

A Report to Congress

February 1980

Marijuana, other Drugs and their relation to

Highway Safety



U.S. Department of Transportation
National Highway Traffic Safety Administration
Washington D.C. 20590

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EXECUTIVE SUMMARY

This report has been developed by the Department of Transportation in response to Section 212 of Title II of the Surface Transportation Act of 1978 (the Highway Safety Act of 1978). This section requires the Secretary of Transportation to report to Congress concerning efforts to detect and prevent marijuana and other drug use by motor vehicle operators.

The full report is organized into five chapters:

- I. An introduction providing a brief history of the report, and a discussion of the similarities and differences between alcohol and drugs as they relate to highway safety;
- II. The frequency of drug use among drivers and its relation to highway safety;
- III. The legal approaches to the control of drug use by drivers;
- IV. Federal and State activity in the detection and prevention of inappropriate drug use by drivers;
- V. The Secretary's conclusions, recommendations and DOT programmatic actions.

This summary extracts the relevant Chapter content to provide concise answers to the basic questions raised in Section 212 of the 1978 Act in the last four Chapters of the report. The rationale, methodology and data to support these answers are found in the body of the report.

What is the frequency of marijuana and drug use by motor vehicle operators, and what are the effects of drug use by drivers on highway safety?

- The extent to which marijuana and other drugs contribute to problems in highway safety is currently unknown.
- Epidemiologic research has demonstrated that some drivers involved in fatal crashes or arrested for impaired driving have taken psychoactive drugs. The

use of more than one drug, in addition to alcohol, is often found. The lack of studies of adequate comparison samples makes it impossible to draw valid conclusions about the contribution of drug use to the traffic safety problem.

- Experimental studies have shown that marijuana and other licit and illicit drugs, at certain dose levels, can have significant adverse effects on skills and other measures of capabilities normally associated with driving performance.
- Appropriate investigations, including roadside surveys of non-accident-involved drivers, must be undertaken in order to determine: (1) if marijuana and other drugs are overrepresented in drivers involved in traffic crashes, and (2) the magnitude of the concomitant highway safety problem.

What are the capabilities of law enforcement officials to detect and prevent the use of marijuana and other drugs by drivers?

- Methods for detecting drug presence *in blood* have improved greatly over the last ten years. However, the capability to detect and measure most drugs, including marijuana, *in either breath or saliva*, is not presently available, nor will it be in the near-term future.
- Legal approaches constitute the primary counter-measure presently used to deal with drug use and driving. For drugs other than alcohol, most State statutes related to driving under the influence of drugs (DUID) have significant loopholes that impede effective law enforcement.
- Only ten States have effective combinations of drug-and-driving laws.
- Arrest statistics indicate that about one DUID arrest is made for every 100 alcohol-impaired arrests. The

relation between these arrest data and the true incidence of drug-impaired driving is unknown.

- Drug cases are difficult and expensive to prosecute, and plea bargaining is common.
- The present capability of law enforcement to detect and prevent the use of marijuana and other drugs is limited by two other major constraints: (1) State traffic laws that impede effective law enforcement, and (2) lack of data relating specific drug levels to driving impairment.

What is being done at the Federal and State level to develop detection methods and prevention programs?

- Both the National Highway Traffic Safety Administration (NHTSA) and the National Institute on Drug Abuse (NIDA) are supporting research projects to advance the state-of-the-art of analytical methodology for highway safety applications. Despite this effort, much work remains before effective measurement techniques can be made available to support legal approaches to the detection and prevention of drug-impaired driving.
- Research to determine the incidence of drugs in fatally injured drivers is presently being conducted. A companion study to determine the incidence of drugs in drivers on the road who have not been involved in crashes may be undertaken by NIDA.
- A variety of relevant studies are being sponsored by NHTSA, NIDA and by other Federal agencies, dealing with drug effects, especially on specific driving-related tasks. However, these studies have just begun to scratch the surface of the problem. A great number of drugs have potential for creating significant driving impairment. Because of the large number of potentially impairing drugs as well as the differences in how they might produce driver impairment and lead to accidents, significant time and additional resources will be required before a complete understanding of the driving problem due to inappropriate use of currently available drugs can be developed.
- A number of States have begun programs to collect data regarding the incidence of drugs among fatally injured drivers, and to investigate the effects of marijuana alone, and in combination with alcohol, on driving.
- There appears to be relatively little State and local activity to provide information and education programs on the possible risks of driving after either licit or illicit drugs. Public information and education programs in the Federal government are scarce and are, for the most part, conducted by the Food and Drug Administration and by the Department of Defense in its drug prevention and rehabilitation program.

What are the Secretary's Conclusions, Recommendations and Planned Programmatic Actions?

The conclusions, recommendations and actions below are summaries of those contained in the body of the report.

CONCLUSIONS:

- With the exception of alcohol, no drug has been established to be a high priority highway safety concern.
- The frequency with which drug-impaired drivers drive, are arrested, or are involved in crashes is not known.
- Drugs which may impair driving, which are used by drivers, include prescription and over-the-counter drugs as well as illicit drugs.
- The information on marijuana and driving is incomplete and does not support arguments either for or against establishing marijuana as a high priority highway safety concern.
- The magnitude and scope of the highway safety problem due to inappropriate use of drugs by drivers cannot be adequately determined without roadside surveys to determine the nature and extent of drug use by drivers who are not involved in accidents or suspected of impaired driving. Therefore the Department of Transportation will continue these essential studies by proposing to the Office of Management and Budget appropriate roadside surveys which will be designed to minimize the burden on the general public.

RECOMMENDATIONS FOR FEDERAL LEGISLATION

No additional Federal legislation is recommended at this time.

RECOMMENDATIONS FOR STATE ACTIONS

For the present, the States are encouraged to revise existing laws dealing with drugs and driving to allow law enforcement to act in conformance with the appropriate sections of the Uniform Vehicle Code, especially with regard to the use of chemical tests, and the definitions of driving under the influence of alcohol and/or drugs.

DOT PROGRAMMATIC ACTIONS

1. The Department of Transportation, in cooperation with the Department of Health, Education and Welfare and other appropriate Federal agencies, should develop an information and education program on the

potential impairing effects of drugs on driving.

2. The Department of Transportation and the Department of Health, Education and Welfare will continue research programs in the drug and driving area, in cooperation with other Federal agencies. These are designed to answer the most fundamental questions concerning drugs and highway safety programs, including:

- Epidemiological research to identify the frequency of drug use in arrested, accident-involved (fatal and injury accidents), and non-accident-involved drivers.
- Experimental research to establish the relationship between drug level and driver impairment.
- Behavioral research to attempt to develop reliable, objective performance tests for driver impairment.

3. The Department of Transportation will request the National Academy of Sciences to convene a study panel to examine these questions:

- What is the feasibility of developing and implementing reliable, noninvasive chemical tests for drugs other than alcohol (considering cost, personnel resources, legal requirements and other practical constraints)?
- Is it feasible and practicable to identify drug concentration levels that can be used as valid indicators of driving impairment for drugs other than alcohol?
- Should the legal system, in particular the criminal law system that is the basis for most of our nation's traffic laws, be used as the primary countermeasure approach for a drug and driving problem? Alternative approaches based in administrative law or greater reliance on medical review processes should be examined in this context.

INTRODUCTION

This report has been developed by the Department of Transportation (DOT) in response to Section 212 of Title II of the Surface Transportation Act of 1978 (the Highway Safety Act of 1978). This section of the Act requires a report to Congress by December 31, 1979, concerning efforts to detect and prevent marijuana and other drug use by operators of motor vehicles. The relevant language of the Act is as follows:

Such report shall include, but not be limited to, information concerning the frequency of marijuana and drug use by motor vehicle operators, capabilities of law enforcement officials to detect the use of marijuana and drugs by motor vehicle operators, and a description of Federal and State projects undertaken into methods of detection and prevention. The report shall include the Secretary's recommendations on the need for legislation and specific programs aimed at reducing marijuana and other drug use by motor vehicle operators.

The responsibility for development of this report was delegated to the National Highway Traffic Safety Administration (NHTSA), the Administration within DOT that is responsible for increasing highway safety. The reduction of vehicle crashes that involve alcohol has been a major goal for NHTSA since its inception.

The NHTSA work on alcohol and highway safety identified drugs other than alcohol as a potential highway safety problem. Case reports revealed that alcohol and drugs were often used in combination. As a result NHTSA started a research program on drugs and driving in the early 1970s. The initial projects focused on collection of information about the nature and magnitude of the problem. Preliminary efforts to identify the incidence of drugs in crashes and in the driving population were undertaken. The results of these studies were not conclusive nor were they expected to be. The early results indicated the existence of a potential

problem that was not as simple to define as the alcohol-highway safety problem, and the need for significantly improved detection and measurement methods so that the problem could be defined and so that enforcement efforts could be undertaken as warranted.

NHTSA has continued to support work in this area. In 1972 and 1975, NHTSA sponsored symposia to bring together leading researchers and practitioners to examine the problem of drugs and driving (Perrine 1974; Joscelyn and Maickel 1977c). At the same time a continuing bibliographic search of the U.S. and international literature was started. Two bibliographic reports have been released and a third will be released shortly (Joscelyn and Maickel 1976; Joscelyn and Donelson 1978). As a continuation of the dialog between NHTSA and the research and practitioner communities that was started with the symposia, a series of workshops were held in 1978 and in 1979 to address such important issues as drugs of interest, analytic methods, and alternative techniques for roadside sampling. Additional workshops will be held in 1980.

In 1975, NHTSA also sponsored a project to review the present state of knowledge about alcohol, drugs, and highway safety. Three reports on these topics were published in 1979 (Jones and Joscelyn, 1979(a), 1979(b); Joscelyn, Jones, Maickel and Donelson, 1979). The most recent, entitled *Drugs and Driving: Information Need and Research Requirements*, was used as a source of data for this report (Joscelyn *et al*, 1979).

For the purposes of this report, the existence of a drug and driving problem has been presumed. However, the nature and magnitude of the problem are not known. The belief that drugs other than alcohol alone may contribute to the traffic crash risk stems from three pieces of information. First, many drugs have the potential to impair driving skills. Second, many people who drive use such drugs. Third, alcohol, which is a drug that impairs

driving skills and which is widely used by the driving population, has been shown to increase the risk of traffic crashes. In fact, it is the alcohol-crash problem that has sensitized people to the potential for other drugs to also be a traffic crash risk. As the remainder of this report will show, the relations between the use of drugs—appropriate and inappropriate, licit and illicit, therapeutic and recreational—and highway crashes have yet to be defined.

ALCOHOL AND HIGHWAY SAFETY AS A BASIS FOR UNDERSTANDING THE DRUG AND DRIVING PROBLEM

In order to put the drug and driving problem in perspective it is necessary to provide a short review of the alcohol and driving problem, the strategies for dealing with it and how they developed, the present status, and how the difference between alcohol and other drugs may reduce the applicability of the alcohol approach to the drug driving problem.

