.

Zylman (1973b) summarized the data from a number of studies and found that alcohol increases the probability of traffic accident involvement among teenagers much more than among drivers aged 20-24. He found also that the drivers aged 20-24 are at higher risk than those aged 25-69. Rosenberg, Laessig, and Rawling (1974) studied the role of alcohol in single-car crashes in Wisconsin over a period from February 1968 to April 1971, and found that youthful drivers were significantly overrepresented in alcohol-related single-car crashes. Of the total sample of 753 drivers 45% were aged 16 to 25. Twenty four percent of the drivers aged 16 to 19 had BACs of .015% or higher at the time of their death. Among drivers aged 20 to 24, 54% had this BAC. Whitehead and Ferrence (1976) argue that recent studies indicate that young people are driving more and that they are drinking more alcohol than middle age and older people. Cucchiaro, Ferreira, and Sickerman (1974) and Whitehead, Craig, Langford, Mac Arthur, Stanton, and Ferrence (1975) note that the alcohol-related collision rates among young drivers have been risen dramatically. Pelz and Schuman (1971) note that alcohol-involved collision rates are lower among drivers in their early twenties than younger drivers. Hossack (1972) found

that in fatal collisions, drivers under 25 are more likely to have been drinking heavily prior to crashes than older drivers. Warren and Simpson (1978) found that the frequency of alcohol impairment in automobile driver fatalities increases with age, in each group, up to age 25-34, and decreases in each age group thereafter. Warren (1976) found that younger drivers are more involved in alcohol-related traffic accidents. Mayhew's recent study (1982) shows that young drivers drink less but are more involved in alcohol-related traffic accidents than older drivers. Smith, Wolynetz and Wiggins (1976) found that the drivers under 30 years of age and involved in traffic accidents in Canada had the majority as legally impaired drivers. In a roadside survey, the Interministerial Committee on Drinking Driving (of Ontario, 1980) found that more than 52% of the drivers with a BAC higher than 0.08 were under 30.

Fell (1982) analyzed the data available in FARS (a computerized file containing data on all fatal traffic accidents occurring each year within the 50 States, D.C. and Puerto Rico) for fifteen states, to find the proportion of alcohol involvement in fatal accidents by age in 1980. He found that this proportion for age groups of 22-24 was 50.4% while for age group of 45-54 was 30.4%. Fell also studied the proportion of alcohol involvement in injury accidents by age through the analysis of data available by NASS (National Accident Sampling System) for the years 1979-80 and found that this proportion was 15.3% for age group of 22-24 and 10.1% for age group of 45-54.

The studies referred to in this section show that the young drivers (especially those between 16-20) are more involved in accidents in which alcohol plays a role, than older drivers. Research also shows that young drivers and in general young people have usually less experience in drinking than older people and easily undergo the impairing effects of alcohol, while older people have more alcohol tolerance. Young drivers are more involved in leisure activities outside the home at parties and in pubs, mostly at evenings and weekends and consequently more exposed to those moments at which alcohol-related accidents occur. It appears from the studies conducted that the youth are inexperienced drinkers and (as it will be demonstrated in a later section of this chapter) inexperienced drivers, certainly they are inexperienced at combining drinking with driving. The behaviour of young drivers is a part of their more general behaviour, since the youth are usually more impulsive than older people. It may finally be concluded that a combination of alcohol and youthful driving overinvolves the young drivers in traffic accidents and age as an important contributing factor which may interact with alcohol should not be neglected in traffic accident research. If in the process of research samples are selected from among the alcohol-related traffic accidents of young drivers the problem may be overrepresented. The alcohol-related road crashes may also be underrepresented if we select middle-age groups involved in those accidents as the samples for research.

## Sex

Drinking and driving is predominantly a male behaviour or phenomenon since men are involved in more alcohol-related road accidents than are women (U.S. National Safety Council, Accident Facts, 1974; Statistics Canada, 1975; Warren, 1978; Argeriou and Paulino, 1976; Hyman, 1968; Chafetz, 1974; Clark, 1972; Perrine, Waller, and Harris, 1971; and Warren and Simpson, 1980).

In 1970 in U.S., of 67,500 drivers of all ages involved in fatal traffic accidents, 85.6% were males (U.S. National Safety Council, Accident Facts, 1965-71). Kowalski, Rose, and Fiorese (1967) found that young males are more highly involved in alcohol-related traffic accidents than young females. Perrine, Waller, and Harris (1971) arrived at the same conclusion. In a study conducted by the Minnesota Department of Public Safety (1970), 93% of all drivers involved in alcohol-related fatal traffic accidents were males. According to Bako, Mackenzie, and Smith (1976), in 1970-72, among 456 drivers involved in alcohol-related accidents in Alberta "male culpable impaired drivers (killed or surviving) were 13 times as numerous as females" (p. 856). Krapf and Williams (1983) noted that male drivers aged 16-19 had much higher involvement in traffic accidents than females: Cospers and Mozersky (1968), and Clark, Compton, Douglass and Filkins (1973) found that in general males are more involved in alcohol-related traffic accidents than females. Warren (1978) noted that during 1975 in Canada 77% of drivers involved in injury collisions and 87% involved in fatal

collisions were males.

One hypothesis to explain male overrepresentation in traffic accident involvement is that the police are more reluctant to arrest female drivers for drinking and driving even after having detected and stopped them (Argeriou and Paulino, 1976; Vingilis, Adalf, and Chung 1982; and Young, 1974). Vingilis, et al. (1982) on the basis of the U.S. National Highway Traffic Safety statistics for the year 1974, claim that police officers:

might either not notice erratic driving patterns of women or they might notice erratic driving but attribute it to other factors, such as inexperience, or feminine driving inability, rather than alcohol (p. 426).

Vingilis and his colleagues (and also Argeriou and Pulino, 1976), based on the statistics published by the U.S. National Highway Traffic Safety for the year 1974, suggest that one group of impaired drivers are "alcoholic housewives" who drive in the afternoons or weekday evenings, times when the police are not anticipating and attentive to drinking drivers.

However, on the basis of studies in recent decades in different parts of the world, as far as road accidents are concerned, it may be concluded that male drivers represent the groups which are more involved in alcohol-related crashes. If in the context of drinking and driving samples are only selected from among the males, it may overrepresent the alcohol-related traffic accident rates.



## Time

Pigman, Rizenbergs, and Herd (1980) analyzed accident data on weekdays, weekends, and holidays in Kentucky. Their analysis focused primarily on data for 1973, 1974 and 1975, but 1976 data were also used. They found that Saturdays had the highest percentage of weekly accidents and this was followed by Fridays and Sundays respectively. Tuesdays had the lowest number of accidents. Rates of fatal and all accidents during holidays were lower than during weekends (not involving holidays) but higher than during weekdays. Volume of traffic on holidays was significantly greater (17% higher) than weekends not involving holidays, yet accident rates were lower (4 to 12%) during holidays. According to Pigman and his colleagues, increased efforts by the police to warn the drivers of hazards associated with travel during holidays have had some impact on reducing the traffic accidents. They found also that the seasons with highest accident rates were fall and winter, followed by spring and summer.

Most alcohol-related accidents occur at night (Zylman, 1973a; U.S. Department of Transportation, 1968; Bako, et al., 1976; Pigman, et al., 1980; Mercer, 1984). Alcohol-involved accidents are predominantly a 9 p.m. to 3 a.m. phenomenon, in contrast to non-drinking driver crashes which most frequently occur at peak periods (Bako, et al., 1976; Dale, 1964; U.S.D.O.T. 1968). Alcohol-involved accidents occur most frequently on weekends particularly Saturdays (U.S.D.O.T., 1968). Shupe and

Pfau (1966) in their study found that in Columbus, Ohio, arrests for alcohol-related accidents were most frequent on Saturdays followed by Fridays and Sundays. December was overrepresented and January and the summer months underrepresented in their report. Shupe and Pfau argue that summer decrease in urban areas may be due to the number of drivers who go away on vacation and drink while driving. To support this argument Shupe and Pfau point to an increase in alcohol-related traffic arrests by Ohio highway patrol in the summer months.

The Interministerial Committee's report (1974) on drinking-driving in the Province of Ontario, shows that alcohol-related human damage crashes in 1973 occurred predominantly in the late evening and early morning hours; in contrast to the pattern for all human damage collisions which peaked in the early evening hours. The Committee's report shows also that alcohol-related human damage collisions occurred predominantly on Fridays, Saturdays and Sundays respectively in contrast to the pattern for all human damage collisions which was more evenly distributed throughout the week. Among the seasons fall and winter had the highest human damage collisions and the pattern of alcohol-related human damage collisions closely followed that of all human damage.

Mercer (1984) found that in 1982 in British Columbia, the highest proportion of alcohol-related accidents occurred in the late evenings and early mornings. He also found that the highest proportions were associated with the weekends.

On the basis of these studies, it may be concluded that the most alcohol-related road crashes occur in the late evening and early morning hours; in contrast to the pattern for all traffic accidents which peak in the early evening hours. The highest proportions of alcohol-related crashes are associated with the weekends. Saturdays have the highest percentage of weekly accidents and this is followed by Fridays and Sundays respectively. Since a considerable number of people are involved in leisure activities outside the home at parties, pubs and bars at late evenings and on weekends (especially on Fridays and Saturdays) and many of them are impaired and exposed to hazards. While the volume of traffic on holidays is greater than weekends not involving holidays, accident rates are lower during holidays. Increased efforts by police to warn the drivers of hazards associated with highway travel during holidays may have some impact on reducing the traffic accidents. The seasons with highest accident rates are fall and winter. It is obvious that combination of alcohol and time of the accidents makes the investigation process more complicated, since for instance neglecting the fact that alcohol-related accidents occur mostly at night and focusing on the data and samples obtained in day time would be misleading, because day time obtained data may underrepresent the alcohol-related traffic accident rates.

## Exposure

Exposure is a concept easily understood but a quantity difficult to measure (Chipman 1982). The notion of exposure underlies most statistical analyses of accident frequencies. For at least 40 years scientists and engineers have recognized that it is important to consider exposure, to define what is meant by the term and to try to measure it (Goldstein, 1972; Chapman, 1973; OECD, 1975; Chipman, 1982). The term exposure has a number of slightly different meanings in accident research (Chapman 1972). "Exposure refers in some way to the extent to which a driver is exposed to the risk of accident involvement" (OECD 1975, p.23). Carrol, Carlson, McDole, and Smith (1971) define exposure as "the frequency of traffic events which create a risk of accidents" (p.18). According to Carrol, et al. exposure is determined by the amount of time spent driving or mileage, and also by the factors related to the type of exposure, such as vehicle variables (e.g. condition of vehicle), environmental variables (e.g. weather and time), etc. Based on this definition, exposure refers to variables external to the driver on whom attention is being concentrated (OECD, 1975).

Chapman (1973) and Blunden (1972) and many other investigators believe that exposure holds the key to the interpretation of accident statistics. Exposure measures may be divided into direct and indirect measures (Carrol, et al., 1971). Direct measures include driving distance (mileage), driving time and traffic volume. Indirect measures include

measures such as petrol sales, car insurance premiums, miles of roadway, population and vehicle registration. For the purposes of national and international comparisons the most commonly used figure or variable (in the grounding of exposure) against which accident numbers are compared is that of vehicle mileage (Pelz and Schuman, 1971a; Chapman, 1973).

