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Drugged Driving Research: A White Paper

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EXECUTIVE SUMMARY

Drugged driving is a significant public health and public safety problem in the United States and abroad, as documented through a growing body of research. Among the research conducted in the US is the 2009 finding that 33% of fatally injured drivers with known drug test results were positive for drugs other than alcohol. Among randomly stopped weekend nighttime drivers who provided oral fluid and/or blood specimens in 2007, 16.3% were positive for drugs. While these and other emerging data demonstrate the drugged driving problem, the US has lagged behind other nations in both drugged driving research and enforcement.

The White House Office of National Drug Control Policy's (ONDCP) 2010 *National Drug Control Strategy* established as a priority reducing drugged driving in the United States. To achieve the *Strategy*'s goal of reducing drugged driving by 10% by 2015, the National Institute on Drug Abuse (NIDA) enlisted the Institute for Behavior and Health, Inc. (IBH) to review the current state of knowledge about drugged driving and to develop a comprehensive research plan for future research that would hold the promise of making a significant impact by 2015. IBH convened an expert committee to develop this report. Committee members included top leaders across a broad spectrum of related disciplines including research, public policy, enforcement and law. The following eight-point research agenda summarizes the Committee's recommendations.

RESEARCH RECOMMENDATIONS

I. **Evaluate Impaired Driving Laws.** Research on the impact of drugged driving laws, particularly zero tolerance (ZT) *per se* laws and alternative impaired driving laws, in the US and in other nations is needed to identify the most effective ways to reduce drugged driving. These research studies should identify the laws' impacts on the prevalence of drugs in drivers on the road and in drug-related crashes.

II. **Evaluate and Improve Drugged Driving Data Collection.** While existing data collection systems have shown recent improvements in collecting drugged driving data, there are new research opportunities that can significantly improve the data they provide. Specific recommendations include:

- **i.** Fatality Analysis Reporting System (FARS): Conducting an initial study of the testing procedures in FARS states with good medical examiner systems could help determine which states can be used for estimating the current drugged driving level in the US to develop a national tracking system.

- **ii.** National Roadside Survey (NRS): Decreasing the length of time between administrations of the NRS would provide information on drugged driving trends. Oversampling the NRS in high-performing FARS states would permit the study of the relationship of enforcement, deterrence and interdiction and prevalence of drug use in the driving public. Creating a new research data collection system to gather drug data on drivers admitted to trauma centers could be a part of a trial monitoring system with FARS and NRS, capable of providing data to detect emerging problems and to track progress on the ONDCP goal of reducing the incidence of drugged driving.

iii. Drug Evaluation and Classification (DEC) Program: Improving and expanding the DEC Program's Drug Recognition Expert (DRE) data collection system to include the details of the DRE evaluations would improve the enforcement effectiveness of the program. Conducting a study of DRE programs would identify best practices.

iv. National Survey on Drug Use and Health (NSDUH) and Monitoring the Future (MTF): Integrating drugged and drunk driving as a focus of study for the NSDUH and MTF annual reports would increase the drugged driving knowledge base and provide annual data to track the prevalence of drugged driving. Making available to researchers the datasets would allow them to use the micro-data with geographic identifiers.

III. Improve Drugged Driving Education. There are six specific groups for which best practices in drugged driving education should be identified and developed. These include drivers convicted of Driving Under the Influence (DUI) as well as repeat DUI offenders, new drivers, older adults, law enforcement and the general public. Research is needed to identify and study best practices in drug and alcohol education and highway safety among these groups, resulting in innovative programs. As education programs are developed they should be evaluated for effectiveness through outcomes monitoring.

IV. Identify and Evaluate Promising Models for Drugged Driver Identification. Research is needed to identify best practices in the identification of drugged drivers and to manage and treat drugged driving offenders, including but also extending beyond Drug Recognition Experts (DRE). Conducting a survey of police agencies on the practical aspects of collection of specimens from impaired driver suspects would identify best practices. Evaluating programs that manage impaired driving offenders with a specific focus on substance use monitoring and its impact on recidivism would also be valuable. Research is needed to determine if offenders who use treatment to succeed in monitoring have more stable post-monitoring outcomes than those offenders who do not use treatment.

V. Standardize Drugged Driver Testing. Fundamental research efforts are needed to assist in effective drugged driver detection, deterrence and data collection. Research is needed to optimize point of contact oral fluid technology which has been used successfully in other countries. Professional organizations in the toxicology community have taken steps to standardize drug testing in drugged driving investigations; those efforts should be supported through study, research and outcomes assessment. Research is needed to determine current practices in drug testing casework and the degree of compliance with published recommendations. Selecting states with good FARS alcohol compliance rates and appropriate laboratory infrastructure to participate in a comprehensive data collection of drug use by drivers would permit examination of different driver populations and demonstrate the use of best testing practices to provide both baseline and time series data to assess the effectiveness of interventions, education and deterrence campaigns.

VI. **Conduct Drug Impairment Research.** Case-control drug risk studies could demonstrate e the value of enacting *per se* drugged driving laws. A series of new research studies of the drugs most frequently encountered in drugged driver and fatally injured populations for their impairing effects would build the currently inadequate knowledge base. Quantitatively assessing new prescription drugs for their effects on skills critical to safe driving would allow both patients and prescribers to assess a new medication with the highest therapeutic value and low driving risks consistent with individual patient needs. In addition, studies might be conducted to improve computerized warning systems for drug interactions that have implications for driving.

VII. **Conduct Drugged Driving Behavioral Research.** New research is needed to determine the complex relationship between knowledge of drug risks and driving behaviors. This research could determine the role of education in reducing prescription-based drugged driving through changes in prescription drug warnings, physician education, regulating pharmacies and educating pharmacists. As drugged driving law enforcement measures change, research will be needed to determine how general deterrence laws and enforcement impact the prevalence of drug-using drivers on the road and the frequency of drug-involved crashes.

VIII. **Conduct Related Treatment Research.** As drugged driving offender management programs evolve, the role of treatment in maintaining sobriety should be studied. Conducting research on the use of Screening, Brief Intervention and Referral to Treatment (SBIRT) with first-time and repeat DUI offenders could be of value to both drugged driving enforcement and to substance abuse treatment. As more drugged drivers are identified, prosecuted, and managed, research will be needed to improve the testing and evaluation of SBIRT and contingency management models with this population of drugged drivers. The use of Behavioral Triage to select which DUI offenders to mandate into treatment might be studied because this strategy has the potential to manage treatment costs.

CONCLUSION

The evidence that drugged driving is a serious public health and safety problem in the US is strong, as is the evidence that current efforts to combat it are grossly inadequate. Now is the time to expand the drugged driving knowledge base to inform the development of more effective policies, laws and programs. A successful response to the problem of drugged driving holds the promise of improving highway safety, creating an important new path to long-term recovery and improving the effectiveness of all drug abuse prevention and treatment.