The widespread use of alcoholic beverages and its consequences for highway safety are common knowledge. Social concern over highway safety problems related to alcohol is but one chapter in alcohol's long history of use and abuse in human culture. Understanding the alcohol and highway safety problem is useful as it provides a perspective for viewing the drug and driving problem. The state of knowledge about drugs and highway safety is similar to the situation with alcohol forty to fifty years ago. An understanding of the history of the alcohol highway safety program is also useful from a research and operational perspective. The research approaches for defining the drug-and-driving problem are similar to those that have been used for alcohol. Current drug-oriented activities of law enforcement and other operational agencies concerned with prevention through education and information are also similar to those used for alcohol.

The first identification of alcohol as a highway safety problem came through anecdotal evidence of alcohol involvement in crashes. This evidence combined with the general societal knowledge of the effects of alcohol on human behavior led many to suspect an alcohol-crash problem.

This led to experimental studies of the effects of alcohol on driving skills. These experimental studies confirmed that alcohol as commonly used could impair driving performance. Chemical tests were developed to measure the amount of alcohol in the body. These allowed the correlation of specific amounts of alcohol in the body with effects on driving behavior.

The experimental studies were complemented by epidemiological studies that determined the incidence of alcohol in crash-involved drivers and in the general driving population. These studies revealed that alcohol

was more frequently used by drivers involved in crashes and was used in greater amounts than by drivers who were not involved in crashes. The data obtained in the epidemiologic studies allowed a much more precise statement to be made about the relative risk of alcohol as a highway safety problem (i.e., the difference in probability of being involved in an accident when not drinking and the probability of being involved after having had a certain amount to drink).

As evidence emerged that alcohol was a highway safety problem, countermeasures were developed and implemented. Laws were passed prohibiting alcohol-impaired driving. As chemical tests to measure alcohol levels in the body became more widely available and, more importantly, as information correlating the effects of alcohol with its levels in the body was scientifically established, test results were gradually accepted in criminal trials as evidence of impairment.

At first, the alcohol level was used to establish the presumption of impairment. More recently, some State statutes have been passed that make it illegal per se to operate a motor vehicle with a level of alcohol in the body above a certain amount. Education and information efforts were undertaken to inform the public about alcohol and highway safety. This was done to deter people from driving unsafely and to create public support for actions against those who drove while impaired. Sanctions against those convicted of alcohol-impaired driving included the traditional sanctions of fine and imprisonment, driver license suspension and revocation, and referral to health and education programs. The last approach has been sometimes called the health/legal approach.

The application of countermeasures and other ways of dealing with the alcohol-impaired driver has been primarily a State and local responsibility. Since 1966 the Federal government, through the efforts of NHTSA and the National Institute on Alcohol Abuse and Alcoholism (NIAAA) has played a significant role in both stimulating and supporting State efforts. The Federal role continues today.

Despite the Federal, State, and local efforts, alcohol continues to be a major highway safety problem. Its nature and magnitude can be estimated but are not fully defined. Approximately 40% to 50% of the drivers fatally injured in crashes have alcohol concentrations in excess of .10% v/v *—the legal limit for alcohol-impaired driving in most states.

For drivers involved in a fatal accident but who were *not* considered responsible for it, it has been shown that only 7% to 12% had been drinking heavily. Comparable

* Alcohol is usually measured in grams per 100 milliliters of blood, and stated in terms of percent alcohol, weight per unit volume. A measurement of 0.01 grams of alcohol in a 100 milliliter sample of blood would be expressed as 0.01% w/v blood alcohol concentration (BAC).

figures for personal injury and property damage crashes are 9% to 13%, and 5% respectively.

In comparison, surveys of drivers not involved in crashes but on the road at about the same time and place that a fatal accident occurred, have shown that only 2% had been drinking heavily before driving.

These data indicate that alcohol is clearly a highway safety problem of major importance.

The magnitude of the alcohol problem can be estimated, and a foundation has been established for actions to reduce the alcohol-crash risk, because extensive study of the problem has occurred over many years. Despite the present advanced state of knowledge about alcohol and highway safety, it remains a major highway safety problem. Our knowledge about drugs and driving is much less. The alcohol-and-highway-safety experience suggests that alcohol and drugs other than alcohol are major societal problems. The problems are long-term in nature and will require an equally long-term view to address them.

DIFFERENCES BETWEEN ALCOHOL AND OTHER DRUGS

The experience with alcohol and highway safety has been addressed to provide a perspective for examination of the issues of drugs and highway safety. While many analogies may be drawn between alcohol and other drugs, there are also many important differences that must be understood.

Alcohol is a drug, but a unique one. Alcohol is a single substance with a simple chemical structure. Its absorption, distribution and action within the body are comparatively simple and well understood. Its use is almost entirely nonmedical. Although a drug of abuse, it is a legal drug whose social use is generally approved by society.

In contrast, other drugs may include many substances. Most are very complex—often products of modern chemistry. In general their absorption, distribution, and actions are much more complex than those of alcohol. Some drugs are transformed by the body into new substances which themselves have effects on behavior.

Some drugs remain in the body for long periods of time. In some cases the drug's effects may continue long after it can no longer be detected in the blood. In other cases, drug presence may be detected after the drug's action has effectively ceased.

From a highway safety perspective several aspects of the differences are important. First, legitimate drug use can create a highway safety problem. Drugs taken as directed can still impair driving behavior. Conversely, drugs used for the treatment of some conditions may reasonably be expected to improve driving behavior.

Second, the complex nature of many drugs may not allow the development and implementation of a drug measurement technique similar to that used for alcohol (i.e., breath analysis). At present, blood specimens must be obtained to analyze for the presence of most drugs other than alcohol. Even when drugs are detected, the full meaning of the findings may be unclear because of the lack of knowledge of the drugs' effect on driving behavior, and the lack of an epidemiological basis relating use of a particular drug in driving to crashes.

The experience with alcohol has served as a starting point for examination of the drug and driving problem. However, the differences between alcohol and other drugs must be kept in mind. Not all aspects of experience with alcohol may be applicable.

REPORT PREPARATION

As part of the NHTSA research program on drugs and driving, a contract was let to have a continuing study of methodological issues in drugs and driving. This effort includes the collection of an extensive literature base and continuing contact with both the research and practitioner communities. This study effort was expanded to collect information on current practices and programs at the Federal, State and local levels.

From June through August 1979, contact was made with representative groups in each of the fifty States to collect data describing current capabilities and programs. Contact was also made with other Federal agencies to obtain information on programs outside the Department of Transportation which focused on drugs and driving.

Most contacts were made by telephone. Letters to agency heads, industry representatives, and others supplemented telephone contacts. Many agencies forwarded documentary material describing their programs. A wide range of agencies and individuals was contacted including:

- Governor's Highway Safety Representatives.
- State Departments of Health, Public Safety, and Motor Vehicles.
- State and local police agencies, prosecutors, judicial officers, and other criminal justice agencies.
- State toxicologists and forensic laboratories engaged in drug analysis.
- State agencies having the responsibility for coordination of drug abuse control programs.
- Public and private organizations engaged in public information and education programs related to drugs and alcohol.
- Universities and private research organizations engaged in drug or highway safety research.

- Federal agencies in the Departments of Transportation; Health, Education and Welfare; Justice; Defense; and other areas of the Federal government.

The information obtained through this contract effort was organized and reported to NHTSA. The technical report from that contract effort along with other research information and information obtained by NHTSA through contact with Federal, State, and local agencies was used to prepare this report. The technical report of this project prepared by the University of Michigan Highway Safety Research Institute will be published as a project report and will be available in the near future.

REPORT ORGANIZATION

This report consists of five chapters. Chapter I provides an introduction and background. Chapter II presents the best available information on the frequency of use of marijuana and other drugs by motor vehicle operators and contains a summary of current knowledge about drugs and driving gained through experimental and epidemiologic research.

Chapter III describes the legal response to the drug and driving problem. The capabilities of law enforcement officials to detect and prevent the use of marijuana and other drugs by motor vehicle operators are presented. Major constraints which limit the effectiveness of law enforcement are identified. Chapter IV describes Federal and State projects undertaken on the methods of detection and prevention.

The Secretary's conclusions and recommendations on the need for legislation and specific programs aimed at reducing marijuana and other drug use by motor vehicle operators are presented in Chapter V.

THE FREQUENCY OF DRUG USE BY DRIVERS AND ITS RELATION TO HIGHWAY SAFETY

The present focus of research on drugs and driving is to determine the frequency of drug use among drivers and its consequences for highway safety. Two approaches, experimentation and epidemiology, have been used to study the drug and driving problem. Within each of these general approaches are many methods to obtain data linking drug use and highway safety problems.

This chapter summarizes the present state of knowledge and presents recent findings along with a critique of past research.

THE STATE OF KNOWLEDGE

Briefly stated, the *extent* to which drugs contribute to problems in highway safety is unknown. Despite an ever expanding body of literature, the state of knowledge of drugs and driving remains limited. Reviewers of research linking drugs and highway safety (Perrine 1975; Joscelyn and Maickel 1977a; Willette 1977; Organization for Economic Cooperation and Development 1978; Seppala, Linnoila, and Mattila 1979; Joscelyn, Jones, Maickel, and Donelson 1979; Nichols 1971) have generally concluded that definitive studies are lacking. Nevertheless, the available evidence indicates that some drugs at certain dosages can impair driving skills, that certain drugs may increase the likelihood of traffic crashes, and therefore further inquiry is warranted.

Research and police investigations have documented drug involvement in specific crashes and have led to the conclusion that drug-impaired driving has been a causative factor in some crashes. Drivers are regularly—but relatively infrequently—detected, arrested, prosecuted, and convicted for drug-impaired driving. These specific instances lend credence to the belief that a drug and driving problem exists. Unfortunately, the magnitude of the drug and driving risk is unknown, and it must be established before drugs and driving can be justifiably

termed a highway safety problem and a priority for its resolution established. The evidence to date has not established that drugs other than alcohol should have high priority among highway safety concerns.

RESEARCH FINDINGS: EPIDEMIOLOGY

Epidemiology in drugs and highway safety attempts to determine whether the use of drugs increases the likelihood of a traffic crash. One aim of epidemiologic research is to identify which drugs and which drivers should be targets for countermeasure action.

Epidemiologic studies of drug use among drivers include:

- the chemical analysis of drivers' body fluids (blood) for the presence and amount of drugs;
- questionnaires that obtain self-reported data from drivers about their use of drugs; and
- examination of driving records of those who use drugs.

Studies that do not include the analysis of drugs in body fluids are not considered valid and reliable indicators of the drug and driving problem. Because it is not possible to positively identify that drugs were present, results of these studies do not provide an adequate basis for defining the relationship between drugs and highway safety.