In the mid fifties Smeed (1955) used the rate of personal injury accidents per million motor vehicle miles and in his analysis found that in general this rate is lower on rural roads than on more built-up roads. To explain the reasons, Chapman (1973) argues that it may be thought that in built-up areas there are more pedestrians, more intersections and consequently more cross and more turning traffic. In the sixties and seventies one aspect of road accidents which caught the eye of investigators and the public was that of young or inexperienced drivers. Many studies showed that exposure, as measured by mileage driven is lower among younger drivers than among older drivers. Foldvary (1969a) analyzed questionnaire data and found that the number of accidents per hundred-million miles of performance decreases as the age of the driver increases up to age 50. Lock (1966) found similar results. Burg (1967) analyzed data available on 14,000 drivers and noted that the drivers aged 15-24 drive fewer miles per year than the older drivers, up to the age 55 for males and 75 for females. He also found that for this age range, mean accidents per year are higher than any other age group. Pelz and Schuman (1971b), controlling exposure, studied data available for 2,000 male drivers and found that the

16-24 age group had the higher accident rates than 35-44 age group. Similar research was conducted by Chipman (1982) to study the relationships between exposure and road collisions of approximately 3,000 licenced drivers among residents of Toronto. He found that the younger drivers had the lower exposure and the higher traffic accident rates. As it was mentioned before, the ideal would be to control for all variables (OECD, 1975) and "this, endeavors to take account of how much traffic uses the road network, how far this traffic travels in the network. It is a useful measure, giving a guide as to how efficiently, in terms of a measure of safety, the traffic system is operating, it does not, however, enable a researcher to use a probability approach; to do this, he must adopt different measures of exposure..." (Chapman, 1973, p. 96).

However, it should be kept in mind that the term exposure in a generic sense refers to conditions external to the drivers such as the roadways, traffic flows, vehicle and environmental conditions and in specific sense to mileage driven. In comparing the accident rates of young and older drivers it is important to control the factors of exposure. On the basis of studies conducted, it may be concluded that young drivers have lower exposure in specific sense but higher accident rates than older drivers. It means that younger drivers drive fewer miles per year and consequently have less driving experience and it leads them to more involvement in traffic accidents.

In the context of drinking and driving research, exposure (mileage driven) is an important contributing factor in traffic accidents interacting with alcohol. Lower exposure of younger drivers which constitutes a part of their driving inexperience when combined with drinking inexperience has adverse results.

### Experience

Driving experience is usually defined as the period of time which has elapsed since a driver obtained a full driving licence (OECD, 1975). Many studies show that inexperienced drivers are more involved in traffic crashes than other drivers (including, Harrington, 1972; Goldstein, 1972; Fell, Mudrowsky, and Tharp, 1973; and OECD, 1975). Harrington (1972) in a study conducted in the United States found that accident rate decreases with increasing experience. Brezina (1969) analyzed Canadian data available for nearly 3,100 beginning male and female drivers. He compared the first year records of beginners with the 1-year averages of experienced drivers of the same ages. Comparison was made for the age groups of 16-19, for the 20-24 and for the 25-54 (accidents per 1,000 drivers). Brezina found that the accident rate for beginners in their first year driving exceeded the average yearly rate for the experienced drivers. Fell et al. (1973) conducted an investigation to study the role of driver experience and vehicle familiarity in traffic accidents. The accident sample consisted of a total 802 drivers involved in 434 accidents. Driving experience (months and/or years) was recorded for 606 drivers and vehicle familiarity (months or years) for

539 of these drivers. The driving experience and vehicle familiarity of another 400 drivers of the general driving population in the same geographic area were used as the data for the control group. Fell and his associates found that drivers involved in the investigated accidents had significantly less driving experience than the drivers in the general population. They found the same result regarding the vehicle familiarity. OECD (1975) referring to some of the aforementioned studies concludes that "More research is clearly needed to delineate the contribution of experience and age-related factors to accident rate" (p.44).

In most of the studies concerned, the problem of lack of experience (with young drivers) is compounded by the effects of age-related factors. There is no evidence to support the contention that physical maturity and traffic maturity go hand in hand (OECD, 1975). However, inexperienced drivers are more involved in traffic accidents than experienced ones. The general term of experience includes actual on road driving experience, familiarity with the vehicle and the area. As it was demonstrated before when driving inexperience is interacting with drinking inexperience the traffic accident rates are increased dramatically. In an alcohol-related traffic accident research the role of driving experience and its interaction with drinking should not be neglected.



## Vehicle Related Factors

A study conducted by Treat and Joscelyn (1973) showed that human factors (including alcohol impairment) have much more importance than vehicle-related factors in traffic accidents. In its analysis of more than 115,000 accidents in the State of Washington in 1971, Washington State Patrol (1971) found that in the frame of road safety research, vehicular factors have much less importance than human factors but they can not be ignored through the process of investigation. Pelz and Schuman (1968) found that the dangerous drivers did not neglect their vehicle more than safe drivers and concluded that higher accident traffic violation rates are not primarily due to neglect of the vehicle. Mercer (1984) analyzed data available in B.C. in 1982 to determine what contributing factors in addition to alcohol, influence the traffic accidents and found that almost all vehicle-related factors were underrepresented for alcohol-related driver/vehicle entities. Mercer argues that:

As the vast majority of the vehicle-related contributing factors were underrepresented for drinking drivers in casualty accidents, one can assume that the drinking driver does not particularly neglect his/her vehicle (p. 74).

Little and Hall (1970) conducted a study in three towns in Michigan, comparing 1,114 drivers involved in traffic accidents with a control group of 8,692 drivers. They found that there was no significant relation between the age of the vehicle and the severity of the collisions. In other words they noted that the old cars were not more frequently involved in serious accidents than newer ones. Little and Hall concluded that compulsory motor

vehicle inspection has no significant influence on the traffic accident rates. According to OECD's report (1975), the effect of vehicle age is not strong enough to allow any definite conclusion to be drawn. The same report shows that poor vehicle equipment such as defective headlights, brakes and tyres, takes second place with respect to human factors. Harrington and McBride (1970) analyzing data available for 147,984 California drivers, found also that bad vehicle equipment has a second place compared with human factors. From the studies conducted it may be concluded that in the frame of traffic accident research, vehicle related factors have much less importance than human factors including alcohol impairment. Higher traffic accident rates are not primarily due to the neglect of the vehicle. The old cars are not more frequently involved in serious accidents than newer ones. Finally it may be concluded that although vehicle related factors should not be neglected in traffic accident research, it does not reduce the great importance of the role of alcohol impairment.

OECD (1975) evaluating several studies concludes that "Another reason for the higher injury and fatality rates of adolescents could be the correlation between the age of driver, safety belt installation and safety belt usage. The cars of young drivers were found to be significantly less often equipped with safety belts and the belts are also used less frequently compared with other age groups" (p.62). Council (1969) attempted to determine if the safety belt usage is less frequent among younger drivers than that of other age groups. He analyzed data

available for 868 vehicle (in 1967 and 1968) and his calculations were made on variables such as, age and sex of the drivers and age of the cars, etc., and found that drivers over 60 use the safety belt more frequently than 16 to 35 year old and even 35 to 60 year old drivers. Richardson (1972), studied the safety belt usage among other variables such as driver's age and sex and also vehicle's type etc., for the 6,307 reported traffic accidents in Oregon State between July 1970 and June 1971 and noted that belt usage increased steadily with increasing age.

It may be concluded that the seat belt usage is an age-related problem and younger drivers use the safety belt less frequently than older drivers. In the context of alcohol-related traffic accident research neglecting the age-related factor of safety belt usage may overestimate the alcohol-involved road crash rates. On the other hand a combination of alcohol impairment and safety belt non-usage may increase the injury and fatal traffic accident rates.

Another subject which has attracted the attention of investigators is the two-wheeled vehicle accidents. In his study in Victoria (Australia) in the years 1961 and 1962, Foldvary (1965) found that the young motorcyclists had the highest traffic accident rates of all age groups. A survey conducted by the Cycle Magazine Subscriber Survey (1967) in the United States in 1967, indicated that approximately 52% of the motorcycle owners were 25 years old or younger and they were responsible

for 59 to 66% of motorcycle fatalities. This survey also showed that fatality rate per mile for motorcyclists was almost five times higher than for car occupants. OECD (1975) evaluating several studies concludes that young driver fatality rate is highly affected by the use of two-wheeled vehicles (about five times that of other vehicles).

It may be concluded that fatality rate per mile for motorcyclists is much higher than for car occupants and drivers. It shows that in the context of drinking and driving, focusing on car accidents and neglecting the motorcyclists' accidents may overestimate the alcohol-related traffic accident rates.

#### General Conclusion

The evidence based on experimental and epidemiological research shows that alcohol impairs important psychomotor skills (chapter one). Multidisciplinary investigations also indicate that alcohol impairment is the human condition most frequently observed in traffic accidents. Although alcohol is an important causal factor in motor vehicle collisions, by concentrating exclusively on alcohol in traffic accident analysis, other correlated variables may be neglected. While there is a considerable correlation between alcohol consumption and road crashes, single cause explanation is misleading and driver impairment alone is neither a necessary nor a sufficient precondition to traffic accident involvement. Nevertheless, some conclusions may be drawn from the available research:

1-Impairment is one of the most important causal factors in traffic accidents and the probability of being responsible for the traffic accidents rises as blood alcohol concentration increases.

2-Alcohol is not a sufficient or necessary precondition of crash involvement.

3-Single cause explanation is misleading and a combination of causal factors may affect the collision involvement which should not be neglected. In other words, alcohol-related traffic accidents may occur in conjunction with the presence or absence of other specific causal factors. A combination of alcohol and youthful driving which overinvolves the young drivers in road collisions may also interact with driving inexperience, lower exposure, or safety belt non-usage factors. Certainly this interactive model of traffic accidents is quite complex and it repudiates alcohol as the sufficient or necessary precondition of collision involvement it does not however, dispute the author's hypothesis that alcohol is a major contributing factor in road injury and fatal collisions and the probability of being responsible for the traffic accidents rises as blood alcohol concentration increases.

## CHAPTER IV

### LEGAL ASPECTS OF DRINKING AND DRIVING

#### The Impact of Legal Sanctions on Drunken Drivers' Behaviour

In previous chapters, research on the relationship between alcohol use and traffic accidents was reviewed. This background material is important, because it draws attention to the interaction between the variables concerned and therefore prevents the reader from underestimating the complexity of the problem. The background material also helps to identify potential high risk groups which consequently leads to the development of effective countermeasures.

In the first part of this chapter, I will try to explain the effects of legislation and penal sanctions on drinking-driving behaviour. Accepting the importance of legal sanctions related to impaired driving does not mean necessarily that laws are the best means for reducing alcohol-related traffic accidents. Actually, there is not a single countermeasure that is currently working effectively. As Hall (1963) has noted, each human society must establish the severity of its own problems and the effectiveness and applicability of specific countermeasures by utilizing the proper survey techniques. In other words as OECD (1978) suggests, successful countermeasures in one country may not work well in another country; a number of national characteristics should be taken into consideration such as police self-perception with respect to the enforcement of

drinking-driving regulations, public perception of the role of police in enforcing drinking-driving legislation, and the public's attitude to driving-while-impaired convictions. The penal sanctions in the form of detection, apprehension and prosecution are usually employed against the drivers who violate the laws and do not respond to other educational countermeasures. Legislation exists in almost all countries to prohibit impaired driving. Legal sanctions constitute the most common countermeasures in use. These legal restrictions vary from country to country and are based on various definitions of alcohol impairment. In some countries impairment is assessed by the level of BAC (blood alcohol concentration), i.e. according to law it is an offence to drive when BAC is above a specified level. In some other countries no reference is made to BAC levels and impairment is assessed by observation or clinical examination and not chemical tests. Some countries determine the impairment by chemical tests without specific BAC levels. Since sufficient data are not available, it is difficult to assert which type of legal system most effectively influences drinking-driving behaviour. The laws for enforcing the BAC level system vary in different countries. In some countries refusal to perform this type of chemical test has the same penalty as a conviction for being impaired. In other countries there is no penalty for such a refusal. In recent years the method of road-side breath testing has been employed by police in several countries. Convictions for drinking and driving result in various penalties in the different countries including fines,

prison sentence and driving licence suspension.

The law makers usually wish to know whether the laws they establish have the desired effects on the social problems for which these laws are created. Many empirical studies have been conducted to assess the impact of law enforcement on drunk driving (Fattah, 1977). Driver's behaviour provides a fertile though complex ground for studies on deterrence (Fattah, 1977). Some of the traffic violations including parking violations are types of rational behaviour and deterrence may be more effective in controlling rational behaviour than impulsive behaviour. Deterrence is thought to be less effective when motivation to engage in the prohibited act is high. In most of the traffic behaviours this motivation is low. Deterrence is less effective in controlling and curbing habitual, unthinking behaviour. Driving behaviour becomes very soon habitual, and it is hard to say whether the main function of legal sanction regarding the drivers' behaviour is intimidation or education. Deterrence is more effective in controlling intentional behaviour; some of the prohibited forms of driving behaviour are negligent. It is not easy to say to what degree drivers respect traffic rules for the fear of legal sanctions and to what extent for the sake of their own safety (Fattah, 1977).