INTRODUCTION

2010 was a historic tipping point for drugged driving prevention and enforcement in the United States. For the first time, this serious highway safety and public health problem became a primary focus of the 2010 United States *National Drug Control Strategy* released by the White House Office of National Drug Control Policy (ONDCP).[1] [a] Efforts to reduce drugged driving are in force around the world. Many nations in Western Europe, as well as Canada and Australia, provide valuable leadership in these endeavors.

This White Paper, commissioned by the National Institute on Drug Abuse (NIDA), summarizes the current state of knowledge about drugged driving and proposes a research plan which will improve that knowledge base and support the ONDCP *National Drug Control Strategy*. It is organized around the drugged driving action plans of the 2010 *National Strategy*.

ONDCP aims to reduce the prevalence of drugged driving by 10% by 2015. The five tactics identified to achieve this ambitious goal include:

- Encourage states to adopt *per se* drug driving laws,
- Collect further data on drugged driving,
- Enhance prevention of drugged driving by educating communities and professionals,
- Provide increased training to law enforcement on identifying drugged drivers, and
- Develop standard screening methodologies for drug testing laboratories to use in detecting the presence of drugs.

Early evidence of the Federal Government's work on drugged driving is found in NIDA's research monograph published in 1977,[2] four years after NIDA's creation. This report focused on drug impairment (determining the effects of drugs of abuse on human performance) and explored the need for continued policy research. This marked an early stage of NIDA's collaborative drugged driving work with the Department of Transportation (DOT) and specifically with the National Highway Traffic Safety Administration (NHTSA).

In the more than three decades since the release of the NIDA research report on drugged driving, related research, laws, and enforcement practices have continued to slowly evolve. The field of forensic sciences has also drawn attention to drugged driving with the release of the National Academies of Science 2009 report calling for raising the standards in toxicology laboratories.[3] This is well aligned with the goals of ONDCP. This report aims to continue this process with the highest level of global science to reduce this serious highway safety problem. In addition these efforts can promote lifelong recovery from drug abuse and reduce illegal drug use. The aim of this paper is to describe the research needed to expand the current drugged driving knowledge base to stimulate significant improvements in public safety and public health by 2015.

To support the *National Strategy*'s goals between now and 2015, new research must identify best practices globally to deal with drugged driving. Once identified, the best evaluation science can be employed to extend and improve these practices in this relatively short period of time. There

[a] The specific language of the National Drug Control Strategy on drugged driving is included in this White Paper as Appendix A.

are also important research studies related to building the fundamental knowledge base of drugged driving that are needed. Although the results from these other research efforts are likely to be realized in the future, they will not be immediately available to inform public policy because they require long-term study and analysis.

During the past three decades, the US and many other nations have acquired significant experience implementing public education and enforcement strategies aimed at reducing drugged driving. Experiences in other related areas provide useful models for drugged driving. The focus of this research is to identify, evaluate, improve and extend these best practices. In particular, experiences in reducing drunk driving provide many useful precedents.

Key Definitions

Drugged driving *refers to operating a vehicle with a measureable quantity of an illegal drug in the driver's body.*

Illegal drug use *refers to the use of any illicit drug as well as the use of legal substances available by prescriptions when used nonmedically.*

Cannabis *refers to the psychoactive Cannabis genus of flowering plants, also known as marijuana or hashish. Tetrahydrocannabinol (THC) is the active ingredient in cannabis. Detection of cannabis by drug tests also may include its metabolites.*

A ***cut-off level*** *is the minimum concentration of an illegal drug or its metabolites present in specimens that can be reliably detected with current equipment.*

Gas chromatography-mass spectroscopy (GC-MS) is a technique used to qualitatively and quantitatively evaluate a solution containing chemicals. GC-MS is a technique commonly used to confirm drug test results.

Blood Alcohol Concentration *is referred to as BAC. BAC laws vary from country to country but across all US states, a BAC at 0.08 g/mL or higher is illegal.*

There are three general classes of ***drugs that may impair driving****:*

> *The first is* ***Schedule I controlled*** *substances.*[b] *Chemicals that are commonly abused and lack approved medical uses by the Food and Drug Administration (FDA) such as heroin, LSD, marijuana and MDMA are listed as Schedule I by the Drug Enforcement Administration (DEA).*
>
> *The second group of chemicals that may impair driving is comprised of* ***prescribed medicines*** *that characteristically are sedating. These are medicines that have approved*

[b] *Controlled Substances Act (Title 21 Chapter 13 USC) – Controlled substances are drugs which are regulated by federal and state law. The production, possession, importation, and distribution of these drugs is strictly regulated or outlawed, although many may be dispensed by prescription. The substances are listed in five categories, or schedules, according to their potential for abuse and medical risk.*

medical uses. Those that have abuse potential are typically Schedule II, III, IV and V controlled substances.

*The third group of medicines that may impair driving is sold **over-the-counter (OTC)**. These are medicines that may cause sedation but are not subject to abuse.*

*A **per se** drugged driving law is one in which a specified level of a drug in the body of a driver is defined as an offense. This may be a level at which here is evidence that the drug has been shown to effect driver performance such as the 0.08g/mL limit for alcohol. For illegal drugs, **Zero Tolerance (ZT)** per se laws are those which set that limit at the drug detection cut-off level. In concept it is not necessary to prove driver impairment to convict an offender under a per se law.*

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***Driving While Impaired (DWI)** and **Driving Under the Influence (DUI)** refer to impaired driving. In many states DWI and DUI are alcohol-specific charges.*

THE DRUGGED DRIVING KNOWLEDGE BASE

In dealing with drugged driving, an important separation is made between the use of chemicals that is legal and the use of chemicals that is illegal. In the review of the drugged driving knowledge base, drugged driving refers to the presence of a substance in the driver which may or may not impair driving. This includes drugs which have legitimate medical uses and some which are purely illegal drugs of abuse. This report concentrates on illegal drug use, including any use of illegal drugs and the illegal use of prescription drugs. However, the impairing effects of drugs when their use is not illegal also are discussed, including use of prescription drugs when the driver has a valid prescription for the drug and the use of OTC medicines.

I. Results of Survey Research

Driving under the influence of drugs is a significant part of the modern drug epidemic that began in the US during the late 1960's. The drug use epidemic peaked in 1979 when 14.1% of Americans 12 and older reported having used an illegal drug in the previous month.[4] Use in the previous month has come to be defined epidemiologically as "current use" of illegal drugs. Since that time, rates of current illegal drug use dipped to a low of 5.8% in 1992; the most recent national survey reported a current use rate of 8.7%.[5]

Useful data on drug use and driving has been developed by the National Survey on Drug Use and Health (NSDUH), which has collected self-report data since 1971. Data from that survey indicated that in 2009 more drivers aged 12 and older drove under the influence of alcohol (12% or 30.2 million) than drugs (4.2% or 10.5 million) in the previous year.[6] However, newer self report surveys in the US as well as studies of drivers using objective biological measures of drug use which will be discussed here suggest a far higher prevalence of drug use by drivers.