In addition to research studies, some police agencies and offices of medical examiners or coroners compile data on traffic cases involving drugs. Because all eligible cases are not reported or because a single local area is represented, these findings do not support general statements about drugs and driving. Nevertheless, we must place a certain degree of reliance on them because of the lack of valid information on drug use among drivers.

Definitive studies would be those which compare the incidence of drug use among accident-involved drivers with a suitable companion group of non-accident-involved drivers. Without this comparison, findings of drug use among drivers involved in crashes or arrested for impaired driving cannot be interpreted to indicate the danger posed by drugs. Studies using suitable control groups have not been done to date, because of the Department of Transportation's desire to reduce inconvenience to the public (e.g., trip delay, being asked to give volunteer body fluid samples). However, after conducting a number of workshops attended by experts from both the public and private sector, DOT is convinced that there is no viable alternative to roadside surveys.

MARIJUANA

Until recently, the lack of chemical tests to detect marijuana use limited marijuana and driving studies to indirect approaches. A questionnaire study in Canada found that about one-fourth of 246 students, at least once in the preceding year, drove after using marijuana (Smart 1974). However, the length of time between using marijuana and driving was not determined. In the United States, a similar proportion of students reported driving after marijuana use (Mortimer 1976).

Information obtained through interviewing friends and relatives of drivers judged responsible for a fatal accident led Sterling-Smith and Graham (1976) to conclude that 43 out of the 267 drivers were under the influence of marijuana. Since the data were obtained by interviews, the only conclusion that can be drawn is that the people interviewed believed that the drivers had used marijuana. It is not possible to determine without an analysis of the blood, which was not available at the time, whether in fact the drivers had been under the influence of marijuana just prior to the accident. This study, widely cited in the popular literature, is among those which indicate a potential marijuana problem. However, the percentage of marijuana-involved accidents reported in this study cannot be accepted as a valid indicator of the extent of marijuana involvement in fatal accidents.

The development of chemical tests for presence of marijuana has led to more direct evidence linking marijuana and highway safety. Teale et al. (1977) reported that blood specimens from 6 of 66 car and motorcycle drivers contained cannabinoids (chemicals derived from marijuana). Reeve (1979) reported on chemical tests for delta-9-tetrahydrocannabinol (THC), an active agent in marijuana, in blood specimens from 1,792 California drivers who were arrested for impaired driving. Of these, 285 (16%) tested positive for THC. This cannot be interpreted to mean that any or all of these drivers were impaired by marijuana. Only 45 of those 285 (2.3% of the 1,792 total) tested positive for THC alone;

the remaining 240 also tested positive for alcohol, with 100 having greater than 0.10% w/v BAC, the legal limit of impairment. Finally, the largest percentage of specimens positive for THC were from drivers aged forty to sixty-one years, a pattern contrary to usage among age groups determined by numerous questionnaire-based surveys.

Information on the frequency of marijuana use by drivers and its contribution to traffic crashes is as yet sketchy. Preliminary research has produced limited data that have been widely quoted to mean that 16% of traffic crashes involve marijuana as a contributing factor. The reported facts do not support this conclusion. It is believed that more realistic estimates would range from below 1% to 5%. These latter estimates take into account: (1) the combined use of marijuana and legally impairing levels of alcohol, and (2) the uncertain meaning of low levels of marijuana constituents in blood. At present, the presence of detectable amounts of marijuana constituents after observable behavioral effects have ceased precludes definite interpretation of analytical results in terms of driver impairment.

SEDATIVES AND HYPNOTICS, INCLUDING ANTIANXIETY AGENTS

Sedative-hypnotic drugs include barbiturates and nonbarbiturates. Those antianxiety agents which have similar effects are primarily represented by benzodiazepines, diazepam (Valium) (R)*, chlordiazepoxide (Librium (R)). Most studies are reported by forensic laboratories investigating cases of traffic deaths or impaired driving. For example, White et al. (1979) found that 358 (29.6%) of 1,819 impaired drivers suspected by the police of being impaired, but who had less than the legal limit for alcohol, had these drugs in their bodies. In a group of drivers arrested for driving under the influence of drugs (DUID), Garriott and Latman (1976) reported that 97 of 135 drivers had used one or more drugs other than alcohol alone; almost all positive finds were sedative-hypnotic or antianxiety agents. A lower incidence of these drugs has been found in fatally injured drivers. Garriott et al. (1977) described twenty-three instances in which drugs or drugs with alcohol were detected in a sample of 127 cases. Diazepam was found 13 times, sedative-hypnotics 6 times.

OTHER DRUGS

The frequency of use of other drugs has not been as widely studied. For example, Lundberg, White, and Hoffman (1979) studied cases in which blood samples were taken from drivers stopped for problem driving. They found that analyses were not usually done for

*(R) signifies Registered Trademark

morphine and other narcotics, cocaine, amphetamines, and antidepressants. The reported incidence of these drugs (e.g., Garriott and Latman 1976) probably do not represent an accurate estimate since most screening methods employed have not been sensitive enough to detect the small amounts of these drugs present in blood. In 1978, however, White et al. (1979) found 125 (6.9%) of blood specimens positive for phencyclidine (PCP, commonly called "angel dust", a dissociative anesthetic) and 51 (2.8%) positive for morphine, in a sample of 1,819 impaired drivers with less than 0.10% w/v BAC. The results of epidemiologic research done to date indicate that the involvement of these lesser used drugs in traffic crashes may be an order of magnitude (i.e., a ten to one difference) less than that of alcohol. In any case, the meaning of percentages of use as indicated above is impossible to determine, since comparable groups of drivers from the general driving population were not included in the studies.

CRITIQUE

The conclusions that can be drawn from past epidemiologic research studies have been limited by methodological problems and other important constraints, including:

- nonrepresentative groups of drivers studies, with invalid comparisons between accident-involved and general driving populations;
- methods to detect and measure drugs in blood were inadequate or unavailable.

Another major constraint has been imposed by the interpretation of the Federal Reports Act of 1942 regarding the conduct of public roadside surveys of drug use by drivers. In roadside surveys, the voluntary participation of motorists is solicited, with assurances that the strictest confidentiality will be maintained regarding any data obtained as a result. Without such studies, the highway safety implications of drug use by crash-involved or arrested drivers will remain unclear, because it is not possible to determine if the drug is overrepresented in the crash or arrest population.

Questionnaire studies of drug use in driving-age populations and other indicators of drug use (e.g., sales of psychoactive prescription drugs) suggest that drug use is widespread, but not necessarily in conjunction with driving. In some instances, of course, the appropriate use of drugs may significantly reduce the impairment caused by the condition for which the drug was taken. The scarcity of other information has led to reliance on experimental research for estimates of drug use and driving risks.

RESEARCH FINDINGS: EXPERIMENTATION

The basic purpose of experimental research is to assess the potential increase in the likelihood of traffic crashes due to drugs. Approaches used to measure drug effects include driving in actual vehicles, driving in vehicle simulators, and special laboratory tests or test batteries. The study of drug effects on measures of driving performance and related skills has produced a large but widely dispersed volume of literature. Despite the many reports, information relating drug effects and performance on laboratory tests of driving behavior to traffic crashes is quite limited. The reasons for this include the large number of drugs to be studied, the wide range of methods used to measure behavior, low levels of funding, and the comparatively few research groups available to conduct needed studies.

MARIJUANA

Experimental research on marijuana has used a number of methods to measure driving performance and related skills. A study under actual road conditions showed the effects of marijuana adversely affect driving performance, though some subjects performed better (Klonoff 1974). Hansteen et al. (1976) used tests on a closed driving course to compare the effect of alcohol and marijuana. The higher of two doses of marijuana resulted in poorer car handling, as measured objectively, while observers in the test car rated the subject's performance similar to placebo conditions. Studies with driving simulators (Crancer et al. 1979; Rafaelsen et al. 1973; Moskowitz, Hulbert, and McGlothlin 1976; Ellingsstad, McFarling and Struckman, 1973) showed that marijuana degraded performance on some, but not all variables measured. For example, Moskowitz *et al.* (1976) found no significant effect of marijuana on twenty-five performance measures related to car control, such as steering wheel reversals, brake and accelerator pad usage, as well as tracking; however, dose-related increases in subjects' reaction times were observed in subsidiary visual search and recognition tasks. Other laboratory studies, using specific mental, psychomotor, and sensory tests, e.g., time sense, reaction time, perceptual-motor coordination, and auditory signal detection, have also shown impairment by marijuana, depending on dose and type of task (Jones 1977). Some researchers have reported that marijuana appears to decrease the level of risk that a driver is willing to take (Dott 1972), but it is not known if this compensation would be negated by possible impairment of other driving tasks. The combined effects of alcohol and marijuana result in greater impairment than with either drug alone in some laboratory tests (Burford, French, and LeBlanc 1974; Chesher et al. 1976).

Experimental research, taken as a whole, indicates that certain dose levels of marijuana can impair tracking and perceptual functions involved in driving (Moskowitz, 1976). Perception and other complex mental functions appear more affected than simple motor or sensory tasks that demand little processing of information. The few studies involving actual car handling on closed courses support the implications of laboratory tests that marijuana use by drivers, especially in higher doses, can increase the likelihood of traffic crashes. However, whether the differences found in a laboratory are large enough to have impact in an actual driving situation is unknown.

SEDATIVES AND HYPNOTICS, INCLUDING ANTIANXIETY AGENTS

Numerous laboratory studies of sedative-hypnotic and antianxiety agents have been reported. The effects of barbiturates and other sedative-hypnotics are similar to alcohol—for example, impaired thinking, lack of emotional control, aggressive behavior, loss of motor coordination, drowsiness, and decreased eye movement (Sharma 1976). Residual effects similar to “hangovers” have been observed (Borland and Nicholson 1975). Depressants can add to the impairing effects of alcohol (Institute of Medicine 1979, pp. 20-31).

Less obvious impairment of psychomotor skills is produced by antianxiety agents (Seppala, Linnoila, and Mattila 1979, p. 392). Kleinknecht and Donaldson (1975) reviewed twenty-three studies of the effects of diazepam on groups of tests that relate to driving performance. In tests of simple reflexive responding, no impairment was noted; however, on tests of vigilance, choice reaction time, and motor coordination, some indications of impaired performance were reported. The combined effects of the drugs and alcohol may be of greater concern, since antianxiety drugs can further decrease performance impaired by alcohol (Moskowitz and Burns 1977; Palva and Linnoila 1978).

The chronic or repeated use of some antianxiety and sedative-hypnotic agents, especially diazepam, chlorthalidopexide, and flurazepam (Dalmane (R)), leads to accumulation of other druglike agents in the body called active metabolites. Their concentrations and effect can exceed those of the parent drugs. Both cumulative and “hangover” effects of these drugs are attributed to their active metabolites (e.g., Clarke and Nicholson 1978). Alcohol consumed following use of these drugs may enhance the effects of the metabolites (Seppala, Linnoila, and Mattila 1979).