Cramton (1969) notes that a fatal traffic accident occurs only once in every 18,000,000 vehicle miles. Cramton argues that although the consequences of a traffic accident could be staggering, the risk of its occurrence has little impact on



driver's behaviour; but the consequences of apprehension by police officer, appearance in court etc. has much more visible and immediate impact on driver's conduct. Cramton concludes that the deterrent role of legal sanctions in controlling traffic can not be rejected, even though the present system of traffic regulations has many deficiencies.

Shoham (1974) found that the large volume of traffic offences is not related to the high punishments generally incurred. According to Shoham:

the severity of punishment is ineffective in this particular area of delinquency, both for preventing additional offences and for reducing their gravity. Severity of punishment is effective only in increasing the period of time between the punished offence and the following one. Furthermore, severe punishment was found to be positively correlated with recidivism and surprisingly, 42.5% of drivers who received light punishment for the first offence did not commit additional offences(p.72)

Shoham's study evaluated the belief that fear of punishment deters drivers from committing their first offence and actual punishment deters them from further violations. Shoham randomly selected 3,864 drivers from among all those who had received a licence between January 1, 1960 and December 31, 1969. The offence records of the drivers were obtained from police records, which contained data such as name, address, sex, age, various identification numbers, and details of the offence and punishment history. Six variables relating to the offence and punishment history were collected and measured:

1-total number of offences committed by each driver;

2-year of first offence;

3-time lapse, in months, between the first and second offences;

4-in cases where punishment was decided by court, the length of time between the commission of offence and punishment was measured in months;

5-gravity of offences (for the first five committed by each driver) which was established as per the maximum punishment laid by law, as it was viewed by the police, and as perceived by a group of drivers including a special traffic policeman; and

6-type and severity of punishment which was classified in seven categories-warning, choice of fine or court hearing, fine, conditional licence cancellation, licence cancellation, conditional imprisonment, and imprisonment(p. 62)

Shoham found that "52.7% of the drivers who received a warning for their first offence did not commit an additional offence, while only 25% of the drivers who were sentenced to imprisonment committed no additional offences" (p. 65). From these findings Shoham concluded that the more severe the punishment for the first offence, the greater the number of subsequent offences. Shoham noted that the more severe the punishment, the longer the time lapse between offences. He found that the rate of recidivism for drivers receiving heavy punishment was higher than that for those receiving light punishment. Shoham noted that the mental element of intention (mens rea) which is important in criminal law, does not have any important role in traffic offences. The obvious intention of the driver is not breaking the traffic laws, rather it is to get from place to place. In traffic offences mostly, an element of negligence is discovered rather than of intention. According to

Stoham the positive correlation between more severe punishments for the first offence and the commission of a greater number of offences, leads to the assumption that personal elements are the main causes of committing an offence. Those personal elements may be defined as the capabilities of the driver. The severe punishment imposed on a driver lacking driving abilities may cause him excessive anxiety which may lead to the commission of an offence.

Ross (1976) studied several traffic laws and found that the more severe the penalty, the more unlikely that it would be imposed. Ross argues that there is always likelihood for police to stabilize or reduce the number of arrests for the violation subjected to increased penalties, judges and juries to fail to convict the accused and to find means to avoid the sanctions prescribed. Three of the traffic laws studied by Ross were: (a) the Connecticut Speed Crackdown of 1955, (b) Jail for Drunk Drivers in Chicago (at Christmas of 1970), and finally (c) the Finnish Drinking-Driving Legislation of 1950. According to Ross (1976), the 1950 Finnish statute greatly increased the maximum severity of prior sentences for impaired driving. The previous maximum penalty was two years imprisonment and the 1950 legislation raised it to four years with the possibilities of six years if it caused serious bodily injury and seven years (in case of death. Ross (1975) found no evidence for effectiveness of severe penalties in lowering crash or fatality rates. He noted the interesting fact that the increase in the maximum penalty was accompanied by a decrease in the number of long

sentences meted out by Finnish courts in cases of drinking and driving. He found that after 1950, prosecutions for drinking and driving declined. Ross concludes that penalties with unreasonable severity may conflict with norms of fairness and consequently the legal actors (police, judges etc.) refuse to enforce the legislation properly.

Tomasic (1977) evaluated the effects of legal sanctions on drunk drivers' behaviour and concluded that heavy penalties do not deter a large percentage of the drinking-driving population. He argues that, in general for a large group within the driving population, undeterred by traditional punitive sanctions, other non-punitive therapeutic are required.

Ross (1983) notes that for several decades Scandinavian-type laws for controlling drinking and driving have been a model for the United Kingdom (and consequently for Canada), some of the European countries, Australia, New Zealand and the United States. The new approach to drinking-driving law was introduced in Norway and Sweden just before World War II. The formulation of new law was aided by Scandinavian experts who developed the technology for measuring blood-alcohol concentration. The Norwegian legislation of 1936 defined the driving with a blood alcohol concentration higher than 50 milligrams per 100 milliliters of blood (0.05 percent in Canadian notation) a criminal act. Sweden introduced the blood-alcohol concentration law for drinking and driving a few years after Norway, in 1941. The Swedish law raised two levels of violation which each

carried a different degree of punishment; one for blood-alcohol concentrations between 80 and 149 milligrams/100 milliliters, and a second at 150 milligrams and over (Ross, 1983). The Norwegian and the Swedish laws of 1936 and 1941 remained basically the same up to the present time with some very slight changes in recent years. As Ross (1983) reports, in Sweden, the penalty, in the absence of very rare extenuating circumstances, is one month's imprisonment for the more-serious offence and heavy fines for the less-serious one. Licence revocation applies to both offences. Imprisonment and licence suspension routinely apply to the single-level Norwegian offence in a similar manner (Ross, 1983). According to Ross (1983) although the 1936 Norwegian and 1941 Swedish laws have served to define the Scandinavian approach to drinking and driving, and several alcohol and traffic experts and government officials have strongly claimed for the effectiveness of these laws, they have achieved little marginal deterrence. Ross (1983) has evaluated the arguments in support of the deterrent effectiveness of the Scandinavian laws on drinking and driving. Regarding the most common argument, testimony from residents and visitors of Scandinavia, Ross refers to Andenaes (1978), one of the most reasonable proponents of the effectiveness of Scandinavian's drinking and driving laws, who has repudiated this sort of argument on the basis of systematic studies. The second argument mentions the relative stability of the rate of violations in spite of increasing traffic over time as an evidence of deterrent impact of laws. To Ross this argument is not

satisfactory because this stability may be a reflection of a constant amount of resources which have been devoted to the control system of police and courts. The third argument suggests that alcohol is found less frequently in traffic accidents in Scandinavia than other countries. Ross has quoted the statements of the director of MHF (the Swedish Temperance Motorists' Association) as support for this argument. This Swedish association reports that due to relatively severe and consistent legislation in Sweden, alcohol-related traffic accidents are around 20% lower than other countries with more liberal legislation and consequently 500 lives are saved on Swedish roads every year. In evaluating the MHF's report, Ross refers to several studies which show illegal blood alcohol concentrations in 25 to 32% of Swedish drivers who were killed in crashes. Ross also refers to other studies which show illegal BACs in 27 to 45% of Norwegian drivers who were killed in fatal traffic accidents. These figures are lower than those in the U.S. which are usually around 50% (as has been shown in chapter three) but they are not lower than those found in other countries (as for instance in the U.K. which will be pointed out in later section). The fourth argument regarding the deterrent effect of the Scandinavian impaired driving laws, as Ross (1983) points out, concerns the public knowledge of and support for these laws found in survey data. Ross argues that:

knowledge of a law is a prerequisite to its deterrent effectiveness...it is a necessary but not sufficient condition for deterrence(p. 67).

Ross (1983) disputes the correlational analysis conducted by

Votey (1978), regarding the deterrent effectiveness of Scandinavian impaired driving laws. Votey attempts to demonstrate that his analysis is supported by the data available and Ross refers to the American National Academy of Sciences' view which strongly criticizes the correlational studies concerning the deterrent effectiveness of legal sanctions. According to Ross (1983), Votey's studies fail to show that the Scandinavian impaired driving laws provide greater deterrence than classical drinking-driving laws that are comparably enforced. However Ross finally concludes that available evidence does not support the arguments suggest that the Scandinavian countries have achieved important increments in deterrence after the adoption of the laws of 1936 and 1941.

According to Fattah (1977) because impaired driving is a serious problem in Finland, the concerned legal sanctions are very harsh. A three to four month unconditional imprisonment is common even when the accident did not result in any harm or damage. In its studies, the Institute of Criminology in Helsinki found that as the result of increased penalties concerned, the rate of impaired driving offence has decreased temporarily each time. But they found no evidence for individual deterrent effect of sanctions used. The Institute noted that the policy against drunken driving should be reappraised in the light of available data, and concluded that the policy of long prison sentences was too expensive and did not show a considerable deterrent effect on impaired driving (Fattah, 1977).

The author believes that a comparative study of legal sanctions in different countries will help to establish that the Scandinavian model of drinking and driving laws can be effective only in a short run. Attempts to reduce the alcohol-related traffic accident rates in a long term, will need to employ more public educational programs.

#### *United Kingdom*

The British parliament adopted Scandinavian type legislation concerning the drinking and driving in the Road Safety Act of 1967. Prior to 1967 there were two Road Traffic Acts of 1960 and 1962. The Road Safety Act of 1967 created the offence of drinking while driving a motor vehicle and prescribed the limit of blood alcohol concentration on the basis of other countries' experience and the advice of the British Medical Association, 80 milligrams/100 milliliters (0.08 percent in Canadian notation). Punishment for the offence of drinking while driving in this act was a fine and imprisonment of up to two years or both, and disqualification from driving for at least a year (Ministry of Transport, England, 1969). Under the Road Safety Act of 1967, during one year period (October 1, 1967 to September 30 1968), a total of 18,785 persons were charged for offences concerned, in the United Kingdom, of which 16,252 were found guilty. This was an eleven percent increase for similar offences during the previous year (Traffic Injury Research Foundation of Canada, 1971).



Two weeks before the Road Safety Act of October 9, 1967 came into effect, the largest campaign on the subject of impaired driving was launched by the British government. The cost for the overall campaign was approximately 840,000 U.S. dollars. The program included public education and a vigorous public relations campaign to gain support from the press, television, radio and the public (Goodwin, 1968). Edelman and Walker (1977) explain that by far the most significant countermeasure from the standpoint of effectiveness was the Road Safety Act of 1967. On the basis of Andenaes's research (in 1968), Fattah (1977) comments that according to the official figures published by the British Ministry of Transport, a decrease in traffic crashes took place in Great Britain after the Road Safety Act of 1967 came into effect. There was an overall two percent decrease in crashes compared with 1966. The findings showed that the decrease was greater for serious accidents. Fattah refers to Andenaes's conclusion that Road Safety Act of 1967 has influenced the people's conduct at least temporarily.

Blennerhasset (1976), chairman of the Departmental Committee on drinking and driving in Britain, described the success of the Road Safety Act:

The early impact of the Road Safety Act showed what could be achieved. Over a thousand lives were saved in the first year, and a further 4,000 in later years. In no other country have laws against drinking and driving led to such large demonstrable savings(p. 1).