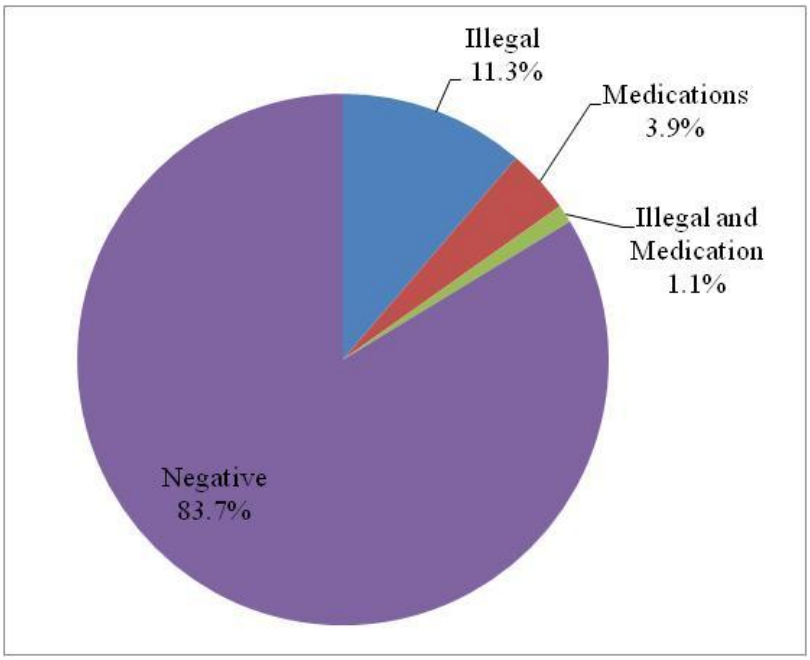
Internationally, over the last decade researchers have documented the problem of drugged driving in many countries and have delineated the issues in a number of comprehensive review articles and research study summaries.[7] [8] [9] [10] [11] [12] [13] [14] [15]

The University of Michigan's Monitoring the Future Study (MTF) has been assessing substance abuse in American high school seniors since 1975. This research shows that the prevalence of driving after drinking or smoking cannabis in seniors is roughly the same in this high risk cohort.[16] Between 2001 and 2006, 15.5% of high school seniors across the US drove after drinking alcohol while 14.1% reported driving at least once after smoking cannabis in the prior two weeks. A study of college-aged American youth showed that they perceived driving after cannabis use as more acceptable than driving after alcohol use.[17] They also perceived that the negative consequences of driving after cannabis were less than those after drunk driving. Lower perceived danger and greater perceived peer acceptance of substance-related driving behaviors was associated with more frequent driving after using cannabis and/or alcohol.

The recently released NHTSA 2007 National Roadside Survey (NRS) was the first US national random-stop roadside survey to collect oral fluid and/or blood samples from drivers for laboratory testing of illegal drugs as well as for alcohol.[18] Of all weekend nighttime drivers sampled who were willing to provide specimens, 12.4% were positive for alcohol, 16.3% were

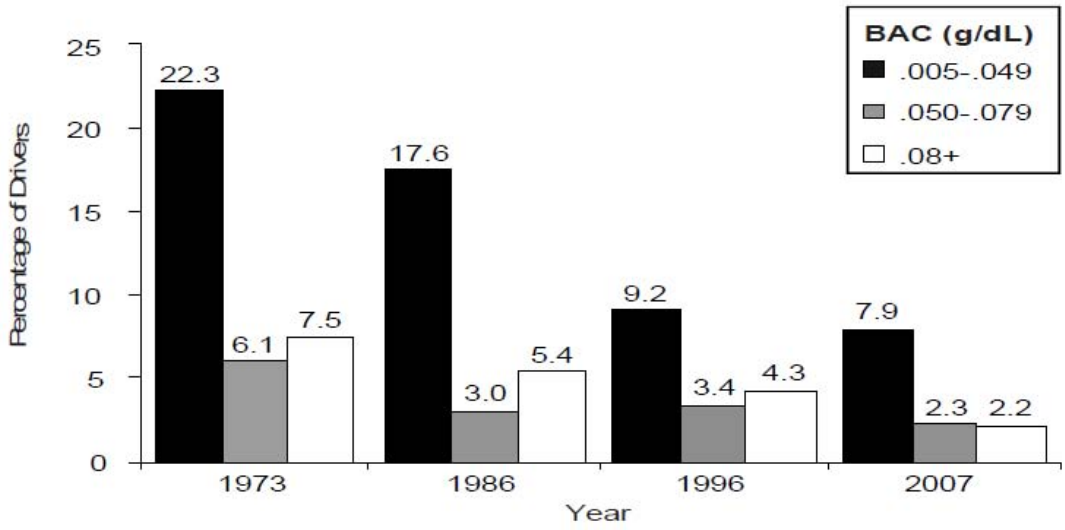
positive for illegal, prescription, or over-the-counter drugs which could possibly cause impairment, and 20.5% were positive for either alcohol or one or more drug.[19] Of the 16.3% positive, 11.3% were illegal drugs, 3.9% medications and 1.1% for both illegal drugs and medications (See Figure 1). The most common illegal drugs were cannabis (8.6%), cocaine (3.9%) and methamphetamine (1.3%).

Figure 1. 2007 NRS Driver Drug Use Prevalence by Drug Category Based on Oral Fluid and/or Blood Results[20]



Responding to concerted efforts in public education and law enforcement, the trend line for driving under the influence of alcohol has been declining. The percentage of weekend nighttime drivers positive for any level of alcohol has steadily and significantly decreased over the four NRS surveys, from 36.1% in 1973 to 25.9% in 1986, 16.9% in 1996 to 12.4% in 2007 and across all BAC levels (see Figure 2).[21] Drivers with illegal levels of alcohol (BAC > 0.08 g/mL) declined to a new low of 2.2% in 2007. While the prevalence of alcohol or drugs among drivers does not necessarily reflect impairment, it is worthy to note that the presence of potentially impairing drugs (16.3%) was substantially greater than the presence of alcohol (12.4%) in the national sample of drivers.