As often noted in literature reviews, however, the use of different test procedures, drug doses, and drug regimens (e.g., acute versus chronic administration) has led to a diversity in findings and has reduced comparability among studies. Nevertheless, in general, these depressant

drugs can and do impair skills associated with driving such as vigilance, motor speed, tracking, and simple and choice reaction times.

OTHER DRUGS

Very little driving-related research has been done on other controlled substances. Gordon (1976) reviewed the influence of narcotic drugs on highway safety and concluded that the available evidence indicates that “the use of narcotics in and of itself does not present a hazard or exist as a significant factor in automobile driving” (p. 6). For example, propoxyphene (Darvon (R)) alone in therapeutic doses did not impair driving-related skills (Kiplinger, Sokol, and Rodda 1974). However acute effects of strong analgesics or abrupt withdrawal in those dependent on narcotics could present a traffic safety hazard (Seppala, Linnoila, and Mattila 1979). Impairing effects of combining strong analgesics or narcotics with alcohol can be presumed.

Given to non-abusers, clinical dosage levels of amphetamines—whose primary effects are stimulation—have been found to improve performance slightly in some driving-related skills, especially under conditions of fatigue (Hurst 1976). Most concern over the use of stimulants by drivers stems not from their positive effects but possible indirect consequences, such as sudden unconsciousness once the stimulants’ effects subside. This is a clear risk for long-distance truck drivers who reportedly use “pep pills” (Wyckoff 1979).

Drugs of abuse have received very little attention in the literature. Phencyclidine (PCP) produces an acute, confusional state with low to moderate doses, one that would certainly impair driving ability (Sioris and Krenzelok 1978). Gross impairment of perceptual performance by hallucinogens, such as LSD and psilocybin, is well known. What is not known is how many users of these drugs attempt to drive while under their influence.

Other psychoactive drugs that are not controlled substances have been studied for their effects on driving performance, for example, antidepressants, antipsychotics (major tranquilizers), antihistamines, and outpatient anesthetics. While a discussion of their effects is beyond the scope of this report, drugs in these and other classes of licit, therapeutic agents have the potential to impair driving (Seppala, Linnoila, and Mattila 1979; Joscelyn et al. 1979).

CRITIQUE

Criticism of past experimental studies of drug effect on driving performance and related skills have identified three problem areas:

- Methods employed to test the effects of drugs do not adequately represent the range or combination of skills required in actual driving performance; standardized test procedures are needed.
- Research designs of experiments intended to demonstrate drug effects on driving-related skills have been weak; in particular, concentrations of drugs in body fluids associated with impairment have not been measured.
- Laboratory studies lack realism, limiting extrapolation to actual driving impairments. To date, test subjects have not been representative of users of drugs in the general driving population.

Furthermore, proper concern for human subjects constrains the kinds of experimental research which can be done in this area. For example, restrictions on the dosage level and frequency of dosage, as set by medical review boards, limits study of the effects of some therapeutic drugs, such as antianxiety agents, in that portion of the driving population which uses these drugs. It should be noted that, in some instances, permissible experimental dosages allowed are less than those normally taken.

SUMMARY

Research to define the nature and magnitude of the drug and driving problem has produced some information on the frequency of drug use among drivers and its possible consequences for highway safety. The present state of knowledge, however, is limited. Experimental studies have shown that marijuana, other controlled substances, and other therapeutic drugs at certain dose levels have adverse effects on skills and other measures associated with driving performance. Epidemiologic research has demonstrated that some drivers involved in fatal crashes or arrested for impaired driving have taken psychoactive drugs. The use of more than one drug, in addition to alcohol, is often found in these driving populations. The lack of adequate comparison samples makes it impossible to draw scientifically valid conclusions about the likelihood of traffic crashes given drug use.

Past research has not fully answered basic questions concerning the specific adverse effects of drugs on skills related to driving performance, and has only begun to define the relations between drug use by drivers and traffic crashes. Regarding the first (which is an experimental question), the selection of subjects not representative of the driving population using the drugs under study, and the lack of adequate behavior tests of driving performance, decrease the relevance of experimental studies. As to the second (which is an epidemiologic question), the absence of surveys that compare the frequency of drug incidence in accident and nonaccident

drivers prevents the meaningful interpretation of studies that only report drug use by drivers involved in crashes or arrested for impaired driving.

The evidence of date indicates that some drugs can impair human behavior and skills related to driving and that drugs may increase the likelihood of traffic crashes. Such information suggests that driving under the influence of some drugs increases the likelihood of traffic crashes. Nevertheless, given present information, the influence of drugs on crash risk can not be specified. However, the involvement of drugs in traffic crashes resulting in death, injury, and property damage appears to be considerably less than that of alcohol. Based on available data, the percentage of drug-involved crashes is in the range of 1% to 15%, including cases of combined alcohol and drug use. This finding clearly warrants further, careful inquiry to define the nature and magnitude of the drug and driving problem. Research has established that many drugs widely used by the driving-age population have the potential to impair driving at commonly used dosage levels. Drugs or groups of drugs of interest for continued highway safety research include:

- analgesics and antipyretics
- anesthetics
- antianxiety agents
- antidepressants
- antihistamines
- antinauseants
- antipsychotic agents
- antivertigo agents
- appetite suppressants
- cardiovascular drugs
- hallucinogens
- marijuana and other illicit substances
- psychostimulants
- sedative-hypnotics

LEGAL APPROACHES TO THE CONTROL OF DRUG USE BY DRIVERS

The use of the deterrent force of the law has been the primary highway safety countermeasure for drugs and driving. The legal approach may be divided into two main categories—drug control and driver control.

Federal laws establish the foundation for drug control. State legislation complements Federal law and provides a basis for local law enforcement.

Driver control laws are primarily State and local. All States have enacted laws that prohibit driving while impaired by drugs. The enforcement of these laws is aided by the analysis of a body fluid sample from the arrested drivers to determine if drugs are present and, if so, in what quantities.

There are potentially two ways of controlling the drugs and driving problem. One is to control the distribution of drugs, and the other is to control the driver who uses drugs. Both of these countermeasures are discussed in this chapter. The chapter begins with a brief discussion of Federal and State drug control laws and then discusses the current capabilities of law enforcement officials to detect the use of marijuana and other drugs by motor vehicle operators.

DRUG CONTROL APPROACHES

Drug control countermeasures are based on both Federal and State statutes. Controls on drug manufacture and interstate distribution have their origin in Federal statutes, while retail distribution is controlled by State statutes that are modeled after the Federal statutes.

Dowling (1971) notes that the major impetus for the Federal drug control laws was the desire to remove inferior, unsafe, and ineffective products from the marketplace and to reduce the abuse of drugs. As medications became more and more potent, legislation was enacted to give the Federal Food and Drug Administration (FDA) the power to require certain drugs

to be dispensed only on the order of a licensed prescriber.

The availability and use of drugs is controlled by two separate but somewhat overlapping sets of legislation. The first, “pure food and drug” laws, deal mainly with quality-control measures aimed at protecting the public from inferior or dangerous products. The second, “narcotics control” laws, are intended primarily to restrict the supply and regulate the use of many drugs that are capable of being abused.

Both prescription and over-the-counter (OTC) drugs are controlled by the Federal statutes. The controls govern the advertising, promotion, manufacture and distribution of these drugs, as well as research and development activities. Narcotics and other substances of abuse are controlled at the Federal level by Title II of the Comprehensive Drug Abuse Prevention and Control Act of 1970, often referred to as the Controlled Substance Act of 1970 or CSA. This Act places each drug into one of five “schedules.” Three criteria are used in scheduling a given drug: the potential for abuse, the degree to which the drug is currently accepted for medical use, and the likelihood that abuse of the drug would lead to psychological or physiological dependence. The more “dangerous” a drug is with respect to these criteria, the lower its schedule number. Thus, a drug that has a high potential for abuse, has no currently acceptable medical use in treatment in the United States, and is considered unsafe for use even under medical supervision would be classified as a Schedule I drug.

State statutes also classify drugs in this way. Any variation between the Federal scheduling and the State scheduling of a drug is resolved by following the more stringent of the two. For example, if a State statute places a drug in Schedule I and a Federal statute places the same drug in Schedule II, then the State regulation takes precedence for the activities of all licensees handling that drug in that State.

The effectiveness of the Controlled Substance Act and other legislation controlling drug abuse has been widely discussed, but no consensus has been reached (The Strategy Council on Drug Abuse 1979; Kaplan 1970; Joint Committee on New York Law Evaluation 1978; Select Committee on Narcotics Abuse and Control 1977; President's Commission on Mental Health 1978, pp. 2103-40). No known attempt has been made to assess the effect of such legislation on highway safety. However, the results of one study conducted for NHTSA, imply that heroin addicts may drive very carefully in order to avoid police detection and they do not have higher accident rates (Blomberg, R.D., and Preusser, D.F., 1972).

DRIVER CONTROL APPROACHES

Legal action to deter drug-impaired driving rests primarily on the traffic laws of the several States. However, individuals stopped for impaired driving who are found to be in possession of an illicit drug may be charged under the appropriate drug control statute in addition to any traffic law charges. The focus in the subsequent discussion is on traffic law enforcement.

DRUG AND DRIVING LAWS

State traffic laws prohibiting drug-impaired driving are patterned after those that prohibit alcohol-impaired driving. In some States the drug and alcohol laws are set forth in a single statute; in other States separate statutes exist. In addition to the basic law which makes impaired driving an offense, all States have enacted an implied consent law to provide for chemical tests of alcohol intoxication. These statutes were passed to facilitate chemical testing for alcohol. If an operator arrested for impaired driving refuses to submit to a chemical test, the operator's license may be suspended. Importantly, these laws allow an operator to refuse a test and accept license suspension as the only penalty. This is a right created by State law that is not required by the U.S. Constitution. Thus, these laws reflect a statement of State policy towards control of impaired driving.

The evolution of traffic law in the United States has been positively influenced by the work of the Committee on Uniform Traffic Laws and Ordinances, which drafts the Uniform Vehicle Code (UVC) as a model for State legislation. The UVC contains model provisions that prohibit drug-impaired driving and provide for chemical testing for drugs. (Relevant sections of the UVC can be found in Appendix A.) The provisions of the UVC are tightly structured to provide for effective law enforcement. Unfortunately, the provisions of many State laws are not as effectively drafted. Significant loopholes exist that favor the drug-impaired driver. Some of these include:

- A definition of drugs so narrow that commonly used substances which can impair driving are not covered.
- A restrictive implied consent statute that provides only for chemical tests for alcohol.
- An implied consent statute that allows the driver to choose the type of test. A driver may elect a breath test—thus, defeating analysis for drugs other than alcohol.
- An implied consent statute that provides for only one test. An impaired driver who passes a test for alcohol cannot be required to provide a body fluid specimen for a second test for drugs.