The committee reported that before the Road Safety Act, 25% of killed drivers in road accidents had over 80 mg/100 ml of alcohol in their blood. This was reduced to 15% in 1968, but was

increased to 26% in 1971 and to 35 in 1974. The Committee explained that the growing abuse of alcohol was a possibly major factor in the declining effectiveness of the Road Safety Act. However, the committee believes that the Road Safety Act has saved 5,000 lives and prevented approximately 200,000 other casualties. Ross (1976a) points out that although the Ministry of Transport was proud of its accomplishment, it later concluded that the act had lost its effectiveness and required revision. As it was pointed out before, by 1974, the proportion of drivers killed in traffic accidents who had illegal blood alcohol levels, was 35% compared with 15% at the inception of the legislation. The Ministry of Transport, therefore decided to appoint the above mentioned committee under the chairmanship of Frank Blennerhasset, to review the problems in the operation and effectiveness of the Road Safety Act. The committee worked for more than a year. It received evidence from 35 organizations and interest groups and 44 private individuals. The result of the investigation was published in 1976 as a report to the Ministry of Transport. The first section of the report states that:

Alcohol accounts for at least one in ten of all deaths and injuries on the roads and its share is growing. The success of the Road Safety Act 1967 sharply, but only temporarily, arrested this deplorable trend. The proportion of drivers killed in accidents who have a blood alcohol concentration (BAC) above the legal limit is higher than it has ever been, and the social cost of road accidents involving alcohol now exceeds 100 million pounds a year. Although numbers of breath tests and convictions have risen, the police and the courts work under handicaps and can not stem the tide(p. 1).

The committee offered central proposals to restore the lost impact of the Road Safety Act on impaired driving. The main

recommendations they made were (briefly):

1-that, as at present, there should be an offence defined in terms of a blood alcohol limit of 80 mg/100ml.

2-that a breath sample should normally be used to determine a driver's BAC, as well as for roadside screening tests, but with a fall-back option of providing blood if the breath analysis is over the limit.

3-that a constable at his discretion should have power to require a breath test of a person who is or has been driving or attempting to drive in charge of a motor vehicle.

4-that proof of an offence should not be measurably dependent on compliance with procedural requirements.

5-that an order of disqualification for a year (or longer at the court's discretion) should continue to be the main penalty, in conjunction with fines, but that in high-risk cases (i.e. those with very high BACs and repeat offenders) licences should not be restored until the court is satisfied that the offender does not present undue risks as a driver.

6-that there should be a continuing program of publicity, having particular regard to the education of young drivers, to develop informed and responsible attitudes to drinking and enlist public support for the law. Social and road safety education should prepare pupils for what has become a major hazard of young adult life.

Ross (1976a) argues that the first recommendation, which suggests that the offence of driving with a blood alcohol level exceeding 0.08 should be retained, seems to be very sound. According to Ross, a lower level of blood alcohol concentration "would threaten numbers of ordinary drinkers and jeopardize the legislation's hard-won popularity" (p.259). Ross also agrees with the second proposal which replaces the blood or urine test by a breath sample test to determine a driver's BAC, as well as for roadside screening tests. Regarding the third proposal Ross suggests that when a constable has power to offer discretionary a breath test, it will no longer be necessary to determine whether a driver is still driving or he has stopped to do another job. On the basis of third proposal, when the police officers are suspicious that a driver is under the influence of alcohol before requesting a breath test, they will no longer have to prove the reasonableness of their suspicion in the court. Commenting on the fourth proposal Ross states that:

Even though as an American I am used to the principle that illegally obtained evidence must be excluded from consideration by the court, I find the general run of successful protests under the legislation so trivial and insubstantial that it is easy to support the committee's recommendation here (p. 260).

Ross argues that the fourth recommendation attempts to restore to criminal procedure (regarding the impaired driving offences) "an independence from at least technical defects in adherence to a complex procedure" (p.260). The fifth proposal suggests that the licence disqualification for a year or longer at the court's discretion should continue to be the main penalty (relative to the fines). This proposal also recommends that in the cases with

very high BACs and repeat offenders (in high-risk cases) restoration of the driver's licence should not be automatic and should be dependent on the court's approval. Ross implicitly agrees with this proposal but refers to two important points. He reminds the committee of Bentham's principle that too much punishment harms both the law and the criminal. Ross argues that if drivers who lose their licences as a punishment really refrain from driving, then long-term disqualification seems a sensible idea. Ross believes that the fifth proposal mostly makes sense on the basis of more disqualification rather than treatment. The sixth proposal suggests that there should be a continuing program of publicity, particularly regarding the education of young drivers, to develop informed and responsible attitudes to drinking and enlist public support for the law. Ross believes that the committee has misconstrued the reasons for the impact of the Road Safety Act publicity campaign. He argues that the Act worked initially because it created the impression that police force armed with a new technique would be able to enforce the legal sanctions effectively. When the drivers learned to disbelieve the threat, the Act lost its effectiveness. Drinking drivers learned that they would be able to avoid the police attention and have little fear of punishment. Ross believes that the committee has done a reasonably good job, on the basis of eight years' experience, of analyzing the problems of the Act, but he doubts "that the implementation of the set of proposals (which the committee treats as a 'related package') will suffice to retrieve the

deterrent effect of the legislation on a permanent basis" (p. 261).

However, as Ross (1983) argues, the British Road Safety Act of 1967 had a short-term deterrent effect on alcohol-related crashes in the United Kingdom.

#### *France*

One of the most recent adoptions of the Scandinavian provisions of impaired driving law is the French law of July 12, 1978. The form and amount of alcohol consumption in French culture makes France an interesting area for investigating the capabilities of an impaired driving law. According to Ross, McCleary, and Epperlein (1982), who evaluated the 1978 French law, this law has less innovation than the British Road Safety Act of 1967, since the breath test was adopted before in French law of 1965 and was made compulsory in specific cases in 1970. The 1970 French law prescribed a 0.08 percent limit of blood-alcohol concentration in case of impaired driving. The punishment of driving with a higher BAC could include mandatory suspension of the driver's licence (under specific circumstances). The passing of the 1978 law brought four main innovations on impaired driving (Ross, 1983):

- 1-Police can conduct, by the order of the region's chief judicial officer a screening test for blood alcohol in the field of roadblock operations.

2-Driving will be ceased and penalties will be imposed in cases of driving with BAC greater than 0.08 percent.

3-Revocation not merely suspension of the driver's licence found guilty of driving with BAC more than 0.08 percent. This revocation was mandatory under specific circumstances.

4-Compulsory replacement of currently used testing devices "with technologically superior ones when such devices would be approved by the authorities."

After the inception of the new law, the road accident figures showed a decrease and officials interpreted the decrease as evidence of the effectiveness of the new law (Ross, 1983). According to Ross, McCleary, and Epperlein (1982), who obtained a variety of time series data regarding the new French law, the 1978 legislation's deterrence was achieved at least for a few months and likely prevented 11,000 injuries and saved almost 700 lives during this period. The comparison between the fatalities and the injuries showed that the impact of the law was greater in the former. According to Ross and his colleagues, the French National Organization for Road Safety (ONSER) conducted two sample studies of blood alcohol concentrations among non-crash-involved drivers, one in 1977, prior to the law and the other as a comparable study during the months of April to June, 1979, the year after the inception of the law. The first study had a large sample of approximately 3,000 and the second had 1,600. The percentage of drivers with illegal blood-alcohol concentrations dropped from 3.4 percent in the first period to

1.8 percent in the second. Ross and his associates believe that the ONSER's finding is impressive in magnitude and lends some support to their conclusion that the 1978 law had a temporary deterrent effect. The source of effect of the law of 1978 "was in its advertised and notorious threat of apprehension and, possibly, mandatory loss of licence for the drinking driver" (Ross, et al., 1982, p. 366). Ross and his colleagues argue that the deterrent effect of 1978 law was lost because the threat was not fulfilled and the drivers gradually realized this fact. They referred to the report of the activities of the French courts which shows that of 25,721 prison sentence cases pronounced in 1979, only 3,227 cases were sent to prison, and the balance were suspended or mitigated. Ross and his associates conclude that the deterrence model is based on perceptual variables. People will change their conduct when facing a legal threat with certainty, severity and clarity. The effect of 1978 French law was diminished because the subject population had realized that the extreme penalties would not be enforced (Ross, et al. 1982).

#### *Australia*

Birrell (1975) and Ross (1983) note that the Victorian law of 1966 which prohibits driving with a BAC more than 0.05 percent received publicity without any public education. Regarding the effectiveness of that law Birrell (1975) suggests that "there was a quite remarkable shift in the times of occurrence of serious traffic accidents but virtually no change in the total number of crashes and deaths" (p. 777). Ross (1983) suggests that "The conclusion on the Victorian law of 1966, then must be



that no effects were demonstrated but that the deterrence model was so poorly complied with as to render unrealistic any expectations of change " (p. 58).

Jonah and Wilson (1983) evaluated several studies and found that the random breath testing, which has been permitted in Victoria Australia since 1976, was at least temporarily effective in abating the drinking while impaired in Melbourne.

#### *Netherlands*

As Ross (1983) reports, the Netherlands' law of 1974 is very close to the 1936 Norwegian law. The legal level of blood-alcohol concentration in the Dutch law is 50 milligrams/100 milliliters (0.05 percent) the same as in Norway. The penalties are fines of up to something more than \$2,000 U.S., licence suspensions of up to five years, and prison terms of up to three months. According to Noordzij (1977), Ross (1983), and SWOV (1977), the Dutch law of 1974, prescribes that the police must always have reason to suspect a driver of having consumed alcohol before they can administer the screening breath test. The drivers who fail the first test but pass the second at the police station are not prosecuted. A driver who fails both screening tests is required to give a blood sample for analysis. A positive result leads to prosecution. Noordzij (1977) reports that the Dutch law of 1974 has been introduced with extensive publicity. After the inception of that law, during the first year prosecutions for impaired driving were doubled, total traffic accidents were reduced by five percent and fatal crashes

by 35%. Noordzij (1980) claims that the 1975 data show some continued but weakening deterrent effectiveness. Von Ooijen (1977) in his time-series analysis, supports the conclusion of deterrent effectiveness of 1974 legislation. Although Ross (1983) accepts the deterrent effectiveness of the new law of 1974 for a short period, he argues that on the basis of data available and the fuel crisis of that same year "the evanescent nature of deterrent effects due to Scandinavian-type law concerning drinking and driving is again demonstrated" (pp. 47-48).

#### *New Zealand*

In the case of impaired driving, New Zealand has adopted the British Road Safety Act of 1967. Following the U.K. example, the 1969 compulsory-blood test law of New Zealand permits the police officer a screening breath test of a driver if the officer has a "good cause to suspect an alcohol offence." In a 1974 amendment, it became necessary only to suspect the driver of having consumed alcohol. If the driver fails the initial test, a second test is compulsory after twenty minutes. Failure of the second breath test results in the requirement of a blood test. On the basis of 1969 legislation the penalties for the refusal of both the breath tests and the blood test are the same. These penalties include a minimum licence suspension of six months. Typical sentences regarding the impaired driving are fines of \$50 to \$400 U.S. and licence suspensions averaging twelve months (Hurst, 1978; Ross, 1983). A year after the inception of 1969 compulsory-blood-test law, statistics showed approximately 5,000

impaired driving prosecutions in New Zealand. In 1975 the figure was doubled. Over 96% of the prosecutions led to convictions. After 1975, the figures stayed relatively constant. New Zealand's law of 1969 had an immediate but moderate deterrent effect on impaired driving for a relative short period of time (Ross, 1983).