Figure 2. Percentage of Nighttime Drivers in Three BAC Categories in the Four National Roadside Surveys [22]



In the United Kingdom a successful roadside survey of drivers tested over 1,300 individuals.[23] Oral fluids tests detected drugs and alcohol at the confirmatory laboratory test cut-off concentrations suggested by the US Substance Abuse and Mental Health Administration (SAMHSA). Estimated prevalence of drugs used alone or in combination with another drug(s) at or above the confirmatory cut-off concentrations for oral fluids varied from 4.6% for ecstasy and similar drugs, 3.2% for cannabis, 1.6% for codeine, 1.3% for cocaine and 0.08% for other opiates. Blood and/or urine specimens were not collected for drug prevalence comparisons, so false negative rates were not assessed, and the oral fluid test used for cannabis had low sensitivity.

Australians have been randomly stopping drivers and testing for alcohol for nearly 20 years. In the past few years, many Australian state laws were amended to allow police to test randomly stopped drivers for cannabis, methamphetamine and MDMA in oral fluid. Police in Victoria Australia attribute the drop in the number of fatally injured drivers that test positive for illegal drugs from 2005 to 2009 (24% to 15% respectively), to the effect of random drug testing of drivers.[24] Annually, 20,000 drivers are randomly tested. Police report that one in 67 Victoria drivers randomly tested are positive for illegal drugs while one in 160 drivers have an illegal BAC above 0.05 g/mL, even though more drivers are tested for alcohol.[25]

II. Impaired Driver Studies

The drug data on impaired drivers in the US are limited because law enforcement agencies do not routinely test impaired driver suspects for drugs if they provide a specimen sample that is above the illegal BAC limit of 0.08 g/mL. Exceptions to this rule are made in most jurisdictions for cases involving serious injury or death.

In a series of uninjured DUI suspect studies funded by NHTSA and NIDA from 1999 to 2001, drivers who were stopped for an infraction and failed the Standard Field Sobriety Test (SFST)

were urine tested for drugs as well as breath alcohol tested. Drugs were as prevalent as alcohol, with cannabis the most commonly found illegal drug.[26]

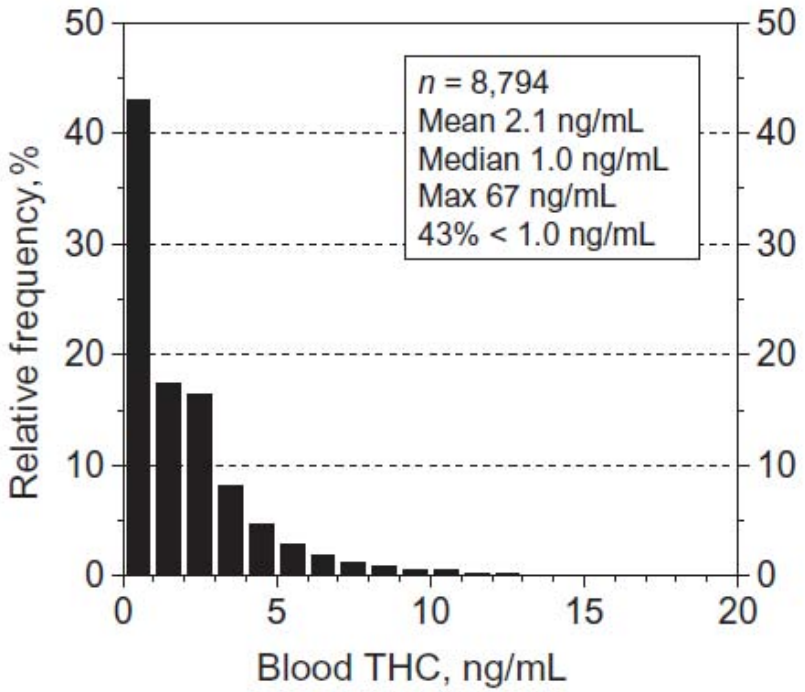
In one of these field evaluations, law enforcement officers collected voluntary urine specimens from 303 DUI suspects from December 1995 to March 1996. Specimens were tested for cannabis, cocaine metabolites, and opiates using rapid onsite urine drug tests.[27] [28] A total of 31% of DUI suspects were positive for the presence of illegal drugs, 86% were positive for alcohol, and 25% were positive for both. Of the DUI suspects who provided breath samples below 0.08 g/mL, 51% were positive for drugs. Of the DUI suspects who provided breath samples at or above 0.08 g/mL, 22% also were positive for drugs.

A few drugged driver suspect studies in Sweden have demonstrated the prevalence of illegal drugs among this population. In addition to behavioral observations, Swedish police are permitted to examine drivers' eye reaction to light, pupil size, and noted other indications of use or abuse of drugs other than alcohol to support arrests.[29] Blood and urine samples are submitted for toxicological analysis.

In a study of over 22,000 blood specimens collected from drugged driving suspects in Sweden from 2001 to 2004, between 80% and 85% were positive for at least one illegal substance.[30] While about 15% were negative for drugs, between 30% and 50% of these suspects had positive BACs of 0.02 g/mL or greater which is illegal in Sweden, far lower than the 0.08g/mL BAC illegal limit for alcohol in the United States. Amphetamines were present in 55% to 60% of cases, cannabis in 24%, and cocaine in 1.2% of cases. Benzodiazepines were the primary prescription drug detected, present in 10% of specimens.

A more recent study examined THC blood concentrations in drivers arrested for drugged driving in Sweden.[31] During the interval from 1995 to 2004, 18% to 30% of all 3,794 drugged driving suspects had measurable THC in blood (>0.3 ng/mL). The majority (61%) of those positive samples had THC concentrations below 2.0 ng/mL. THC concentrations were higher when drivers did not have other detected drugs in their blood. Researchers concluded that THC concentrations are higher at the time a driver is stopped for cause, because the THC concentration declines by the time the sample is obtained up to 30 and 90 minutes later. This study demonstrates the importance of rapid blood collection to obtain accurate detection of recent drug use, as well as the importance of utilizing detection cutoffs lower than 5.0 ng/mL. Many cannabis-impaired drivers would not be identified at these cutoffs because THC is rapidly cleared from the blood after smoked cannabis (See Figure 3).

Figure 3. Relative Frequency Distribution of the Concentrations of THC in Blood Samples from Driving Under the Influence of Drugs Suspects Apprehended over a 10-year Period[c]



A study of over 14,000 drugged driving arrestees in Sweden in 2004 and 2005 examined the blood concentrations of psychoactive substances and compared them to the therapeutic concentration range of these prescription drugs.[32] Benzodiazepines were frequently identified among arrestees including diazepam (26%), nordazepam (28%), alprazolam (5.6%), flunitrazepam (4.0%), and nitrazepam (2.9%). Morphine (11%), codeine (8%) as well as hypnotics including zolpidem (1.9%) and zopiclone (1.5%) were also identified, among other drugs. Concentrations of commonly used sedatives and hypnotics found in arrestees were above the therapeutic limits including those for alprazolam (65%; 0.005-0.05 mg/L), flunitrazepam (22%; 0.005-0.015 mg/L), and zolpidem (36%; 0.08-0.15 mg/L).