A preliminary analysis of existing State laws indicates that only ten States have laws that support effective law enforcement. Many of the other States have one or more of the problems cited above. Table 3-1 compares existing State laws with the UVC. The nature of drug-impaired driver control laws is a significant limitation on law enforcement. Law reform is indicated, especially with regard to the use of chemical tests, and the definitions of driving under the influence of alcohol and/or drugs.

DETECTION AND APPREHENSION

Enforcement practices for drug-impaired driving parallel those for alcohol. A drug-impaired driver is usually detected as a result of involvement in an accident, the commission of a traffic violation, or other unusual driving behavior that comes to the attention of a patrol officer. Investigation involves questioning the driver and, in some cases, asking the driver to perform a series of tests at the scene (e.g., walk a straight line, pick up a coin, close his eyes and touch his/her nose, etc.). Use of such tests to detect alcohol impairment has been traditional. If the officer believes the driver is sufficiently impaired, an arrest is made. Unless the driver has admitted drug use or drugs have been found in a search incident to arrest, a chemical test for alcohol (usually a breath test) is commonly given. The results of the test are a guide to further action. If the operator shows alcohol presence above a legal limit, an alcohol-impaired driving charge will likely be made.

If the driver passes a chemical test for alcohol (i.e., tests below the legal limit) and is obviously impaired, a chemical test for drugs will usually be requested in those few States where this may be done. A driver who is obviously impaired (but not by alcohol) is likely to be charged with a drug and driving offense. Those who, in the officer's opinion, are marginally impaired and who pass an alcohol test will probably not be charged.

Combined alcohol and other drug use is common. Anecdotal reports indicate that some illicit drug users

ingest a small amount of alcohol prior to driving with a deliberate view of increasing the likelihood that, if stopped for impaired driving, an alcohol breath test will be given. Since the test will show a low BAC, in most cases the user will escape any further legal action. State laws which provide only for a breath test, or allow only one test, facilitate such behavior.

Arrest statistics for drug-impaired driving demonstrate that law enforcement action is being taken, but relatively

infrequently. About 100 arrests are made for alcohol-impaired driving for each arrest for drug-impaired driving. Table 3-2 presents some typical data. No precise estimate of the total number of drug-impaired driving arrests can be made. A rough approximation would be that about 10,000 drug-impaired driving arrests are made each year in comparison to nearly one million alcohol arrests.

TABLE 3-1

Comparison of State Driving Under the Influence of Drugs (DUID) Law Conformity With Uniform Vehicle Code (UVC) Provisions

State	DUID Applies to Any Drug?	DUID Applies to All Combinations of Alcohol and Drugs? (a)	May Officer Designate Blood Tests?	May Two or More Tests Be Administered?	May Samples be Analyzed for Drug Content?
	UVC S. 11-902 (a) (3)	UVC S. 11-902 (a) (3)	UVC S. 6-205.1 (a)	UVC S. 6-205.1 (a)	UVC S. 6-205.1 (a)
Alabama	NO(b)	NO	NO(g)	YES	NO
Alaska	NO(c)	NO	NO(h)	YES	NO
Arizona	YES	NO	NO(h)	YES	NO
Arkansas	³ YES	NO	NO(g)	YES	NO
California	YES	YES (1971)	NO(i)	NO	NO
Colorado	YES	NO	NO(g)	NO	NO
Connecticut	YES	NO	NO(i)	NO	YES
Delaware	YES	YES (1979)	YES	NO	NO
Florida	NO(c)	NO	NO(h)	NO	NO
Georgia	YES	YES (1971)	YES	YES	YES
Hawaii	YES	NO	NO(i)	NO	NO
Idaho	YES	YES (1971)	NO(z)	NO	NO
Illinois	YES	NO	NO(h)	NO	NO
Indiana	NO(c)	NO	NO(z)	NO	YES
Iowa	YES	YES (1979)	NO(g)	YES	NO
Kansas	YES	NO	YES	NO	NO
Kentucky	YES	NO	YES	NO	NO
Louisiana	NO(d)	NO	YES	YES	NO
Maine	YES	NO	NO(i)	NO	NO
Maryland	YES(c, d)	YES (1979)	NO(z)	NO	NO
Massachusetts	NO	YES (1979)	NO(h)	NO	NO
Michigan	NO(c)	YES (1971)	NO(j)	YES	NO
Minnesota	NO(c)	YES (1971)	NO(g)	NO(k)	YES
Mississippi	YES	NO	NO(h)	YES	NO
Missouri	YES	NO	NO(h)	NO	NO
Montana	YES	NO	YES	NO	NO
Nebraska	YES	NO	NO(g)	NO(l)	NO

TABLE 3-1 (continued)

Comparison of State Driving Under the Influence of Drugs (DUID) Law Conformity With Uniform Vehicle Code (UVC) Provisions

State	DUID Applies to Any Drug?	DUID Applies to All Combinations of Alcohol and Drugs? (a)	May Officer Designate Blood Tests?	May Two or More Tests Be Administered?	May Samples be Analyzed for Drug Content?
	UVC S. 11-902	UVC S. 11-902	UVC S. 6-205.1	UVC S. 6-205.1	UVC S. 6-205.1
	(a) (3)	(a) (3)	(a)	(a)	(a)
Nevada	YES	NO	NO(g)	NO	NO(m)
New Hampshire	NO(c)	NO	YES	YES	YES
New Jersey	NO(d)	NO	NO(h)	YES	NO
New Mexico	YES	NO	NO(h)	YES	NO
New York	YES	NO	NO(z)	NO(l)	YES
North Carolina	YES	NO	YES	YES	NO
North Dakota	NO(b)	NO	YES	YES	NO
Ohio	NO(e)	YES (1971)	YES	YES	NO
Oklahoma	YES	NO	NO(i)	YES	NO
Oregon	NO(f)	YES (1971)	NO(h)	NO	NO
Pennsylvania	NO(c)	YES (1971)	NO(h)	NO	NO
Rhode Island	NO(d)	YES (1971)	YES	NO	YES
South Carolina	YES	NO	NO(h)	NO	NO
South Dakota	NO(c)	YES	NO(z)	NO(l)	NO
Tennessee	NO(d)	NO	NO(z)	NO	YES
Texas	NO(c)	NO	NO(h)	YES	NO
Utah	YES	YES (1971)	YES	YES	YES
Vermont	YES	YES (1971)	YES	NO(z)	YES
Virginia	YES	NO	NO(i)	NO	NO
Washington	YES	NO	NO(h)	YES	NO
West Virginia	YES	YES (1971)	NO(g)	NO	NO
Wisconsin	NO(c)	NO	YES	YES	YES
Wyoming	NO(c)	YES (1971)	YES	NO	NO

- (a) The 1971 UVC prohibited driving while under the influence, etc., of a combination of alcohol and a drug. A 1979 UVC amendment also prohibited driving while under the influence, etc., of a combination of two or more drugs. States in conformity with either version are listed, with the particular version noted in brackets.
- (b) Only narcotic drugs are included within the DUID definition of "drug."
- (c) Only controlled substances (as defined by State law) are included within the DUID definition of "drug."
- (d) Only those substances or classes of substances listed in the DUID statute are included within the DUID definition of "drug."
- (e) Only "drugs of abuse" (not further defined) are included within the DUID definition of "drug."
- (f) Only narcotic drugs and "dangerous drugs" (not further defined) are included within the DUID definition of "drug."
- (g) The driver may refuse a blood test and instead take another test designated by the officer.
- (h) The only chemical test authorized by law is the breath test.
- (i) The driver may choose from among available tests.
- (j) The driver may demand a breath test in lieu of a blood or urine test.
- (k) State law provides for prearrest screening tests, but the test may be refused without penalty.

- (l) State law provides for prearrest screening tests, but those tests apply to alcohol only.
- (m) Chemical analysis is authorized only for the presence of controlled substances.
- (z) Statute is ambiguous or does not address this point.

TABLE 3-2

Arrests for Driving Under the Influence of Drugs (DUID) and Driving Under the Influence of Liquor (DUIL) in Phoenix, Arizona; North Carolina; and Texas

Year	Number of Arrests for DUID			Number of Arrests for DUIL		
	Phoenix, Arizona	North Carolina	Texas	Phoenix, Arizona	North Carolina	Texas
1976	N.A.	253	N.A.	N.A.	37,655	N.A.
1977	89	283	N.A.	9,627	37,053	N.A.
1978	84	290	311	11,232	42,391	40,621
January- June 1979	73	N.A.	N.A.	7,754	N.A.	N.A.
August 1979	N.A.	32	N.A.	N.A.	3,712	N.A.

N.A.—Data presented were provided by the respective jurisdictions. Missing data were not readily available.

DRUG ANALYSIS

Evidence in drug-impaired driving cases may include the results of chemical tests showing the presence and amounts of drugs in body fluids. Presently, blood is the only specimen from which meaningful results can be obtained. Chemical tests for drugs in blood are more involved than those for alcohol and require more complex laboratory methods. Alcohol is a single, simple chemical, while many other drugs are more complex. Several techniques may be employed for detection. More complex methods may be needed to measure the concentrations of drugs detected.

Although methods have been developed to analyze blood for almost all drugs, including marijuana, not all have been fully evaluated for use in court proceedings. In most cases they are not available in those laboratories serving operational agencies, where older, less expensive techniques are employed. The detection of drugs other than alcohol is not a routine procedure except in research laboratories and in a few forensic laboratories. Because of the cost of drug analyses, many forensic laboratories limit drug analysis to specimens with blood alcohol below legal limits. Most laboratories associated with police agencies or offices of medical examiners indicate that current workload and limited funding—not lack of interest—prevent greater activity in the area of drugs and driving.

The results of chemical tests for drugs can be used to establish the presence of some drugs. Although drug presence is usually an essential element of proof in a drug-impaired driving case, mere presence is not sufficient to

support a conviction. Measurements of the amount of the drug (quantitation) are required for appropriate interpretation.

The ability to detect and measure the level of drugs in blood has surpassed the ability to interpret the meaning of the results of such analyses. Most psychoactive drugs including those commonly used for therapeutic purposes are much more chemically complex than alcohol. Drug effects vary much more from individual to individual than do the effects of alcohol. In addition, a tolerance to some drugs is developed. A chronic user may tolerate a dosage that would render unconscious someone taking the drug for the first time. The problem of interpretation is further compounded because some drugs remain in the body for many days long after the drug effects have stopped. Presence cannot always be equated with effect.

Thus, for potentially impairing drugs other than alcohol, determining the relationship between degree of impairment and blood concentration levels that will be valid for all (or even for most) users will be extremely difficult and, for some drugs, may be impossible. As a consequence, the outlook is not bright for establishing specific blood concentration levels of such drugs as evidence of impairment. Unfortunately, the problem of interpretation is made more difficult when drugs are taken in combination with alcohol. This type of use appears common. Each substance may be present in an amount that would be unlikely to impair driving, but taken together might impair driving. General knowledge of combined drug interactions exists. However, precise knowledge of the effects of various combinations of

drugs, or of drugs and alcohol, on driving behavior does not exist.