#### *The United States of America*

In the United States, the impaired driving is primarily controlled by the individual states. The U.S. National Committee on Uniform Traffic Laws and Ordinances has issued a guide for State motor vehicle laws. The guide which is entitled, the Uniform Vehicle Code, suggests: "It is unlawful and punishable...for any person who is under the influence of intoxicating liquor to drive or be in actual physical control of any vehicle within this State." The Uniform Vehicle Code introduces the minimum level of blood alcohol concentration at 0.10 percent (this limit in Utah and Idaho is 0.08 percent). Many states do not follow the Uniform Vehicle Code. Prime requisites for implementing the Code are implied consent laws (the suspect must consent to a chemical test or lose his licence) and chemical test laws (Traffic Injury Research Foundation of Canada, 1971). "In fact as of May 1970, 46 States have enacted 'implied consent' legislation and 47 States have enacted chemical test laws establishing varying presumption limits of intoxication" (Alcohol and Traffic Safety 1971). The Uniform Vehicle Code prescribes mandatory prison on a first conviction of drinking and driving. In some cases diversion to

treatment is permitted. Some studies concerning the drinking and driving laws in various states indicate that Scandinavian model appears in the United States impaired driving formal laws (U.S. Department of Transportation, 1979; Ross, 1983). In the seventies, Alcohol Safety Action Projects (ASAPs) were launched in the United States by the Department of Transportation to reduce the alcohol-related traffic accidents. While other intended goals of these Projects including treatment and education of apprehended violators were achieved in long run, increased law enforcement on drinking and driving in some states had no deterrent effects at all, and in some other states had only effects in the short run (Clay and Swenson, 1978; Ross, 1983; Jonah and Wilson 1983). Clay and Swenson (1978) found that the Phoenix ASAP had no apparent impact on alcohol-involved traffic accidents. Ross (1976) who evaluated the Connecticut Speed Crackdown of 1955, concluded that the judges and police officers were reacting to the increase in penalty that year, and mostly believed that Speed Crackdown was not based on the norms of fairness. In their study in Denver County, Ross and Blumenthal (1974) tried to find out "among the types of sanctions for driving while intoxicated that are available to the typical American traffic court, are there any that can be shown to be relatively effective in reducing subsequent accident and traffic law violations" (p. 53); and concluded that the fines and conventional probation are not "superior means of rehabilitation of the first-time drunk-driving offender" (p.52). Robertson, Rich, and Ross (1973) used the time series analysis

to study the effect of seven-day jail sentences (as a countermeasure) on drunk drivers in Chicago during the winter and spring of 1971. The study was based on data collected from police, coroner, and court records. To measure the possible effect of simultaneous events, Robertson and his associates collected data from Milwaukee, as a neighboring city as well, where there was no special program during the period of study. They noted that the reduction in motor vehicle fatalities during the Chicago crackdown was only a "chance variation from the fatality rate over the preceding five years" (p.64). However, further study showed that the reduction occurred for pedestrian fatalities only and it appeared to be "a downward drift in the fatality rates in both cities beginning in 1969, some two years before the crackdown" (p.61).

#### *Canada*

The Canadian Criminal Code sections on impaired driving ("Breathalyzer" Legislation of December 1969) followed closely the British Safety Act of 1967 (Chambers, Roberts, and Voelker 1976; Ross, 1983). In subsequent years the Canadian legislation adopted several new provisions which now distinguish it from its British forerunner. Prior to 1969, drivers involved in alcohol-related collisions usually were not chemically tested for their blood alcohol concentration levels and the assessment of alcohol consumption was based on the judgement of the police officer. But according to "Breathalyzer" legislation of 1969 and also other subsequent provisions, police officers have the power to stop the suspect drunk drivers, based on "reasonable and

probable grounds", and require breath tests. Like its British model, Canadian "Breathalyzer" legislation prescribed penalties for drunk driving.

The most related and basic sections of Canadian Criminal Code regarding the impaired driving are Section 234, which prohibits driving while impaired; Section 235 which explains the legal consequence of failure or refusal to provide breath test; and Section 236 regarding the BAC of 0.08 percent. Section 234 of the Canadian Criminal Code which deals with impaired driving reads:

Every one who, while his ability to drive a motor vehicle is impaired by alcohol or drug, drives a motor vehicle or has the care or control of a motor vehicle, whether it is in motion or not, is guilty of an indictable offence or an offence punishable on summary conviction and is liable...(p.125).

Impaired driving has been introduced into Canadian law since the 1920s. According to the Canadian Criminal Code, driving a motor vehicle after having consumed alcohol in such a quantity that its proportion in blood exceeds 80 milligrams in 100 milliliters of blood is an offence. Section 236 of the Criminal Code reads:

(1) Every one who drives a motor vehicle or has the care or control of a motor vehicle, while it is in motion or not, having consumed alcohol in such a quantity that the proportion thereof in his blood exceeds 80 milligrams of alcohol in 100 milliliters of blood, is guilty of an indictable offence or an offence punishable on summary conviction and is liable...(p.127).

The legal limit BAC as section 236 of the Criminal Code suggests is 0.08 percent, same as in the U.K. the Canadian

Criminal Code allows the police to conduct two types of breath tests. The police can ask the accused to blow into a roadside tester and they can ask the accused to blow into a breathalyzer. Police can conduct both tests on the accused when he or she is picked up. Those who fail the roadside test are taken to the police station for a breathalyzer test (Sections 234 and 235). Subsequent amendments to the Criminal Code of Canada on sentences for impaired driving introduced two new concepts: mandatory jail terms for second, or subsequent offences and sentencing to rehabilitative institutions or programs for persons who have a drinking problem. The sentencing provisions of the Canadian Criminal Code, according to the Section 234 are:

- (a) for a first offence, to a fine of not more than two thousand dollars and not less than fifty dollars or to imprisonment for six months or to both;
- (b) for a second offence, to imprisonment for not more than one year and not less than fourteen days; and
- (c) for each subsequent offence, to imprisonment for not more than two years and not less than three months (pp. 125-126).

According to the Section 234, on second and subsequent offences there is no alternative and jail terms are mandatory. Sentencing to a rehabilitative institution or program applies only to those convicted of exceeding 0.08 percent blood alcohol concentration or impaired driving and does not apply to a charge of refusing a breath test or refusing a roadside test.

One of the consequences of an impaired driving conviction is loss of the driver's licence. In all the provinces and territories, a period of licence suspension applies for an impaired driving offence. While licencing is a provincial

responsibility, under the British North America Act, criminal law is a federal responsibility. However, when a person is convicted under federal law, his or her licence is suspended under provincial law. Periods of licence suspension vary from province to province.

As previously discussed, several studies have been conducted in Canada and abroad concerning the impact of the Breathalyzer legislation on the rate of alcohol-related traffic accidents. Cameron (1979) evaluated the studies related to the effectiveness of the Canadian Breathalyzer legislation and concluded that the legislation was not able to produce a long-term reduction in alcohol-related traffic accidents. He argues that within a few years the proportion of alcohol-related collisions climbed above prelegislation figures (see also, Wilde, O'Neil, and Cannon, 1975). Carr, Goldberg, and Farbar (1974) studied the reported crashes of 1971 in Canada and found that the Canadian Breathalyzer legislation had a "transitory effect in 1970 that may have dissipated in 1971" (p. 24). Chambers, Roberts, and Voelker (1976) analysed the data available for alcohol-related crashes before December 1969 (pre-1969 Breathalyzer Amendment) and the post-Breathalyzer years, 1970, 1971 and 1972 in Canada and found that the effect of Canada's 1969 Breathalyzer Amendment has been small and of short duration. Ross (1983) evaluated several studies related to the effectiveness of breathalyzer legislation of 1969 and concluded that:



Although some deterrent effect for the Canadian legislation is usually conceded, the consensus is that it was less marked and less prolonged than the effect of the British Road Safety Act of 1967, after which the Canadian law was patterned (p. 51).

### *Conclusion*

For decades, in the context of drinking and driving, legal sanctions have been presumed to be an appropriate deterrent. Although the short-run deterrent role of legal sanction in controlling alcohol-related traffic accidents cannot be rejected, it is questionable whether these efforts can be maintained for extended periods. Studies in different jurisdictions indicate that increasing penalties for alcohol-involved drivers have only a transitory or evanescent nature in deterrence. Studies also show that when legislation is too harsh and is not based on the norms of fairness, even the criminal justice officials (judges, juries and police officers) are reluctant to enforce it. Since legal sanctions are usually ineffective, in reducing the crash rate, at least in the long-run, educational and rehabilitative devices should be much more utilized by social policymakers. This will be discussed at greater length in the final chapter.

### The Deterrent Effects of Police Spot Checks on Drunken Driver's Behaviour

The detection of the drunken drivers is almost a chance event and usually only the worst cases (unusual driving behaviour or involvement in accidents) are brought to the attention of the

police (Hyman, 1968; Vingilis, 1980; Ross, 1983). Ennis (1977) and Vingilis (1980) refer to two types of law enforcement activity aimed at increasing detection of the drunken drivers. One type covers special trained patrols who supplement routine enforcement of drinking driving laws and the other consists of "the establishment of roadblocks where cars are stopped randomly to check for any violation including drinking driving" (Ennis, 1977, p.20). Maxted (1974) explained that the manifest objective of spot check is to detect drivers who have been drinking, but its real purpose is to deter drivers who have been drinking, from driving.

The examples of spot check activity are not numerous and in this area I will refer to a few roadblock activities conducted in Canada and abroad and evaluate their deterrent effects.

#### *The United Kingdom Blitzes*

In July 1975, William Kelsall, the chief constable of Midlands County of Cheshire, decided to randomly breathalyze people driving between 9 p.m. to 4 p.m. This blitz lasted for one week program. During the week, breath testing increased tenfold (Ross, 1983; Jonah and Wilson, 1983). The blitz was expanded in September 1975. According to Jonah and Wilson (1983), two blitzes performed within a short period of time was effective in reducing drinking and driving for a brief period (about five months). Ross (1977; 1983) evaluated the effect of the Cheshire blitz (which was based on the Road Safety Act of 1967) and noted that during the period of the Cheshire blitz, the level of

breath testing in Midlands County rose to six times the national average. Ross found that the drop in alcohol-related crashes in Midlands was only supportive of deterrence for a short run and its effectiveness over the long term is questionable.

#### *The New Zealand Blitzes*

Paul Hurst, then the New Zealand minister of transport, informed of the Cheshire blitz, decided to launch similar campaigns in New Zealand; two nationwide blitzes were mounted in 1977 and 1978. The New Zealand campaigns were designed to enforce the 1969 drinking and driving law modified by 1971 and 1974 amendments (Hurst and Wright, 1981; Jonah and Wilson, 1983; Ross, 1983). According to Ross (1983) in both campaigns police activity was increased and the number of breath tests was quadrupled in the first blitz and doubled in the second. A drop appeared in alcohol-related road injuries and the result again was supportive of short-run deterrence. Ross (1983) suggests:

One might note the limited nature of these blitzes; as in Cheshire, they had definite terminations, and all indexes show that either immediately or after a short lag things looked very much as before. No permanent changes seems to have been achieved (pp. 80-83).

#### *Random Roadside Breath Testing in Australia*

Random breath testing of drivers was performed in Melbourne in the Australian state of Victoria, during a few predetermined roadblocks in 1977 and 1978 (Cameron, 1979; Ross, 1983; Jonah and Wilson, 1983). Ross (1983) found that Australian campaigns' evaluation yields conclusions that resemble the Cheshire and New Zealand blitzes (see also Jonah and Wilson, 1983). Tomasic

(1977) evaluated the effects of the 1977 Australian blitz and suggested:

The possible deterrent effect of random testing in Australia is not known...There is no definite evidence as to how drivers would respond to random testing in Australia, and no certainty that the deterrent effect of existing legislation would be enhanced...by random testing (pp.28-29).

#### *The U.S. ASAPs*

Alcohol Safety Action Projects (ASAPs), which were launched in the United States in the seventies in 35 locations, consisted of several programs including spot checks for alcohol impaired driving. Numerous studies have been conducted to examine the effectiveness of ASAPs (Zador, 1977; Nichols, Weinstein, and Ellingstad 1978; Mann, Leigh, Vingilis, and DeGenova 1983; Ross, 1983; and Jonah and Wilson 1983). All these studies show that the U.S. blitzes have been effective only temporarily. Ross (1983) evaluated the U.S. ASAPs and concluded that:

...It supplied evidence supporting the proposition that some programs involving enforcement of prevailing U.S. laws could, in the short run, produce declines in drinking and driving and in associated casualties. The analysis is too approximate, and the negative cases too prominent to conclude much beyond this (p.89).