A recent retrospective cross-sectional study of impaired driver suspects in Norway focused on the impairing effects of cannabis.[33] Researchers examined 589 impaired driver suspects who were positive for THC only and 894 impaired driver suspects were positive for both THC and alcohol. Suspects were compared to 3,480 drivers positive for alcohol only and 79 drivers who were negative for impairing substances. Blood THC concentration was related to conjunctival injection (bloodshot eyes), pupil dilation and reaction to light, and to the overall risk of being judged impaired; however there was no relationship found between blood THC concentration and the Norwegian clinical test for impairment tests. The positive concentration-effect relationship between blood THC concentration and impairment was smaller than the effect for alcohol. Drivers were at an increased risk for being judged impaired for both lower THC concentrations (0.30-1.60 ng/mL) and higher THC concentrations (1.6 ng/mL and above). In

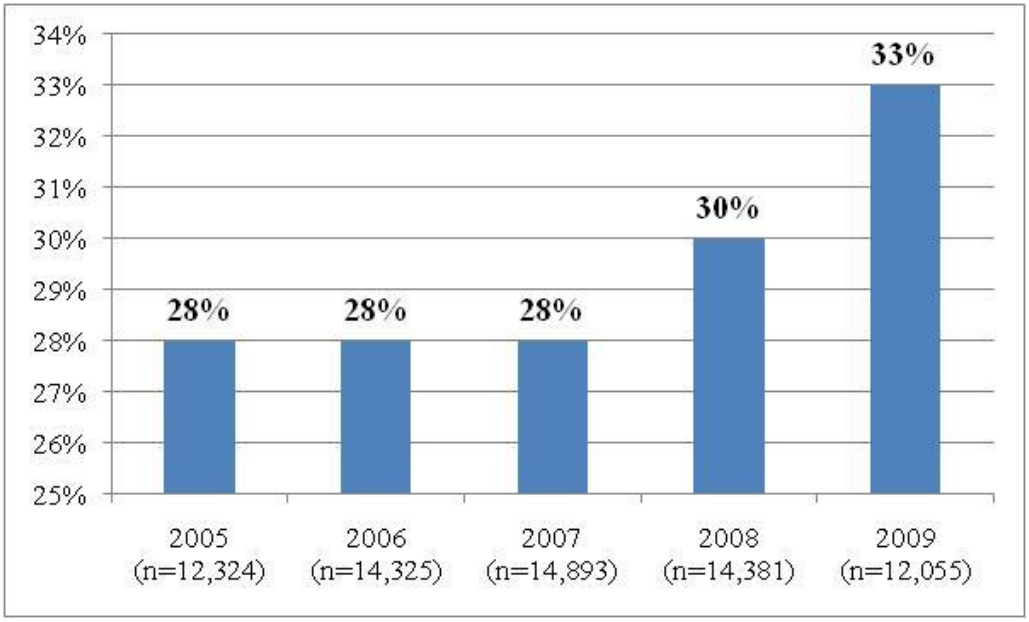
[c] n=38 cases (0.43%) with a THC concentration above 20 ng/ml are not plotted for clarity

addition, the study confirmed that the combination of even a small amount of alcohol with cannabis increases impairment,

III. Crash-Involved Driver Studies

The Fatality Analysis Reporting System (FARS), a census of fatal motor vehicle traffic crashes, provides data on the presence of drugs among drivers. Categories of drugs include narcotics, depressants, stimulants, hallucinogens, cannabinoids, phencyclidines (PCP), anabolic steroids, and inhalants. In 2009, 63% or 21,789 of fatally injured drivers were tested for the presence of drugs and entered into FARS.[34] Eighteen percent of all fatally injured drivers in the United States in 2009 were positive for drugs other than alcohol, 37% were negative for drugs and 8% of drivers had unknown results. However, of the 12,055 drivers with known test results, 33% were positive for drugs. While the number of drivers killed in motor vehicle crashes has declined over the past five years, the number of drivers positive for drugs has increased nearly 18% (See Figure 4).

Figure 4. Percentage of Fatally Injured Drivers With Known Test Results Testing Positive for at Least One Drug,[d] 2005-2009[35]



In study of fatally injured drivers in Washington State, 370 drivers who died within four hours of a crash between February 1, 2001 and January 31, 2002 were tested for impairing substances.[36] Blood and serum specimens were tested showing 62% of drivers were positive for drugs and/or alcohol. Alcohol was present in 41% of all drivers with a mean concentration of 0.17 g/mL, while 35% of drivers were drug-positive. However, of all alcohol-positive cases, 42% also were positive for one or more drug, again, suggestive of an alcohol-drug interaction on impairment. Cannabis was the most commonly detected drug, with 12.7% of all drivers positive, followed by benzodiazepines (5.14%), amphetamines (4.9%), and cocaine/methamphetamine (4.9%).

[d] Nicotine, aspirin, alcohol and drugs administered after the crash are excluded.

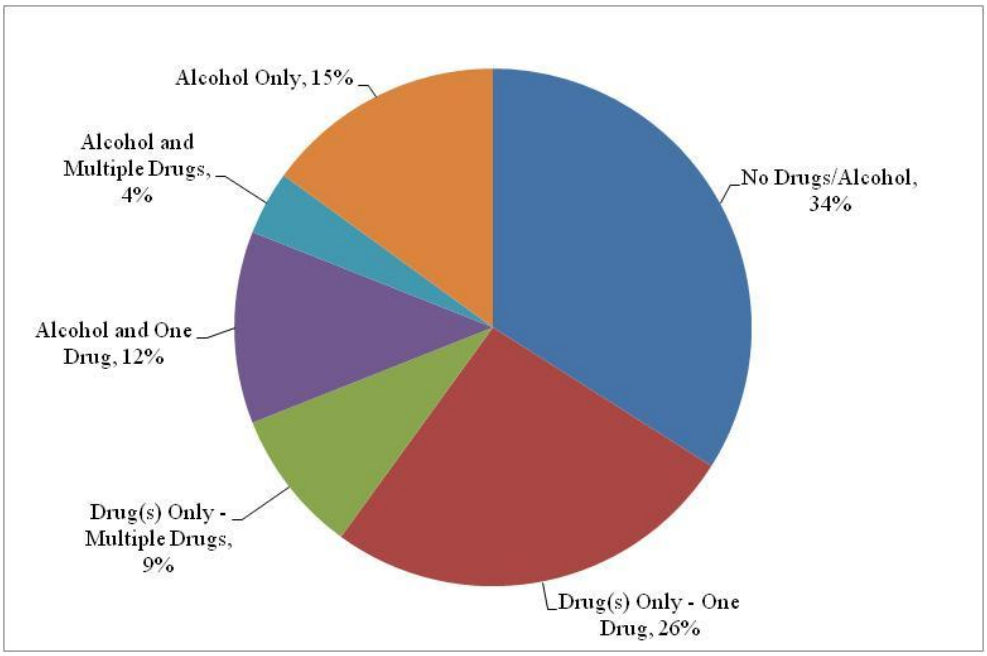
In a study of West Virginia motor vehicle fatalities, the Centers for Disease Control (CDC) analyzed data reported by the West Virginia Office of the Chief Medical Examiner to the FARS.[37] In 2004 and 2005, 458 deceased drivers were tested for the presence of drugs and/or alcohol in blood or a combination of blood and urine. A total of 33.8% were positive for alcohol, and drugs were present in 28.4% of drivers. A combination of alcohol and one or more drug were present in 12.2% of drivers. The most commonly noted drugs were cannabis (8.5%), opioid analgesics (7.9%), depressants including benzodiazepines (7.9%), and cocaine (4.1%).