Qualified experts testifying in drug-impaired driving trials carefully limit their testimony to present knowledge. Expert testimony that a drug was present in a sufficient amount to impair driving behavior is usually limited to those cases where the drug level is high—a level much higher than that associated with the customary therapeutic dose, or a level usually associated with misuse or abuse—and could be expected to produce gross signs of impairment. However, actual driving impairment might well occur at much lower levels.

Thus, the most telling evidence in a drug-impaired driving case is likely to be the testimonial evidence establishing the driver's actions and reactions at the time of the offense rather than the chemical test results which indicate presence and concentration levels. Such test results may constitute persuasive supporting evidence but they do not have the same evidentiary value as do chemical test results for alcohol. Clearly, the foregoing discussion does not lead to optimism about developing test procedures and legal actions for drugs that are based on blood level concentrations, and as such, would be operationally equivalent to those used in connection with alcohol. Nevertheless, the fact that impairment has been used successfully—albeit in connection with other evidence—to establish guilt in cases involving drug use and driving, has promising implications for this direction and success of future countermeasure development.

ADJUDICATION

Prosecution and adjudication of drug-impaired driving cases follow the usual criminal justice model. In some cases the offender simply pleads guilty. In contested cases, plea bargaining is common. Because chemical tests legally could not be, or were not administered, evidence of drug presence or use is often lacking. In those cases where chemical tests were administered, and the analytic results are available, an expert witness must be called to introduce the evidence, establish the validity of the analysis procedure, and interpret the results. Sometimes two expert witnesses must be called. One testifies about the chemical analysis techniques, and the second interprets the findings. Trial of a contested drug and driving offense is complex, expensive, and time consuming.

Even with expert testimony, the outcome is not certain. The knowledge about drug effects on driving is not widely available or uniformly accepted within the scientific community. Conflicting views are often expressed by expert witnesses. In general, prosecutors view drug-impaired driving cases as difficult to prosecute. The probability of a conviction is seen as significantly lower than for an alcohol-impaired driving case. Thus, many drug-impaired driving cases are plea bargained to a lesser

charge (e.g., reckless or impaired driving). Some cases are never brought to trial.

The case disposition process undoubtedly influences enforcement officers in their decision on charging a driver suspected of drug-impaired driving. It is likely that arrest frequency would be higher if laws were modified and prosecutions were more vigorous. It is equally likely that conviction rates would be higher if better evidence-gathering and presentation techniques were used.

The sanctions or punishments prescribed by law for those convicted of drug-impaired driving are similar to those for alcohol-impaired driving. In actual practice, drug-impaired drivers are likely to receive more severe sanctions. In part, this is because society views a “drug offense” as more serious than an alcohol offense, and also because drug-impaired drivers are reported to be more likely to have had prior court involvements. To date, very few drivers have been convicted for DUID where an appropriately used therapeutic drug was involved.

There are three basic types of sanctions used for individuals convicted for drug-impaired driving offenses: traditional punitive sanctions (fine and jail), health/legal (referral to education and treatment programs), and action by the driver license authority (suspension or revocation). In those jurisdictions that have developed a health/legal approach for dealing with alcohol-impaired drivers or who have drug abuse education and treatment programs, referral of individuals convicted of drug-impaired driving offenses to education and treatment programs is likely.

The content of education programs and the protocol for treatment programs is locally established. No rigorous evaluation has been performed of such programs, so that their effectiveness is unknown. Similarly, evaluations have not been performed to determine the effectiveness of traditional sanctions or driver license control actions in dealing with drug-impaired drivers. Evaluations of these types of programs have been attempted for alcohol, but no evidence establishes that these findings can be applied to the area of drug use and driving.

Thus, the *actual deterrent effect of alcohol-impaired-driver-control laws is unknown*. There is a widely held belief that such laws are necessary. There is however no evidence either to support or controvert that belief.

SUMMARY

Legal approaches constitute the primary countermeasure presently used to deal with drug use and driving. Drug control laws at the Federal and State level attempt to regulate the availability of substances with the potential to impair driving.

Laws prohibiting impaired driving exist in all States, and for alcohol, States have “implied consent” laws as well that provide for chemical testing of intoxicated

drivers. On the other hand, for drugs other than alcohol, most State laws have significant loopholes that impede effective law enforcement. Only ten States have effective combinations of drug and driving laws. Law reform is needed.

Enforcement of drug-impaired driving laws parallels the enforcement of alcohol-impaired driving laws. Drivers are detected, charged, prosecuted, convicted and sanctioned. When State laws allow and laboratory resources are available, chemical test evidence is used. This is relatively infrequent.

Arrest statistics indicate that about 1 drug-impaired driving arrest is made for each 100 alcohol-impaired driving arrests. A rough estimate is that there are about 10,000 drug-impaired driving arrests each year. Contested cases are difficult and expensive to prosecute, and plea bargaining is common. However, convicted offenders are likely to receive more severe sanctions than those convicted of alcohol-impaired driving. Sanctions may include referral to education and treatment programs, and driver license actions such as suspension or revocation in addition to, or in lieu of, the traditional sanctions of fine and imprisonment.

When blood samples can be obtained, chemical tests are used to detect and measure the amount of drugs present. The results can establish the presence of a drug. This alone is not sufficient for conviction, but, when combined with other evidence of impaired driving, it can support a conviction. Interpretation of the drug concentration level found is difficult because of the lack of scientific documentation of the relationship between specific levels of drugs—alone or in combination—and driving impairment. Expert testimony is required to present any interpretation. Qualified experts generally conclude that impairment exists only in those cases where the drug levels are very high—significantly above a therapeutic level—and where gross impairment may reasonably be expected. Actual driving impairment may occur at much lower levels.

At present, chemical test evidence for drugs is persuasive and supportive but does not have the evidentiary value that chemical test results have for alcohol. The primary evidence in a drug-impaired driving case is the evidence of the driver's actions at the time of the offense charged.

The present capability of law enforcement to detect and prevent the use of marijuana and other drugs is limited by two primary constraints:

- State traffic laws that preclude effective law enforcement, and
- a lack of information on the relationships between specific drug levels and driving impairment.

The first constraint can be addressed in the near-term future by law reform at the State level. The second constraint can only be addressed through careful study over a period of time. Even then, conclusive results are not likely for all drugs.

FEDERAL AND STATE ACTIVITY IN THE DETECTION AND PREVENTION OF INAPPROPRIATE DRUG USE BY DRIVERS

Present and planned activity in the detection and prevention of inappropriate drug use by drivers entails three kinds of efforts at the Federal and State levels:

- research and development of methods to detect drug use by drivers;
- research to define the magnitude and scope of the drug and driving problem; and
- activity directed at preventing inappropriate drug use by drivers as well as inappropriate driving by persons who must take drugs.

The term "inappropriate drug use" in this report refers to the use of drugs by drivers so as to degrade their ability to drive safely regardless of what therapeutic effects a drug might have. Federal and State programs in each of these three categories are described below.

ANALYSIS OF DRUGS IN BLOOD SPECIMENS

Adequate methods to detect presence and concentration of drugs in body fluids of drivers are required both by researchers and by agencies that deal with drivers impaired by drugs. Researchers at the Federal and State levels are currently developing and testing methods of analyzing body fluids for drugs, especially marijuana. For example, NHTSA and the National Institute on Drug Abuse currently support a number of projects to advance the state of the art of analytical methodology in highway safety:

- Contract No. DOT-HS-7-01527: *Development and Validation of New Marijuana Technology* (Missouri University, Kansas City, School of Medicine). This project is concerned with developing practical means for measuring the amount of marijuana constituent(s) in the blood.

- Contract No. DOT-HS-7-01737: *Analysis for Drugs in Saliva and Breath* (Research Triangle Institute, Durham, NC). This project is studying the feasibility of developing methods for analyzing breath or saliva or both for detection and quantitation of selected drugs.

The National Institute on Drug Abuse even more extensively supports the development of analytical techniques and methods for analyzing marijuana in body fluids, for example:

- Contract No. 271-78-3528: *Dosage Forms and Analysis for Marijuana Compounds* (Research Triangle Institute, Durham, NC). This is an extensive, multifaceted project that is attempting to develop highly sensitive, specific techniques for analyzing the constituents of marijuana. Also, this project is completing the development and early field testing of routine procedures for analyzing biological materials containing marijuana compounds.

Rapid technical advances in analytical methodology and increased interest in drug analyses have produced widespread activity in this area. Efforts which are not directly related to the drugs and driving problem may at some time in the future have some applicability. Efforts by such diverse groups as the Drug Enforcement Administration, private industry, universities and colleges bear watching for useful products.

EPIDEMIOLOGIC AND EXPERIMENTAL PROGRAMS

Epidemiologic and experimental research on drug use and driving is also ongoing and planned at the Federal and State levels of government. NHTSA is sponsoring a nationwide epidemiologic study of *The Incidence of*

Drugs Among Fatally Injured Drivers (Contract No. DOT-HS-8-02024, University of Michigan Highway Safety Research Institute). The feasibility of a project to determine the incidence of drugs among drivers *not* involved in accidents is currently being studied by NHTSA and the National Institute on Drug Abuse. Combining the data from these two studies would provide insight into the risk of a traffic accident after drug use and would be important to understanding the role of drugs in causing accidents. NHTSA is also sponsoring a study of *Driver Behavioral Errors in Alcohol, Marijuana, and other Drug-Involved Collisions* (Contract No. DOT-HS-5-01179, Calspan Corporation).

Several planned or ongoing epidemiologic studies, germane but less directly related to the subject of drugs and highway safety, are sponsored by the National Institute on Drug Abuse, for example:

- Grant No. 271-76-3313: *Relationship Between Drug Use and Violent Crime in Adolescent Offenders* (Psychiatry Department of the Stanford University School of Medicine). The project is attempting to identify specific drugs that are related to specific delinquent activities and to determine other possible drug effects (e.g., traffic accidents) on juvenile delinquents.
- Grant No. ROI DA 0065-07: *Longitudinal Study of Teenage and Young Adult Drug Use* (Massachusetts General Hospital). The project studies factors (including traffic accidents) related to drug use among teenagers and young adults over a 13-year time period.
- Grant No. ROI DA 01411-04: *Drug Use and Lifestyles of American Youth* (University of Michigan Institute for Social Research). This project administers questionnaires each year to 19,000 high school seniors and includes questions on drug use and driving.
- Grant No. 271-78-3532: *Survey of Drug Related Casualties* (Center for Human Toxicology, University of Utah School of Medicine). This study attempts to determine the incidence of cannabis use among victims of a variety of types of accidents, including traffic accidents.

In addition, the U.S. Veterans Administration is conducting a series of clinical studies of the relationship between drug and alcohol use and behavioral problems, including "trouble driving" (Grant No. 481-44-8279, 640-002-P).