#### *Canadian Spot Check, R.I.D.E. Program*

Commencing on October 1, 1977 and ending on September 17, 1979, a roadside spot-check program, R.I.D.E. (Reduce Impaired Driving in Etobicoke) was conducted as a drinking-driving countermeasure in Etobicoke, Ontario (Vingilis, Adalf, and Chung 1982). A pamphlet was publicized to explain the R.I.D.E. program and was mailed to every household in the district, but the main sources

of knowledge for the residents were media and personal experience at a roadblock (Ross, 1983). Between 7 p.m. and 3 a.m. two cars, three officers in each car, conducted spot-checks, at over 100 randomly chosen locations (Vingilis, et al., 1982). Special police cars with portable R.I.D.E. signs would inform drivers of the spot check program. The officers stopped motorists (under the authority of the Ontario Highway Traffic Act), identified themselves as part of the R.I.D.E. program, and watched for signs of drinking while driving. The program's main purpose was to stop drunk drivers from driving and deter a large sector of the potential drinking drivers (Vingilis and Salutin, 1980; Vingilis, et al., 1982; Ross, 1983). Over the period of the R.I.D.E. operation, more than 180 drivers were stopped and a total of 1957 A.L.E.R.T.s (Alcohol Level Evaluation Roadside Tester) were performed by R.I.D.E. police officers on suspected drinking drivers (Vingilis, et al., 1982). Vingilis, Salutin, and Chan (1979) studied R.I.D.E. program and found that the one year (October 1, 1977 to September 30, 1978) data for this program present a confusing picture which makes the evaluation of its efficacy exceedingly difficult. According to Vingilis and his associates there is no definitively conclusive evidence in support of the success or failure of this program. In another evaluation of two year R.I.D.E. program (October 1977 to September 1979) Vingilis, et al. (1982) found that the majority of legally impaired drivers were not detected through this spot check program (around 95% were missed) and the data concerned did not clearly demonstrate

a deterrent effect. Ross (1983) evaluated the R.I.D.E. program and argued that:

Estimates of actual drinking and driving in the district were based largely on inappropriate data (police estimates and charges filed). Although these showed no clear evidence of deterrence, the results are probably irrelevant. The one potentially valid measure, blood alcohol concentrations among drivers involved in crashes, did not vary as expected (p.86).

### *Conclusion*

On the basis of studies conducted (the results of systematically published evaluations) in different jurisdictions, spot check programs may be effective at most in the short run. To reduce the alcohol-related traffic accidents in a long term, other methods will need to be employed. These will be discussed in the concluding chapter.

### The Legal Minimum Drinking Age and Motor Vehicle Crashes

Minimum drinking age laws and studies are fairly new and attracted little attention prior to 1970 (Wagenaar, 1983b). Until the early decades of nineteenth century, beverage alcohol was readily available to the North Americans; drinking was frequent and per-capita consumption rates were high (Mosher, 1980; Aaron and Musto, 1981; Wagenaar, 1983b). Most young people drank and it was not considered a problem. In the late nineteenth and early twentieth centuries, concern about the availability of beverage alcohol to youth emerged and legal restrictions were initiated to control the minimum drinking age. In the United States all fifty states have recently passed

legislation which changed the minimum drinking age; most set the age at twenty-one (Wagenaar, 1983b). Until 1970 only a few states and provinces in North America legally permitted young people under 21 to purchase all types of alcoholic drinks (Wagenaar, 1983b). But in the 1970s, many jurisdictions lowered the drinking age. According to Whitehead (1977):

There was at the turn of the decade, a mood that was highly favorable to enforcement of eighteen-year-olds, possibly due to some degree of guilt over involvement in Vietnam and concern about perceived disaffiliation and rebelliousness among young people. Allowing eighteen-year-olds to vote was a possible way of attracting them to the mainstream political process. Allowing young people to enter into legal contracts and lowering the legal drinking age were seen as less important issues, but as something that ought to be done in order to be consistent (p.9).

Whitehead (1977) also refers to the influence of the recommendations of people who had positions of prestige and power, like Plaut (1967) and Wilkinson (1970) who suggested a reduction of the legal drinking age to eighteen. Chafetz (1965), later the first director of the American National Institute on Alcoholism and Alcohol Abuse (in early 1970s), announced "Let's get rid of the age limit for drinking."

The controversy over the minimum drinking age, in the United States, began in 1970, after the Twenty-sixth Amendment to the U.S. Constitution was passed by Congress. The Amendment lowered the minimum age for federal elections from 21 to 18. The Amendment was ratified by the states and within three years fifty states lowered the age for state elections to 18. Adherents to the reduction of drinking age would argue that if young people could vote in federal elections they could also

purchase and consume alcoholic beverages. Following this trend, twenty-nine states lowered their minimum drinking ages between 1970 and 1975 (Wagenaar, 1983b). Twenty-three states reduced the drinking age for all alcoholic beverages and a few states only for some sorts of them (Wagenaar, 1983b). All the Canadian provinces, Yukon and Northwest Territories also lowered the drinking age in the early 1970s (Whitehead, 1977).

Quite a large number of studies have been conducted regarding the impact of minimum legal drinking age and traffic accidents (including Williams and Zador, 1984; Hingson, Scotch, Mangione, Meyers, et al., 1983; Flora, Filkins, and Compton, 1978; Warren, Simpson, Page-Valin, and Collard, 1977; Smart and Goodstad, 1977; Shattuck and Whitehead, 1976; Bako, Mackenzie, and Smith 1976; Williams, Rich, and Zador 1975; Whitehead, Craig, Langford, MacArthur, Stanton and Ferrence 1975; Ferrence and Whitehead, 1974; Douglass, Filkins, and Clark 1974; Cucchiaro, Ferreira, and Sichertman 1974).

Douglass (1980) attempts to show that minimum age reduction in some states has increased teenage fatal crashes and consequently has caused the post-1975 efforts to withdraw the age reduction. Whitehead (1980) has evaluated the studies regarding the effect of minimum legal drinking age reductions on teenage fatal crashes during the 1970s in some states of U.S. and Canadian provinces, and found that the results have been mixed. Some states showed a great increase in teenage fatality rate and some not at all. Hammond (1973) argues that the result



of the drinking age reduction resulted in more than 100% increase in Massachusetts and 54% in Michigan in the number of 18-20 year old drinking drivers in fatal crashes, compared to the equal period of the prior year. Williams, et. al. (1975) suggest it is possible that the reduction in minimum legal drinking age has resulted in a change in police investigation and reporting of drinking among the drivers under 21 who have been involved in fatal crashes. Williams and his colleagues argue that the single cause analysis may mislead the investigators. There are other events and factors occurring simultaneously with the reduction drinking-age which can produce such changes, like economic indicators.

Williams, et al. (1975) examined the possible effect of reducing the minimum legal drinking age through an analysis of data available on fatal road accidents, from three years before, until a year after the reduction in legal drinking age, in three areas, compared to neighbouring areas where the minimum legal drinking age was not reduced. They selected bordering areas because reducing the legal drinking age in one area may affect the drinking and driving behaviour in an adjoining area. For instance drivers under 21 residing in an area with a minimum legal drinking age of 21 may go to the bordering area to be able to buy alcoholic drinks legally. This would change the number of alcohol-involved crashes in bordering areas. For this reason, Williams and his colleagues examined the adjacent areas separately. The involvement of drivers under 21 in fatal traffic accidents in two states of U.S., Michigan and Wisconsin, and one

Canadian province, Ontario, in which the minimum legal drinking age was reduced from 21 to 18, (in 1971 or 1972), was compared to the involvement of such drivers in three states, Indiana, Illinois and Minnesota, respectively adjoining to them, in which the drinking age remained 21 during the period studied. The drivers involved in fatal traffic accidents, even those who were not killed, were included in the data; pedestrians and bicyclists were excluded but drivers who hit them were included. In this study, Ontario was compared to Minnesota, Wisconsin to Illinois and Michigan to Indiana. The basic statistic was the number of 15-17-year-old and 18-20-year-old drivers involved in fatal traffic accidents "in a law-change area divided by the combined number of such drivers in the change area and comparison area" (p.223). Williams and his colleagues found that:

the proportion rise and fall rather inconsistently in the years preceding the change in drinking age but rise consistently in the year after the law was changed in both the 15-17 and 18-20-year-old age groups. However, although consistent this change was not large, relative to pre-law-change fluctuations(pp.223-224).

They found that in Wisconsin for which they had adequate data on blood alcohol concentrations in fatally injured drivers under 21, alcohol was much more involved in fatal traffic accidents occurring at night, compared to daytime. Forty percent of the 15-17-year-olds and almost 75% of the 18-20-year-old drivers "killed in nighttime crashes before the law changed, had blood alcohol concentrations of 0.05 percent by weight or above compared to approximately one in five of those in each age group killed in daytime crashes...The proportion of fatally injured

drivers with elevated blood alcohol concentrations in single vehicle crashes is greater than the proportion of such drivers in multiple vehicle crashes, perhaps because crash-responsible drivers in multiple vehicle crashes are not necessarily the ones killed" (p.226). Blood alcohol concentrations of 0.05 percent by weight or above were found in 24% of the 15-17-year-old drivers and 36% of the 18-20-year-old drivers who were killed in multiple vehicle crashes before the law changed. The same blood alcohol concentrations were found in 60% of 15-17-year-old drivers and 80% of 18-20-year-old drivers who were killed in single vehicle crashes before the law changed. The magnitude of the effect of the change in legal minimum drinking age were estimated for each area by Williams and his colleagues. The estimates of excess involvement of 15-20-year-old drivers in fatal crashes ranged "from 2.6 to 3.3 per hundred thousand 15-20-year-old population in the first year after the change in legal minimum drinking age" (p.237). Williams and his associates found that the areas which reduced the legal minimum drinking age from 21 to 18, compared to bordering areas with legislation unchanged, indicate a significant increase in alcohol-involved fatal crashes of drivers under 21, especially in nighttime and single vehicle crashes. This increase also occurred to a lesser degree among 15-17-year-old drivers to whom the changed legislation was applied, when alcohol, became available legally for the 18-20 age group. They concluded that there is little doubt that reducing the legal minimum drinking age is a social policy that carries a price in increased fatal motor vehicle

collisions.

Popham, Schmidt, deLint (1976), unlike Wilkinson (1970) who has recommended lowering the purchasing age of alcoholic drink to 18 in all jurisdictions, argue that any liberalization in this context would contribute to higher capita consumption and consequently to alcohol-related problems including impaired driving. Smart and Goodstadt (1977) argue that lowering the legal minimum drinking age would have no effect on alcohol consumption, since many teenagers drank before the law reduced the drinking age and the new legal age has only legalized the status quo. Smart and Goodstadt argue also that many European countries such as Britain have always had low drinking ages, and they have low per capita alcohol consumption rates. Smart and Goodstadt believe that international comparisons have less real value than before-and-after studies in a single jurisdiction.

Bako and his associates (1976) studied the effect of lowering the drinking age on the alcohol-related involvement of young drivers in crashes in the province of Alberta. They found that almost half of the drivers involved in fatal crashes were between 15 and 24 years old. Bako and his colleagues also found that the main contributing factor in the majority of crashes in that group was impairment by alcohol. They analyzed the task force survey of highway accidents in Alberta which was based on data collected from the files of the Chief Coroner for Alberta. Their three-year study (1970-72) of fatal traffic accidents showed that 1,297 persons were killed on Alberta roads during

this time at a rate of 26.7 per 100,000 population. Eight hundred and fifty-four drivers were responsible for the fatal crashes in which 554 persons (42.7% of all dead) were killed innocently. Of the 854 responsible drivers, 454 were fatally injured and 400 survived. Of the 854 drivers who were responsible for fatal crashes, 367 (43%) were between 15 and 24 years of age. Of the 854 responsible drivers, 295 drivers were impaired by drinking and 130 drivers (44% of 295) were in the age group of 15-24. Bako and his associates found that the number of 15-24 year old impaired drivers responsible for fatal accidents was increased by 89% over the years of study, while other age groups showed a decrease of 12.3%. They also found that this rate was increased by 118% among 15-19 year olds, almost twice the increase in the 20-24 year old drivers (60%). The legal drinking age was lowered from 21 to 18 years in the province of Alberta in 1971. According to Bako and his colleagues the above figures strongly show a possible correlation between the reduction in minimum legal drinking age and the increase of impaired young drivers causing fatal crashes. Bako and his associates argue that the fact that the increase is higher for 15-19 year old drivers than 20-24 year olds, since the greater number of the drivers in the age group of 20-24 were legally permitted to drink and only a small portion could contribute to the increase. They concluded that their survey shows that the 1971 legislation which reduced the minimum legal drinking age from 21 to 18 years had an effect in increasing the rate of young drivers involved in fatal

alcohol-related crashes.