From 2001 to 2003, urine and blood samples were collected from all drivers involved in fatal car crashes in France to detect cannabis, cocaine, heroin, and amphetamines.[38] Results were combined with the standard police collection of detection of illegal levels of alcohol, producing a sample of around 11,000 crash-involved drivers. Of the sample, 21% were above the French illegal alcohol limit of 0.05 g/mL while only 6.8% were positive for cannabis. About 40% of drivers positive for cannabis were also at or above the illegal limit for alcohol, a total of 14.1% of all drivers.

In a study of fatally injured drivers in Sweden, over 1,300 blood and urine samples from drivers involved in crashes between the years 2003 and 2007 were analyzed.[39] Forty percent (40%) of drivers had positive toxicology results. Illegal BACs above the 0.02 g/mL were found in 22% of cases; 18% of drivers were positive for drugs other than alcohol including prescription drugs and 13.3% of drivers were positive for one or more prescription drug.

The presence of drugs among seriously injured drivers has also been studied. In a study of seriously injured drivers admitted to a Maryland Level-1 shock-trauma center for three months in 2003, urine specimens and BACs were collected from 108 drivers.[40] The tests of 65.7% of those drivers were positive for drugs and/or alcohol. Less than one third (30.6%) were positive for any level of alcohol while more than half tested positive for drugs (50.9%); one quarter (24.9%) tested positive for both (See Figure 5).

Figure 5. Seriously Injured Drivers Admitted to a Level-1 Trauma Center[41]



Cannabis was the most common illegal drug for which drivers tested positive (26.9%), followed by cocaine (11.6%) and methamphetamine/amphetamine (5.6%). In addition, 11.2% of drivers were positive for benzodiazepines and 10.2% were positive for opiates and other prescription drugs, which have impairing effects. While positive tests resulting from EMT or trauma treatment were excluded from the analysis, it is unknown whether drivers who were positive for prescription drugs had valid prescriptions and were taking them appropriately.

IV. Crash Risk Studies

The Impaired Motorists, Methods of Roadside and Assessment for Licensing (IMMORTAL) project consortium, made up of 10 European institutions, investigated the influence of impairment factors on driving and crash risk and the implications for roadside impairment testing and licensing assessment. One IMMORTAL project studied drivers to determine whether drivers who used one or more drug groups had higher crash risk than those who did not use these drugs.[42]

In the IMMORTAL study in the Netherlands, 184 seriously injured drivers at a local hospital were compared to nearly 3,800 drivers randomly stopped in the same region to participate in a roadside drug testing survey.[43] Severe road injuries were associated with drug-free BACs above 0.13 g/mL, with combined alcohol and drug use at BAC levels above 0.08 g/mL, and with combined use of two or more illegal drugs. While these categories of drivers were present in 0.8% of the randomly surveyed driving population, they accounted for 28% of all serious injuries. The Dutch research team did not find significant increased risk of injury associated with individual use of amphetamine, cannabis, cocaine, ecstasy, or tricyclic antidepressants when taken alone.

In the IMMORTAL study in Norway, a combination of drug test results collected from seriously injured drivers and fatally injured drivers was analyzed.[44] Of the over 400 drivers from the general public who were stopped and tested using laboratory analyzed oral fluid, only 4 were positive for drugs at or above the cut-off level. Of the 87 seriously and fatally injured drivers, whose blood was drug tested, 47.1% were positive for at least one substance; 32.1% were positive for drugs other than alcohol and 4.6% were positive for alcohol and one or more drug. Researchers determined that drivers who were positive for one or more drug had a risk of injury or death about 30 times higher than drivers who did not use these drugs.

V. Confounding Challenges

There are a number of confounding challenges in determining the prevalence of and responses to drugged driving. They include the current drug testing technology, the limits of the precedents flowing from a century of alcohol-impaired driving detection and enforcement, the impairment conundrum, the role of prescription drug abuse in drugged driving, and new cannabis laws.

Drug Testing Technology

Typically after a driver suspected of driving impaired is arrested, an evidentiary alcohol breath test is administered at the police station. There is a potential opportunity for the police to administer a drug test as well but such tests are rarely administered because samples must be sent to an offsite laboratory for analysis and results are not immediately available. Depending on the number of drugs that are analyzed, the cost of this procedure can be substantial. Rapid testing technologies such as point of contact, "onsite" tests, among others, could be used at police stations or in mobile testing units to limit the number of blood or urine samples sent to the laboratory for analysis. However, false positive rates for current onsite tests are high. An important function of the police officers trained as Drug Recognition Experts (DRE), discussed later, is to determine the type of drug the suspect has been using in order to reduce the number of substances for which the laboratory needs to test. At the present time, the lack of sensitivity, especially for cannabis, limits the use of the drug testing technology available for rapid testing that does not require laboratory analysis. This is discussed in more detail in the next section **RESEARCH RECOMMENDATIONS** under **V. Standardize Drugged Driver Testing, *Current Precedents and Opportunities in Drug Testing***.

The European Commission under the Transport RTD Programme has funded three major initiatives described below to study the effectiveness of roadside drug testing. Such studies are without parallel in the US.

The Roadside Testing Assessment (ROSITA) conducted extensive evaluations of drug tests for roadside use. ROSITA-1 evaluated 15 onsite urine tests and three oral fluid and/or sweat drug tests in eight countries from 1999 to 2000.[45] Samples were collected from over 2,900 drugged driving suspects at varying locations, including the roadside, police stations, hospitals, laboratories, etc. and were compared to blood samples using gas-chromatography mass-spectrometry (GC/MS). Most urine testing devices served as good predictors of whether a drug would be detected in the blood. Urine was the preferred specimen in Italy while urine was considered unacceptable in Nordic countries. Sweat was the preferred specimen for onsite tests

in Germany. Oral fluid was the overall preferred specimen for roadside collection in Norway, Finland, France, Spain, Scotland and Belgium.