Experimental research into the effects of drugs on driving related behavior is primarily being sponsored at the Federal level by NHTSA and the National Institute on Drug Abuse. NHTSA projects include the following:

- Contract No. DOT-HS-7-1651: *Pharmacokinetic*

Effects of Drugs on Driving Performance (Southern California Research Institute). The project uses a driving simulator to study how driving performance is affected by various levels of use of selected drugs. (This study is being done in combination with NIDA Grant No. 271-76-3316.)

- Contract No. DOT-HS-5-1257: *Effects of Alcohol and Marijuana on Drivers' Control Behavior* (Systems Technology Incorporated). This project uses driving simulators and in-vehicle tests to study the effects of alcohol and drugs on lateral path control.

Two National Institute on Drug Abuse experimental projects also deal with the effects of drugs on driving performance. The projects are:

- Grant No. ROI 01883-02: *Sensitivity to Driving Impairment with Drugs of Abuse* (Department of Psychiatry, Duke University School of Medicine). This project examines the effects of diazepam and pentobarbital on driving-related psychomotor skills.
- Grant No. 271-76-3316: *Pharmacokinetics of Drug Effects on Driving Performance* (Southern California Research Institute). This project studies effects of selected drugs on driving and other complex tasks, including perception, attention, and information processing.

Other experimental studies sponsored by other agencies of the Department of Health, Education and Welfare are analyzing combined alcohol-drug effects on driving performance, for example, Grant Nos. ROI HL 21672-02 (National Heart, Lung, and Blood Institute) and ROI AA 00301-06 (National Institute on Alcohol Abuse and Alcoholism). Also, the Insurance Institute for Highway Safety is sponsoring a study of the effects of alcohol and other drugs in driving-related skills, and State and local organizations in Pennsylvania are funding a study of the effects of marijuana and alcohol on closed-course driving.

NHTSA'S PLANS IN THE DRUGS AND DRIVING AREA

Clearly the fundamental questions to be answered are: Are drugs a highway safety problem? And if they are a problem, how big is the problem? At present, the NHTSA 403 Plan, a comprehensive planning document completed in 1979 as a general guide for NHTSA research and development in alcohol and drugs through 1984, projects an expenditure of about \$200,000 per year, which will fund or partially fund one or two projects a year. At this funding level, it will not be possible to answer these questions in the near-term future, e.g., 5 years.

The projects included in the 403 plan for each of the five fiscal years are described below:

FY 80—Epidemiological Research *\$100,000*

NHTSA is presently conducting a study which will collect data regarding the incidence of drugs in a fatal accident sample. The National Institute on Drug Abuse has been requested to implement a study to collect the data for the comparison group. If NIDA is able to do the study, NHTSA will provide \$100,000 for the study. As a result of these studies, it will be possible to begin to focus NHTSA's drug research program on those drugs which have the largest degree of overrepresentation. (This is based on an assumption that NIDA will be able to fund this project at a level of approximately \$400,000).

FY 80-81—Develop Improved Detection System with the National Institute on Drug Abuse *\$100,000*

This project involves the development of improved methods to permit the determination of which drugs an individual has active in his/her body. This would permit the use of the same type of testing equipment that is presently used by police to test for the presence of alcohol on a driver's breath.

FY 81— Develop Systems for Modifying Dosage with FDA *\$100,000*

Drugs are routinely administered at special temporal intervals (e.g., once every six hours) which are designed to maximize their therapeutic effects. The physician usually has a number of dosage options open. The objective of this study is to determine whether the impairing effects of these drugs could be significantly reduced, while maintaining the therapeutic value, by altering the drug dosage regimen.

FY 82-84—Develop Techniques to Determine Impairment Effects of Drugs *\$100,000*

The first aspect of this project involves the development of behavioral measures which could be used to determine whether or not a driver was too impaired to drive even though it was not possible to determine on site what the impairment was caused by.

The second aspect of this project concerns the determination of a drug's impairing effect on driving ability. Unfortunately, much of the work currently being done by drug companies for the Food and Drug Administration (FDA), looks at the general negative side effects of the drug, and has not been directed toward answering specific questions regarding the potential

impairing effects of a drug on driving. In fact, the approach has been to include a general caveat in a drug's basic information literature indicating that the individual should not operate machinery while under the influence of the drug. Those drugs (psychoactive agents) which by the very nature of their observed effects, have a high probability of being overrepresented in the fatal population, will be studied to determine their specific impairing effects and how long they last. This work will be done in cooperation with the National Institute on Drug Abuse.

In addition to formal, federally sponsored research, State and local efforts to compile data on drug use and driving continue. A few offices of medical examiners and coroners analyze specimens from most drivers fatally injured in their jurisdictions. Special State efforts focus on fatally injured, injured, and arrested drivers, supported at least in part by highway safety grants from the U.S. Department of Transportation.

PREVENTION EFFORTS

Ongoing efforts to prevent traffic crashes due to drug-impaired driving are devoted almost entirely to the following:

- State and local enforcement of driving under the influence of drugs (DUID) and Federal and State enforcement;
- educational programs employing formal classroom-oriented mechanisms of information transfer; and
- public information and education (PI&E) programs using more informal mechanisms.

Federal, State, and local enforcement programs were discussed in Chapter III. Education and PI&E programs are discussed here. Education programs tend to fall into the following five categories:

- driver education,
- general health education,
- drug abuse and substance abuse education,
- professional medical education, and
- professional education for highway safety specialists.

In contacts with 195 operational State and local agencies, only three (1½%) said that they had drug-and-driving education programs which were conducted apart from court referral programs. All of these programs were in the driver education category. The Oakland County, Michigan, Office of Substance Abuse has a program to show teachers of driver education courses how to present information on substance abuse and driving to high school students. The University of Alaska Center for Alcohol and Drug Addiction Studies is starting a three- to four-day unit on drugs and driving as a part of a six-week driver education course for high school students. The

American Association for Retired Persons devotes "about 10%" of its six-week driving safety program to the problem of driving after taking prescription drugs.

Five of the State and local agencies (3%) contacted said they had or formerly had PI&E programs dealing directly with drugs and driving. The agencies and their programs are:

- Virginia Pharmaceutical Association—A comprehensive public information program emphasizing polydrug use aimed at health professionals and the public;
- Minnesota State Pharmaceutical Association—a program for distributing to State pharmacists materials containing information about the dangers of driving after taking certain drugs;
- Minnesota Department of Public Safety—A program to develop and distribute to licensed drivers a brochure on the effects of drugs on driving;
- Alabama Department of Mental Health—A program for distributing to females aged sixteen to twenty-six years an article on the effects of marijuana and Valium (R) on driving and other tasks; and
- Do it Now Foundation of Phoenix, Arizona—A pamphlet on the effects of alcohol and drugs on driving.

Other State agencies (for example, Texas and Florida) said that they regularly distribute information on drugs and driving to the public. One private company (Eli Lilly & Company) reported disseminating information on the effects of Darvon (R) on driving to physicians, pharmacists, and consumers.

Contacts indicate that the Department of Defense has the broadest range of drug abuse programs for its personnel of any Federal agency. For example, relevant Air Force alcohol and drug programs include:

- rehabilitation programs for drug abusers,
- alcohol and drug education programs for personnel convicted of driving under the influence, and
- alcohol and drug education programs for personnel reporting to a new duty station.

A very small percentage (less than 5%) of these programs addresses drugs and driving explicitly. The Air Force also provides some information on drugs and driving in its Driver Rehabilitation Program and in its standard program on traffic safety for persons entering the service. Its *Driver* magazine has published an article related to the problem of drugs and driving. The Air Force programs appear to emphasize alcohol and marijuana as the substances of abuse.

Army education programs on drug abuse are of two basic types:

- prevention programs on the hazards of drug abuse

(typically a two-hour session every three months); and

- rehabilitation programs for individuals with drug problems.

Neither of these deals explicitly with drugs and driving to any significant extent. The same is true for Army programs in traffic safety, which typically devote only a small portion of a one- to two-hour unit to drugs and driving.

This Navy's educational program in drug abuse is built into the Naval Alcohol Safety Action Program (NASAP) for persons with alcohol and drug problems. Its thirty-six hour curriculum emphasizes alcohol, but some mention is made of drug effects on driving. The Navy also has an extensive Alcohol and Drug Rehabilitation Program for persons who need treatment for alcohol or drug abuse. Also, all naval personnel under twenty-six years of age must participate in an eight-hour traffic safety course when they enter the service. The course treats drug effects on driving among other topics.

PI&E programs on drugs and driving appear to be fairly rare in the Federal government. The Drug Enforcement Administration of the Department of Justice distributes information on drugs in general upon request. As noted above, the Air Force monthly magazine, *Driver*, sometimes publishes relevant information. The Food and Drug Administration of the Department of Health, Education and Welfare periodically conducts PI&E campaigns that touch on drugs and driving and issues advisories to medical professionals on the adverse effects (including effects on driving) of drugs.

SUMMARY

Efforts to develop methods for detecting drug presence in the body have increased greatly over the last ten years, paralleling increased awareness of psychoactive drug use and its possible hazards, including the hazards of traffic accidents. Both NHTSA and the National Institute on Drug Abuse are supporting research projects to advance the state of the art of analytical methodology for highway safety applications. Other governmental agencies and private organizations are supporting similar activities not explicitly directed at highway safety but which will, if successful, improve the ability to detect drug usage among drivers. Despite this activity, much work remains to be done before effective measurement techniques can be made available to support legal approaches to the detection and prevention of impaired driving.

Research into the use of drugs in driving populations (i.e., epidemiologic research) is in a relatively early stage. A current project sponsored by NHTSA is studying the incidence of drugs among fatally injured drivers, which may be complemented by a National Institute on Drug Abuse study of the incidence of drugs among drivers

using the roads but who have not been involved in accidents. If undertaken, these studies will for the first time enable an estimate to be made of the magnitude of the drugs-and-driving problem in fatal crashes. If it is not possible to conduct roadside surveys of the general driver population, then it will be necessary to rely only on experimental findings. It is not likely that experimental data alone would be strong enough to warrant legal action to be taken against an individual who was found to be driving under the influence of any one or more of a wide variety of drugs.

Other epidemiologic studies sponsored by the National Institute on Drug Abuse and other agencies are exploring drug use and its effects on various populations and will also be useful in defining the dimensions of the problem.

Experimental research is also essential to understanding the effects of drugs on driving behavior. A wide variety of relevant studies is being sponsored by Federal agencies (including NHTSA and the National Institute on Drug Abuse), and many of these are dealing directly with drug effects on specific driving-related tasks. Marijuana and alcohol-drug effects appear to be receiving the most emphasis in the studies.

There appears to be relatively little State and local activity to deal with the current drugs-and-driving problem through information and education programs. A few States include material on drugs and driving in their driver education courses for high school students, but other educational modes (e.g., general health education and professional medical education) do not appear to be used to any significant extent. Within the Federal government, the Department of Defense has an extensive program in the area of drugs. The program provides both education and treatment and has components that deal with drug-impaired driving. Public information and education programs in the Federal government are scarce and are, for the most part, conducted by the Food and Drug Administration.