Schmidt and Kornaczewski (1972) studied the effects of lowering the minimum legal drinking age on traffic accident involvement in Ontario. They found that the proportion of accidents involving young drivers was increased more than three percent in 1971, the year of the change of the legislation compared to 1970 the year before the change. Whitehead, et al. (1975) conducted a similar study in London, Ontario and found that the change in the alcohol-purchasing age has increased the alcohol-involved collisions among young drivers. Naor and Nashold (1975) studied the effect of reducing the minimum legal drinking age on road collisions and found no significant increase in the proportion of the collisions.

On January 1, 1972 the legal drinking age in Michigan was lowered from 21 to 18 years. Zylman (1974) studied fatal crashes among Michigan youth following the reduction of legal drinking age. Zylman notes that it has been reported, primarily in the mass media, that the reduction had dramatically increased the number of young drivers involved in alcohol-related crashes. He studied the collision data available over a 21 month-period, for all of 1972 and the first nine months of 1973, to examine what effects the new law had on alcohol-related collisions of 18 to 20-year-olds in Michigan over this period. Zylman found that alcohol-involved fatal crashes among drivers aged 18 to 20 in Michigan during the first nine months of 1971, 1972 and 1973 were 61, 103 and 112 respectively; approximately an increase of

84% in the first nine months of 1973 over the same period in 1971. To determine the probable causes of this increase, Zylman refers to:

- (1) a change in drinking practices among 18 to 20 year-old drivers, or
- (2) a change in drinking-after-drinking practices of this age group, or
- (3) a change in reporting practices on the part of officials, or
- (4) a combination of these factors (p.284).

Zylman argues that in his opinion the third explanation is more likely. He argues that policemen in Michigan, like other areas, do not always record whether the victim or the driver had been drinking in a crash. He argues that the change in legal drinking age, probably changed the police techniques in recording the alcohol-related collisions. According to Zylman, after the law changed, the police collision investigators, unlike the past in which the presence of alcohol was recorded only in the most important cases, recorded any evidence of alcohol whether it was a causal factor or not, and consequently the number of alcohol-related crashes increased significantly. Zylman referred to a period of ten years (from 1962 to 1971) and found that there were five year-to-year changes in fatal-crash involvement among drivers aged 18 and 19 "which were equal to or greater than the change from 1971 to 1972, and none of them were related to the change in the legal drinking age" (p.285). Zylman argues that although there has been a persistent increase in the number of 18 and 19 year-old drivers in collisions in that ten year-period, this increase generally corresponds with the increase in the number of 18 and 19 year-old licenced drivers and is a "normal annual fluctuation which could have occurred

even without a change in legal drinking age" (p.285). Zylman concludes that the increase in alcohol-involved fatal crashes among drivers aged 18 and 19 in Michigan, after the reduction in the legal drinking age, more likely reflects a change in reporting practices than changes in driving-after-drinking behaviour. Ferrence and Whitehead (1975) contend that Zylman's analysis of the data is misleading and a more reasonable interpretation of the data available indicates that the reduction in the drinking age led to an increase in alcohol-involved fatal crashes among young drivers. Ferrence and Whitehead argue that on examining the data available they found an increase of 69% in alcohol-involved fatal crashes among drivers aged 18 and 19 in Michigan during 1972 and this followed by another nine percent increase in subsequent year. Ferrence and Whitehead argue that on the basis of Zylman's analysis, from 1971 to 1972 the number of alcohol-related fatal crashes among 18 to 20 year-old drivers increased by 42 and total crashes increased by 86. The increase in alcohol-related fatal crashes from 1971 to 1973 among the same age group was 51 and for total crashes was 65. Ferrence and Whitehead conclude that whichever time series is considered, the essential results are the same. Both total and alcohol-involved fatal crashes increase and there is an excess of total fatal crashes over alcohol-involved fatal crashes which is exactly the kind of increase that might be expected. Ferrence and Whitehead disagree with Zylman and argue that if reporting factors were responsible for the increase, one would expect no change in the total incidence. Zylman (1975)



attempts to reply to Ferrence and Whitehead, but he fails to undermine the logic and substance of their arguments. Whitehead (1977) suggests:

Zylman's (1975) argument that the subjective observations made by the police are too inaccurate for use, is nowhere supported by evidence that they actually did overreport cases involving alcohol among young drivers following the change in the law(p.14)

Cucchiaro et al. (1974) used an interrupted multiple time series analysis of adjusted monthly data from January 1969 to September 1973 in Massachusetts after the drinking age was lowered in March 1973. Analyses were performed for three types of collisions and for four age groups: drivers under 18, 18 to 20, 21 to 23, and 24 and older, and also for all ages combined. Cucchiaro and his associates found a significant increase in total alcohol-related fatal collisions among 18 to 20-year old drivers. Douglas et al. (1974) conducted a sophisticated study of the impact of the change in the drinking age, at the University of Michigan, Highway Safety Research Institute. On the basis of the time series analyses, Douglas and his associates found a significant increase in alcohol-related crashes among young drivers in the states that had lowered the drinking age, compared to control groups. Lynn(1981) analyzed data available in Virginia from 1969 to 1979 and found an increase in alcohol-related crashes among drivers aged 16 to 20, beginning in 1974 when the drinking age for beer was reduced to eighteen. He found also a decrease of alcohol-related crashes among the drivers aged 25 and over, during the same period. Lynn concludes that reduced drinking age is responsible for increased

alcohol-involved collisions among young drivers in Virginia in the late 1970s.

Whitehead (1977) conducted a study in London, Ontario to examine the impact of the lowered drinking age on alcohol-related crashes among young drivers. He used a quasi-experimental multiple time series, covering a period of three and a half years prior to the lowering of the drinking age in July 1971, and two years following it. He searched police records of all traffic collisions in London from January 1968 to July 1973 and culled and coded the data from collisions that involved drivers at the time, aged 16, 17, 18, 19, 20, or 24 on the basis of the age and sex and drinking condition of the driver, date of the collision, time of day. Whitehead included drivers aged 16 and 17 to examine whether the lowering of the drinking age had an effect on those age groups. Drivers aged 24 were included in the study as a comparison and non-equivalent control group. Whitehead found that:

1-Alcohol-involved crashes for each group that were directly affected by the lowering of the drinking age (18-, 19- and 20-year-olds) indicate a noticeable increase following the change in the legislation. The incidence of total crashes were in all cases greater than the increased incidence of alcohol-involved crashes.

2-The incidence of alcohol-involved and total crashes was increased among young drivers who have been directly affected by the reducing the drinking age (16- and 17-year-olds).

3-Collision involvement among young drivers which was increased after the reducing the drinking age, did not return to the previously lower level and the increase was continued.

After investigations indicated the adverse effects of lowering the drinking age, a number of states decided to raise the minimum legal drinking age. Actually, since 1975 no state has reduced its legal drinking age. Between September 1976 and January 1983, sixteen states increased the legal drinking age, and legislation to raise the drinking age came under consideration in several other states (Wagenaar, 1983b). Several studies have been conducted to indicate the impact of raising the legal drinking age on fatal and non-fatal traffic accidents.

On April 16, 1979, the minimum legal drinking age in Massachusetts was raised from 18 to 20 years. Hingson, et al. (1983) studied the impact of raising the drinking age on teenage alcohol-related traffic accidents in Massachusetts during the initial two years after the inception of the new law, compared to the state of New York which retained an 18-year-old drinking age. Hingson and his associates undertook random telephone surveys with approximately one thousand 16-19 year olds in each state prior to the raising the drinking age and twice at yearly intervals following it to assess the law's impact on teenage drinking and driving. Fatal crash data available through the U.S. Department of Transportation by each state from April 16, 1976 to April 15, 1981 were also analyzed. Hingson and his associates found that after the drinking age was raised, fatal

collisions among 18 and 19-year-old Massachusetts drivers decreased 15%, versus a 16% increase among 18 and 19-year-old drivers in New York. For the 16 and 17-year-old drivers the similar effect was not found. The proportion of 16 to 19-year-old Massachusetts young drivers who were driving after any drinking (compared to driving after heavy drinking) decreased from 51%, prior to the raising the drinking age, to 42% following it and no decrease was found in New York. Telephone surveys concerning the frequency of driving after drinking indicated no change in driving after heavy drinking which could be attributed to the higher drinking age. In June 1972, the legal drinking age in Maine was reduced from 20 to 18. According to Wagenaar (1983a) and Douglis et al. (1974), due to the reduction in drinking age in Maine, alcohol-related crashes were increased significantly among drivers under 21. In October 1977 the legal drinking age in Maine was raised to 20. Wagenaar (1983a) conducted a study to assess the effect of raising the drinking age in Maine on alcohol-related property damage and all fatal or injury crashes among young drivers. Wagenaar analyzed all the reported motor vehicle crashes among drivers aged 18-45 in the states of Maine and Pennsylvania, from 1972 to 1979. Pennsylvania was studied as a comparison state, since the drinking age remained unchanged in this state during 1970s. "Controlling for the effects of long-term trends, seasonal cycles, and other factors with Box-Jenkins time series models" (p.365). Wagenaar found a significant 17-21% reduction in alcohol-related property damage crash involvement among the

18-19 year-old drivers in Maine after the drinking age was increased. "No demonstrable effect of the raised drinking age on the incidence of injury and fatal crashes was found" (p.365). Wagenaar argues that the replication of these findings in other jurisdictions is necessary and for making any general conclusion, additional research is required.

Vingilis and Smart (1981) studied the effect of raising the legal drinking age from 18 to 19 on drinking and driving in Ontario. The study was based on two types of drinking driving statistics on a province-wide basis: " (1) monthly Ontario drinking driving convictions from 1977 to 1979 for 16-21 year-olds and (2) monthly Ontario accident fatalities from 1973 to 1979 for 16-21 year-olds. Both sets of data were analyzed by time series analysis" (p.421). In Ontario, the purchasing and drinking age which was reduced to 18 in July 1971, was again increased in January 1979 from 18 to 19. In the context of drinking driving convictions, Vingilis and Smart found no significant differences between the pre-intervention and post-intervention time periods for the 16-17 year-olds, the 18 year-olds, and the 19 year-olds, but almost significant decrease for the 20-21 year olds. In the context of driver fatalities Vingilis and Smart found no significant changes between the pre-intervention and post-intervention time periods. As Vingilis and Smart note these results are contrary to Michigan's findings in a similar study conducted by Wagenaar (1980). Vingilis and Smart conclude that the one year period is not sufficient to cause a major impact on youthful drinking behavior (the legal

age increase in Michigan was three years from 18 to 21).

Klein (1981) studied the effect of raising the drinking age in Maine. In his time-series analysis he used the data of involvement in nighttime collisions among young male drivers from 1974 to 1979 and found a significant reduction in crash involvement (from 20% to 14%). Filkins and Flora (1981) studied the impact of raising the drinking age in Michigan from 18 to 21 and found that raising the legal drinking age reduces the amount of alcohol-related crashes among young drivers. Maxwell (1981) studied the effect of raising the drinking age (from 19 to 21, effective January 1980) in Illinois on collision involvement among young drivers from 1977 to 1980. His time series analysis showed a significant nine percent decrease in involvement in single-vehicle nighttime collisions among 19-to-20-year-old male drivers. In contrast there were no significant changes for drivers under 19 or over 20. Williams, Zador, Harris, and Karpf (1981) studied the fatal alcohol-related traffic accidents from 1975 to 1979, in nine states that raised the legal drinking age, compared to adjacent states that did not change the drinking age and during the same period. They found a significant decrease of 28% in involvement in nighttime fatal traffic accidents among the young drivers affected by the raising the drinking age.