The ROSITA-1 study showed that rapid onsite oral fluids showed promise for ease of use and minimal privacy concerns for collection; however, researchers concluded that they had inadequate sensitivity, especially for cannabis, which is among the most prevalent drugs. Sensitivity of the devices was determined by true positives as verified by GC-MS expressed as a percent of all positives. Specificity was determined by true negatives expressed as a percent of all negatives. ROSITA-1 established criteria for acceptable roadside tests of at least 90% sensitivity, 90% specificity and 95% accuracy.[46] The accuracy of the many onsite oral fluid drug tests varied a great deal by each device and by type of drug detected, with none meeting suggested criteria. The recommended accuracy, sensitivity and specificity are currently in place for laboratory-based oral fluid testing; however, there were no onsite oral fluid tests that met these requirements.

The ROSITA-2 project studied the usability and reliability of nine onsite oral fluid drug tests in six European countries and four US states between 2003 and 2005.[47] Over 2,000 drugged driving suspects voluntarily provided blood and oral fluid samples. No onsite oral fluids testing device met the criteria proposed by the ROSITA-1 project and no device was considered sufficiently reliable to recommend for roadside screening of drivers. The ROSITA studies used drug tests whose results could be read immediately at the roadside or at a police station and did not study the collection methods for obtaining samples for laboratory analysis.

The Driving Under the Influence of Drugs, Alcohol and Medicines (DRUID) is a 5-year project established by the European Commission with the ultimate goal of reducing fatalities and traffic injuries. The research consortium is comprised of a total of 37 partners from 19 States (18 Europen Commission Member States and Norway). Projects include conducting case-controlled studies on impaired driving, determining prevalence of substances in driving and accidents, and determining best practices in identification of drivers, law enforcement and legislation, among others.

One DRUID project, from 2006 to 2008, was the Evaluation of oral fluid screening devices by TISPOL [European Traffic Police Network] to Harmonise European police Requirements (ESTHER). Thirteen rapid onsite oral fluid screening devices were evaluated by police teams in 6 EU states: Belgium, Irish Republic, Finland, Spain, Germany, and the Netherlands. Oral fluids tests included devices from the ROSITA-2 project in addition to new or improved devices.[48] Based on this study, five oral screening devices were recommended for roadside testing regardless of the vehicle a police offer is using, time of day, or location. Two additional devices had environmental requirements for best results such as good lighting and a power supply. Another oral fluid device was identified as promising and qualified to be used in mass quantities such as at police stations or with mobile drug testing stations with high testing capacity per hour.

Police in Australian providence of Victoria report success using oral fluid tests for random drug testing of drivers. Between 2004 and 2009, 1,618 driver oral fluid samples were sent to the Victoria Police laboratory for confirmation testing after initial positive roadside results; of the

tests sent for confirmation, 1,556, (96.2%) confirmed recent use of illicit drugs; 3.8% of confirmation tests were negative for illegal drugs. [49]

The short history of these devices shows that initial rapid development has stalled based on the limitations of existing immunoassay technology. There is a tradeoff between ease of use against sensitivity and scope. Improvements in sensitivity with current technology require the use of an instrumented device which limits their deployment in the field. While some manufacturers are working on fine tuning the current technology through this approach, a major change in immunoassay technology would help in the development of broad spectrum, high sensitivity tools. Advancing this type of technology change would have benefits far beyond this application, in diagnostics, and clinical medicine and would be a suitable for a National Institutes of Health (NIH) grant application.

Breath testing technology for detecting drugs of abuse may also be developed in the future, as a new study shows potential for detecting amphetamines in breath samples.[50]

Limits of the Alcohol Precedent and the Impairment Conundrum

Detecting alcohol impairment is a well-accepted process. All 50 US states and the District of Columbia use the alcohol standard of 0.08 g/mL BAC, meaning that it is an offense for any driver to be in control of a vehicle at a BAC that is at or above 0.08 g/mL. However, all states also have impaired driving laws which are based on the behavioral evidence produced by a police officer to cover those cases for which a BAC is not collected or where a person provides a breath sample below the illegal BAC limit. To address the problem of drunk driving among drivers under the legal drinking age of 21, the US enacted zero tolerance (ZT) laws which make it illegal for drivers under age 21 to have any alcohol in their systems, generally defined as a BAC of 0.02 g/mL or greater. Strong evidence has been found in support of the efficacy of the 0.08 g/mL illegal alcohol limit, the ZT alcohol law, and the minimum legal drinking age (MLDA) law which have been enacted by all 50 states.[51]

Advances in technology have provided rapid, accurate instrumentation alcohol sensing for use in both the police station and at the roadside by minimally trained officers. Similar technological advances in drug testing are being pursued; however, the full utilization of this type of equipment is limited by laws and enforcement policies. For example, portable hand held preliminary breath test (PBT) devices employing fuel cell sensors for use at the roadside, have been found to be as accurate for measuring BACs as the large desk evidential units employed at police stations for collecting BAC measures for submission in court. These devices can be used in the field early in an officer's investigation of a potential impaired driver to avoid delaying drivers who are not impaired and consuming officer time in an unnecessary investigation. This is the way they are used in Australia and some other industrialized countries.

These units are not generally employed early in the stop to detect drunk drivers in the US; rather, they are used to confirm intoxication once the officer has completed his investigation and is planning to make an arrest. This limitation in the most effective use stems from the legal limit imposed by the Fourth Amendment to the Constitution[52] which requires that the officer have reason to believe that a person is impaired before requiring a test. The reasonableness of a

search is determined by the balance of the loss of privacy with the public interest in conducting the search. The laws in some states permit only one evidential test which precludes a test at the roadside. In addition, some police department policies limit their use as initial detection devices out of concern that BAC information might bias the judgment of the officer in scoring SFSTs or result in the officer not apprehending drugged driving offenders. These types of limitations can be expected to apply to drug testing, limiting the application of the new technologies for detecting drugged drivers.