CONCLUSIONS, RECOMMENDATIONS AND DEPARTMENT OF TRANSPORTATION PROGRAMMATIC ACTIONS

CONCLUSIONS

Many drugs that have the potential to impair driving are taken by people who drive. Case reports establish that drivers who have used drugs are involved in traffic crashes. Drivers arrested for impaired driving have also been found to have taken drugs—either alone or in combination with other drugs or alcohol. The limited knowledge about the drug and driving problem supports the following conclusions:

- With the exception of alcohol, no drug has been established to be a high priority highway safety concern.
- The frequency with which drug-impaired drivers drive, are arrested, or are involved in crashes is not fully known.
- Drugs which may impair driving include certain prescription and over-the-counter drugs as well as certain illicit drugs.
- Presently available information on marijuana and driving is incomplete and does not support arguments either for or against establishing marijuana as a high priority highway safety concern.
- The magnitude and scope of the highway safety problem due to inappropriate use of drugs by drivers cannot be adequately determined without roadside surveys to determine the nature and extent of drug use by drivers who are not involved in accidents or suspected of impaired driving. DOT will continue these essential studies by proposing to the Office of Management and Budget appropriate roadside surveys which will be designed to minimize the burden on the general public.

Drug-impaired driving is perceived by many as a highway safety problem; and, in fact, State laws exist

prohibiting it in all fifty States. Law enforcement and education countermeasures are the most common reactions to the problem of drug use and driving.

The effectiveness of law enforcement is limited by existing State laws. The laws of forty States contain significant loopholes that preclude the effective prosecution of a contested drug and driving case. For example, in twenty-nine States, a driver can effectively avoid a blood test that would detect a drug other than alcohol. In fact, thirteen of those States have restrictions so that only a breath test, ineffective in detecting drugs, can be given to conscious drivers. Other problems also exist (e.g., the legal requirement to specify which drugs should be sought in tests; inability of the forensic facilities to test for the wide range of drugs presently being used; inability to state specifically that a found level of drug is impairing) that restrict the capabilities of law enforcement officials. Until law reforms correct this situation the full deterrent effect of the law will not be realized.

Other constraints also exist. The attitudes of law enforcement officials reflect the experience with alcohol. Practitioners seek an operational and legal equivalent to the blood alcohol concentration (BAC) measure for drugs other than alcohol to support detection and prosecution. Simple, inexpensive devices like the breath tester used for alcohol are also desired. For the foreseeable future this will not be possible. There are several reasons for this:

- Most drugs can be identified and quantified only in blood. Tests that produce meaningful results from the analysis of breath or saliva (or urine for most drugs) are not available for drugs other than alcohol. Further, such tests will not be available in the near-term future, despite the advancements in analytic methods which permit the identification and quantification in blood. At present, blood tests are required to detect and measure the use of drugs by motor

vehicle operators and will continue to be required for the indeterminate future.

- The relationship of specific blood-drug levels to driving impairment has not been established for drugs other than alcohol, except in the case of extreme doses that may be expected to produce gross impairment. Thus, even though a blood-drug level may be determined, it is often not clear what it means in terms of impairment.
- For the foreseeable future, blood-drug levels that are legally acceptable as proof of driving impairment will not be established. The establishment of the relationship between a specific drug level and the impairment of the driving task is a complex and costly undertaking. Sophisticated experimental procedures must be used. Many drugs must be tested, and new drugs are being introduced daily. As drugs are commonly used in combination with other drugs and alcohol, certain of these combinations of drugs must be tested. In addition, for some drugs it may not be technically feasible to establish a specific blood level that is indicative of impairment for all drivers. Thus, it should be clear that the development of the operational equivalent of BAC for most drugs would be a costly and time consuming undertaking. Therefore, alternative approaches must be considered, e.g., the development of a performance test that police officers could use at the roadside to determine probable cause to make an arrest for driving under the influence.

Clearly the fundamental questions still to be answered are: Are drugs a highway safety problem? And if they are a problem, is the problem of sufficient magnitude that it should be dealt with by the Federal Government? Since 1968, NHTSA has awarded about 3.3 million dollars for research on drugs and highway safety. This can be compared to the alcohol research and demonstration program which has had in excess of \$100 million spent in the same time. At present, the NHTSA 403 Plan, a comprehensive planning document completed in 1979 as a general guide for NHTSA research and development in alcohol and drugs through 1984, projects an expenditure of about \$200,000 per year. The programs outlined are designed to answer these fundamental questions. Nevertheless, at this funding level, it will be possible to answer these questions in the near-term future, i.e., 5 years.

RECOMMENDATIONS FOR FEDERAL LEGISLATION

No additional Federal legislation is recommended at this time.

RECOMMENDATIONS FOR STATE ACTIONS

The States are encouraged to revise existing laws dealing with drugs and driving to allow law enforcement to act in conformance with the appropriate sections of the Uniform Vehicle Code, especially with regard to the use of chemical tests, and the definitions of driving under the influence of alcohol and/or drugs. Appendix A contains the wording of each of these sections relevant to drugs.

DOT PROGRAMMATIC ACTIONS

1. The Department of Transportation will continue programs in the drug and driving area. Cooperation with other Federal agencies (e.g., the National Institute on Drug Abuse) would continue to ensure coordination of related activities. Recommended programs include:

- In cooperation with the Department of Health, Education and Welfare and other Federal agencies, the Department of Transportation should develop an information and education program on the potential impairing effects of drugs on driving. Current knowledge would be organized and made easily available for inclusion in existing education and information programs directed at the public, health care providers, health and safety professionals, driver education students, police officers and related education areas..
- Epidemiologic research to identify the frequency of drug use in arrested, accident-involved (fatal and injury accidents), and non-accident-involved drivers. These studies are being developed in cooperation with the National Institute on Drug Abuse and will involve national roadside survey work. These studies will take into account Congress' desire to minimize the burden on the general public.
- Experimental research to establish the relationship between drug levels and driver impairment will be continued. These studies will also provide information on how drugs impair driving. This will support current law enforcement efforts and provide a knowledge base for information and education programs. These studies are being developed in cooperation with the National Institute on Drug Abuse. Coordination will be maintained with the National Institute on Drug Abuse to ensure that the needs of the highway safety practitioners are considered as the development of new analytical methods for the detection and quantification of drugs is pursued.
- Behavioral research to attempt to develop reliable, objective performance tests for driver impairment will be implemented. Such tests would support law

enforcement activity and also provide a basis for research efforts examining drug effects and driver impairment. Performance tests would facilitate the examination of impairment caused by the use of drugs alone or in combination with other drugs or alcohol.

However, these studies have just begun to scratch the surface of the problem. A great number of drugs have potential for creating significant driving impairment. Because of the large number of potentially impairing drugs, as well as the differences in how they might produce driver impairment and lead to accidents, significant time and additional resources will be required before a complete understanding of the driving problem due to inappropriate use of currently available drugs can be developed.

2. The Department of Transportation will propose that the National Academy of Sciences convene a study panel to examine the extent to which the designation of a legal limit of impairment (i.e., for drugs, the equivalent of 0.1 BAC for alcohol) should be relied upon to plan research and operational approaches to deal with other drugs. Using the "BAC equivalent" means using the approach of establishing a quantitative measurement of a drug or drug component in the body as a basis for legal action with regard to drugs and driving. Either the BAC equivalent approach or the approach which requires the development of a performance test for impairment will require a substantial commitment of significant resources. However, it is anticipated that the BAC approach (if it is feasible) will require more money and a longer period of time. Before DOT commits to either approach for dealing with drugs that are potentially dangerous when used in conjunction with driving, it would be desirable to have a review by an independent, nationally or internationally recognized scientific body. Such a review would examine, but not be limited to, the following issues:

- What is the feasibility of developing and implementing reliable, noninvasive chemical tests for drugs other than alcohol (considering cost, personnel resources, legal requirements, and other practical constraints)?
- Is it feasible and practicable to identify drug concentration levels that can be used as valid indicators of driving impairment for drugs other than alcohol?
- Should the legal system, in particular the criminal law system that is the basis for most of our nation's traffic laws, be used as the primary countermeasure approach for a drug and driving problem? Alternative approaches based in administrative law or greater reliance on medical review processes should be examined in this context.

The recommended programs are intended to use existing knowledge to more effectively establish priorities for future research and action programs at the Federal, State, and local levels. The immediate priority is to define the nature and magnitude of the drug and driving problem and make the findings available to State and local officials who must deal with the problem on a daily basis.

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SECTION OF UNIFORM VEHICLE CODE DEALING WITH DRUGS AND DRIVING

- 6-205.1 (a) states that:

Any person who operates a motor vehicle upon the highways of this State shall be deemed to have given consent, subject to the provisions of 11-902.1 to a chemical test or tests of his blood, breath, or urine for the purpose of determining the alcohol or drug content of his blood or arrested for any offense arising out of the acts alleged to have been committed while the person was driving or in actual physical control of a motor vehicle while under the influence of alcohol or any drug. The test or tests shall be administered at the direction of a law enforcement officer having reasonable grounds to believe the person to have been driving or in actual physical control of a motor vehicle upon the highways of this State while under the influence of alcohol or any drug. The law enforcement agency by which such officer is employed shall designate which of the aforesaid tests shall be administered.

- 11-902(a)3 states that:

A person shall not drive or be in actual physical control of any vehicle while. . . . Under the influence of any drug to a degree which renders him incapable of safely driving.

- 11-902(a)4 states that:

A person shall not drive or be in actual physical control of any vehicle while. . . . under the combined influence of alcohol and any drug to a degree which renders him incapable of safely driving.

- 11-902(b) prohibits any person charged with driving under the influence of drugs from using the fact that he has been legally entitled to use the drug as a defense to such a charge.

- 11-902(c) of the UVC sets forth the punishment for conviction of DUID. The punishment is the same as for driving under the influence of alcohol and includes a jail term of ten days to one year and a fine of \$100 to \$1000 for a first offense and for a second or subsequent conviction it calls for a jail term of ninety days to one year and a fine of not less than \$1000.

- 11-902.1(a) of the Code provides:

Upon the trial of any civil or criminal action or proceeding arising out of acts alleged to have been committed by any person while driving or in actual physical control of a vehicle while under the influence of alcohol or drugs, evidence of the amount of alcohol or drug in a person's blood at the alleged time, as determined by a chemical analysis of the person's blood, urine, breath, or other bodily substance, shall be admissible.

- 11-902.1(c) provides that:

If a person under arrest refuses to submit to a chemical test under the provisions of 6-205.1, evidence of refusal shall be admissible in any civil or criminal action proceeding arising out of the acts alleged to have been committed while the person was driving or in actual physical control of a motor vehicle while under the influence of alcohol or drugs.

DOT HS 805 229
February 1980