Wagenaar (1983b) studied the impact of raising the legal drinking age on traffic accidents in Maine and Michigan. Wagenaar claims that he has designed his study in such a way that causal inferences about effects of the changed laws could

be made beyond any reasonable doubt. Because of controversy over the drinking age issue, Wagenaar argues that the preferred design for inferring a causal relationship between the change in drinking age and the amount of traffic collisions is the true experimental design in which the population of interest is randomly assigned to two or more treatment conditions. Wagenaar notes that comparing young drivers randomly assigned to a condition of legal availability of alcoholic drinks (lower drinking age) to young drivers randomly assigned to a condition of no legal availability (higher drinking age) is not feasible. In other words permitting and prohibiting access to alcohol in this way is not possible. As a result a quasi-experimental design was used by Wagenaar, the nonequivalent-multiple-time series design which has the highest internal validity. The statistical data for four different states were analyzed (Maine and Michigan which had raised the drinking age in late 1970s and New York and Pennsylvania which had made no such legal changes). Maine and Michigan were selected, because both states reduced the drinking age in the early 1970s and raised it in the late 1970s. A second reason for the selection of Maine and Michigan was that the effect of lowering the drinking age had been evaluated in both states. New York and Pennsylvania were selected by Wagenaar for comparison purposes because the climate and seasonal patterns in crash involvement in these states were similar to those in Maine and Michigan. In Maine the drinking age was increased from 18 to 20, and in Michigan from 18 to 21. The drinking age in New York was 18 and 21 in Pennsylvania when

the study was conducted. Within each of the study states young drivers directly affected by a drinking-age change were compared with their proximal peers who were not the focus of the legal change. Drivers aged 16 and 17 were also examined by Wagenaar to assess any possible spillover effect of raising the drinking age. The crash involvement of older drivers was also analyzed as a further comparison. Involvement in alcohol-related collisions with non-alcohol-related crashes was compared in each state and age-group combination. Briefly, in Wagenaar's study, Maine and Michigan (the states that raised the drinking age) were compared with New York and Pennsylvania with unchanged drinking ages. In each state the alcohol-related collisions of young drivers and older drivers were compared and finally within each state and age-group combination, the frequency of involvement in alcohol-related collisions was compared with that of non-alcohol-involved collisions. The data for study were collected from police records on all traffic accidents in each of the four states between January 1972 and December 1979 (for New York the data acquired were more limited). Wagenaar found that in both Maine and Michigan, after raising the drinking age, the involvement of young drivers in alcohol-related-property damage crashes was significantly reduced compared to the involvement of older drivers within experimental states or younger drivers in comparison states (around 17% in Michigan and 20% in Maine). Alcohol-related injury-producing crashes were reduced among younger drivers in Michigan (20% for drivers aged 18 to 20) after the drinking age was raised, but no clear effect



was found in Maine. This reduction was not observed among the older drivers in Michigan or young drivers in comparison states.

#### *Conclusion*

Numerous studies in different jurisdictions strongly show a correlation between the reduction in minimum legal drinking age and the increase of youthful fatal and non-fatal traffic accidents. Several investigations also have been conducted to indicate the impact of raising the legal minimum drinking age on youthful road crashes. Although the periods of studies were not sufficient to cause a major impact on youthful drinking behaviour, it may be concluded that raising the minimum drinking age has decreased to some extent the volume of youthful alcohol-related traffic accidents. This confirms once more the author's hypothesis which stresses the great importance of the role of alcohol in road traffic accidents.

## CHAPTER V

### RECOMMENDATIONS FOR SOCIAL POLICY

There is a strong need for preventive action on alcohol-related traffic accidents, particularly in North America, including Canada. This need in Canada is justified by estimates that the link of alcohol to fatal road accidents is at least between 30 to 50% of fatalities investigated (as shown in chapter three). On the basis of statistics presented in chapter three, the author suggests that actions to prevent alcohol-related collisions should be a priority at all levels in Canada. The relationship between the level of alcohol consumption and the rates of road crashes indicates that efforts to reduce the level of alcohol consumption should be strongly encouraged. The World Health Organization should considerably support, much more than before, the international efforts, and simultaneously, similar efforts should be made in Canada. In chapter four the author tried to provide sufficient evidence that coercive means of social control in the context of drinking and driving such as legal sanctions are not able to reduce the rate of alcohol-related traffic accidents at least in a long run. The author believes that other methods must be used in addition to legal sanctions.

Intervention in the form of the application of persuasive (and coercive) social control is possible at three distinct but interrelated stages of the drinking-driving problem : (I) Primary intervention, i.e. before the drinking-driving occurs.

(II) Secondary intervention, i.e. after the drunk driver is on the road and before the occurrence of accident. (III) Tertiary intervention, i.e. after the drunk driver has been detected but before he or she recommitts the same offence.

The author's recommendations in the context of social policy are mostly related to primary intervention.

### Primary Intervention

Primary intervention reduces the incidence of drinking and driving. Public education is the heart of this sort of intervention.

The adverse results of alcohol-related traffic accidents should be presented in a form which is accepted and understood by the audience concerned through the media. Educational media programs should be performed separately for young drinking-drivers, problem drinking-drivers and social drinking drivers. The proposed "Alcohol and Traffic Safety Commissions" (see discussion later in this chapter) should provide a method for evaluating the result of mass media public education campaigns. Unfortunately, little research is currently available. The media may be the best means for increasing public awareness of and compliance with drinking-driving laws. The emphasis should be on establishing in the mind of the public that the related drinking-driving laws are fair and that the laws concerned fulfil an important public need. The material

written for educational purposes should avoid the "preaching" and the "violation of law" angles to have a better chance to reach and be remembered by a greater number of drivers. Classroom instruction on drinking-driving should be conducted in the driver-licensing schools and in driver-education courses. Children should become quite aware of the hazards of alcohol-related traffic accidents in the schools. Education on alcohol-related problems at schools should be conducted by a specially-trained classroom teacher who has a continuing relationship with the students. Organizations such as MADD (Mothers Against Drunk Drivers) should be strongly supported by the federal and provincial governments. MADD was first formed by a group of concerned citizens in the United States in 1980 and brought to Canada in 1982. This organization's efforts have considerably raised the awareness of the public about the problem of drinking and driving. However, the greatest promise exists in the area of primary intervention which may be able to deter the potential drunk drivers in a long term. As discussed in chapter four, secondary intervention, such as police spot check blitzes and also tertiary intervention, such as legal sanctions may not be effective in the long run. To develop the extent of primary intervention through persuasive means of social control (federally and provincially) the governments may also financially reward the drivers who have not been involved in alcohol-related traffic accidents. One of the ways to reward and aid the law abiding drivers who have not been involved in traffic accidents especially alcohol-related collisions is to

pay a part of their car insurance premiums. This could be granted separately from any reductions car insurance companies may offer. Introducing the drivers who have a good record in a period of time to the public through media (especially television and newspapers) may have more deterrent effect on potential drunk drivers than imposing the legal sanctions.

Numerous studies in different jurisdictions strongly show a correlation between the reduction in minimum legal drinking age and the increase of youthful fatal and non-fatal traffic accidents. Several investigations also have been conducted to indicate the impact of raising the legal minimum drinking age on youthful road crashes. These studies show that raising the minimum drinking age has decreased the volume of youthful alcohol-related traffic accidents. On the basis of studies conducted the reduction in minimum legal drinking age has dramatically increased the alcohol-related traffic accident rates especially for drivers under 21 (16-20). Studies show that drivers under 21 residing in an area with a minimum legal drinking age of 21 may go to the bordering area to be able to buy alcoholic drinks legally and this would increase the number of alcohol-related crashes in bordering areas. To reduce the adverse results, minimum legal drinking age should be raised to at least 21 in every Canadian province and territory.

Studies also show that the amount of driving experience is another important contributing factor in traffic accidents, especially when it is combined with the amount of drinking

experience. After raising the minimum legal drinking age to 21, a basic reform should be made in the context of driving preparation programs to provide the means for good training and additional experience. The common testing methods of a multiple-choice test, a very short test drive demonstration of parking ability and the like, seem inadequate. The process and procedures should be developed and assigned around the needs of individual drivers (based on the investigations conducted by behavioural scientists and driving experts).

### Secondary Intervention

Secondary intervention is usually applied after the drunk driver is on the road and before the occurrence of an accident. Studies show that the detection of the drunk drivers is almost a chance event and the worst cases may be brought to the attention of the police. Police spot checks are effective in a short run and studies indicate that immediately or after a while, things look very much as before. The blitzes referred to in chapter four may be useful as a method of estimating the number of drunk drivers on the roads which will help social policymakers in their endeavors. Although no permanent changes seems to have been achieved through the conducted police spot checks (and certainly more educational means should be utilized to achieve long run deterrent effectiveness), these checks should not be stopped, since public education needs time and can not usually be achieved in a short period. Since the studies show that most alcohol-related traffic accidents occur in the late evening and

early morning hours, in contrast to the pattern for all road collisions which peak in the early evening hours, specific police spot checks can be conducted during these intervals to detect the drunk drivers and stop them at least temporarily from driving and thus prevent their involvement in traffic accidents. Considering the amount of loss suffered by the governments, it may be worthwhile to increase the number of police spot checks and specify a sufficient budget for this purpose. Police spot checks should also be conducted during weekends, since studies indicate that the highest proportions of alcohol-related crashes are associated with the weekends. Specific educational programs performed through media on weekends will be considerably useful to explain to drivers the adverse results of impaired driving.

### Tertiary Intervention

Tertiary intervention is usually imposed by legal sanctions. Studies show that actually there is not a single countermeasure working effectively in all jurisdictions and over a long period of time. Each society must establish the severity of its own problems and the effectiveness and applicability of specific countermeasures by utilizing the proper survey techniques. In other words, successful countermeasures in one country may not work well in another country; a number of national characteristics should be taken into consideration such as police self-perception with respect to the enforcement of drinking-driving regulations, public perception of the role of police in enforcing drinking-driving legislation, and the

public's attitude about driving while impaired convictions. However, considering all these subtle points the appropriate legal sanctions (in the form of detection, apprehension and prosecution) should be employed against the drivers who violate the laws and do not respond to other educational countermeasures. Studies show that legal sanction has no power to deter the potential drunk drivers in a long run, unless it is accompanied by long-term mechanisms, such as habit formation and voluntarily internalization through public education. The proposed "alcohol and traffic safety commissions" should examine the techniques by which the educational means may be more effective.

The fact that coercive provisions are not the best deterrent countermeasures in a long-run does not deny the reality that the legal sanctions may be appropriate means for the maintenance of social order in a specific period of time.

### The Role of Research

The problem of drinking and driving is not a single, identifiable phenomenon, but rather a complex multidimensional entity and therefore a concerted endeavor by several segments of society will be required to achieve a proper control of the drunken driver. A full understanding of the factors which cause alcohol-related traffic accidents can only come from comprehensive road crash statistics which are based on the contributions of several private and public departments such as



enforcement agencies (federal, provincial and local), insurance companies, private industry sectors, researchers, evaluators, and educational specialists. All these private and public departments should have close cooperation with Alcohol and Traffic Safety Commissions (suggested in this chapter). Since a single cause explanation in the context of drinking and driving is naive and misleading, the commissions should provide the means and facilities for the researchers to extensively investigate the factors interacting with alcohol in traffic accidents. This will help the social policymakers concerning the planning for programs to deal with the problem of impaired driving.

#### Alcohol and Traffic Safety Commissions

Most of the studies evaluated or referred to in the present investigation were conducted separately by different segments and sectors of society and with limited funds and resources. To address the complex problem of alcohol-related traffic accidents in an efficient way and to have more organized and comprehensive research in the context of drinking and driving and its adverse results, the author suggests that permanent commissions under the title of "Alcohol and Traffic Safety Commissions" should be established (at federal and provincial levels). To gain the governments' support, the Prime Minister at the federal level and the Premier at the provincial level should have the position of the chairperson of the commission concerned. The members of the commissions should be appointed federally by the Prime

Minister and provincially by the related Premier from among the experts in alcohol and traffic safety. A separate fund should be established for this purpose (federally and provincially). The areas of jurisdictions, responsibilities of the commissions and the nature of their cooperation should be explained by a specific legislation enacted by the federal parliament. The main purpose of establishing these commissions would to provide the means for the reduction of alcohol-related traffic accidents mostly through primary intervention and public education. The commissions should examine the ways in which limited government funds may achieve the greatest impact in reducing the rate of alcohol-related traffic accidents.

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