As noted, in the US, a police officer cannot request a breath sample from a driver unless the officer has reasonable suspicion that the driver is impaired; there are very few circumstances where a driving pattern is sufficient on its own to establish reasonable suspicion for impairment. Without behavioral evidence, a judge will generally not allow BAC evidence to be considered. Evidential tests in most states are given post-arrest; drivers are not arrested for DUI unless there is probable cause that they committed the offense. That said, the reliable alcohol breath testing technology available to determine a driver's BAC has significantly improved prosecution of drunk drivers, as has the illegal limit of 0.08 g/mL BAC. In addition, while there is much individual variation, there is a rough correlation between the level of impairment and the blood alcohol level (as the alcohol level increases, the behavior becomes predictably more impaired and as the BAC falls, impairment lessens). Several large studies have demonstrated that crash risk rises rapidly with driver BAC.[53] [54] [55] [56]

In drugged driving there is no standard relationship between blood levels of a drug (or drug metabolites) and impairment.[57] [58] There are complex loops of impairment related to blood levels. The size and shape of these impairment curves vary considerably depending on the drug. Following drug ingestion, blood concentrations rise and fall as the drug is distributed and metabolized, however the drug's behavioral effects are often prolonged. As the blood levels rise and fall, the degree and nature of impairment at the same blood concentration can vary depending on whether the subject is in the acute intoxication or withdrawal phase. Tolerance to a drug also plays a role in the level of impairment observed for drugs, as it does for alcohol. Individuals can also respond differently to the same drug dose, depending on genetics and drug metabolism. Age, sex, weight, disease state and drug-drug and drug-alcohol interactions also can cause differences in how an individual behaves under the influence of a drug. In addition, when it comes to drugged driving, the list of drugs of abuse is long. It is not practical to study all the drugs of abuse under the almost limitless range of circumstances that can affect driving behavior. For all of these reasons, setting impairment thresholds based on blood levels or drug metabolites for illegal drugs is not a viable option.

The general acceptance of the 0.08 g/mL BAC as the impairment level in the US today obscures the fact that many drivers are significantly impaired at lower BAC levels.[59] [60] [61] [62] Alcohol impairment is well documented at levels below 0.08 g/mL. For this reason a level of 0.05 g/mL BAC is the impairment level used throughout most of Europe, while Sweden and Norway use a 0.02 g/mL as the BAC impairment level.[63] On the other hand, because of tolerance and consumption effects, many people do not show outward signs of impairment at BAC levels of 0.08 g/mL and higher, even though critical driving skills can still be adversely affected. Because the 0.08 g/mL BAC is so widely accepted in the US, these complications are seldom discussed.

There is, however, general acceptance of the fact that one cannot relate specific drug levels to a degree of impairment. Still, laboratory studies show that the use of illegal drugs commonly produces significant impairment of functions related to the ability to drive a motor vehicle and data from studies of dead and seriously injured drivers previously discussed leaves no doubt that the use of illegal drugs, including cannabis, is associated with large numbers of crashes, injuries and death.[64] [65]

While the data for establishing impairment levels for drugs are limited, there is abundant precedence for establishing ZT laws for alcohol for special categories of drivers, such as underage and commercial drivers. The MDLA law was based on, among other factors, that it was illegal for youths under 21 to consume alcohol. It is currently illegal under Federal law in the US for individuals of all ages to use illicit drugs. This has provided a basis for states to pass drugged driving laws specifying that any detected level of illegal drugs in drivers is a violation, as indicated by the 15 of the 17 states that have enacted such legislation.[66] The specific types of drugged driving laws are discussed in greater detail in the following section, **RESEARCH RECOMMENDATIONS, I. Evaluate Impaired Driving Laws**.

Prescription Drug Use

While many medicines can impair driving, the method for managing their potential impact on highway safety remains controversial in part because of concerns about the potential of drugged driving laws to inhibit appropriate medical treatment. Many of the drugged driving studies previously discussed show a high prevalence of prescription drug use among drivers in the US and countries abroad; however, the extent of drug-impaired driving due to prescription drugs, with and without valid prescriptions has yet to be clearly defined. New research shows that most drivers in the US ages 55 and over take medications that can impair their ability to drive and that most are unaware of the risks.[67] Recently in the US popular press there has been increasing attribution of serious injury and death in accidents in which the driver is using one or a combination of prescribed medications.[68] There has also been a significant increase in the abuse of prescription drugs as indicated by an epidemic increase in opiate use [69] [70] as well as overdose deaths, hospital admissions and ED visits in recent years.[71] [72] [73] [74] The implications of prescription drugs for highway safety are significant and are not limited to prescribed medicines but also OTC or non-prescription medicines such as antihistamines and sleep aids.

The prescription and OTC drug problem related to drugged driving appears to fall into four areas:

1) Drugs that do not affect driver safety;
2) Drugs that are critical to safe driving by individuals with disabilities such as epilepsy or heart problems;
3) Legitimately prescribed drugs that impair driving performance under some circumstances; and
4) Prescription and OTC drugs that are used for nonmedical purposes.

The first category of drugs is not a highway problem. The second category becomes a problem primarily when drivers with disabilities fail to take their prescriptions. Principal attention has been given to the third category which may be a law enforcement issue in some states. The same

medicine can be impairing under some circumstances and not in others. Reviews of research studies have shown that medical opioid use by opioid-dependent/tolerant patients does not appear to be associated with impairment, increased incidence of motor vehicle crashes or fatalities;[75] [76] however, there are many other prescription drugs on which patients rely that should be researched. In addition, the effect of prescription drug interactions on driving is unknown. To sort out these complexities in ways that protect public safety and promote effective medical treatment is challenging both in prevention and law enforcement. Identifying medications that may impair driving and devising adequate warning labels likely presents a major challenge to health researchers. The fourth category of drugs is a law enforcement problem similar to the control of illegal drugs.

While it is important to not let concern about illegal use of prescribed controlled substances inhibit legitimate prescription and use of these often useful and safe medicines, it is also true that failure to address the significant problem of nonmedical use may inevitably lead to strong public demands to curtail all use of these substances. In 2009, 6.4% of persons aged 12 and older reported using a prescription drug nonmedically in the past year and 2.8% reported doing so in the last month.[77] Nonmedical use of prescribed controlled medicines without a valid personal prescription is illegal and is therefore subject to the same laws as other illegal drug use as discussed later in this paper. As noted later in the following section **RESEARCH RECOMMENDATIONS**, drivers impaired by drugs taken as prescribed can be prosecuted under the *affected by* impairment standard in the same way alcohol-impaired drivers are prosecuted.

Cannabis Laws

In 1996, California became the first state to implement a "medical marijuana" (MM) law permitting legal use, with a physician's authorization, of cannabis, an illicit drug under Federal law.[78] Since that time, MM laws have been enacted by 15 states and the District of Columbia, which challenge the current state and national drug control procedures. Research on MM users continues to expand including the risk MM users may pose as drivers on the roads. For example, expert opinion suggests that there are no reasonable circumstances for MM users to operate a motor vehicle if they also use prescription opioids due to the serious impairing effects of both drugs.[79] A doctor's recommendation of cannabis use is not a bar to prosecuting commercial drivers and transportation workers in states with MM laws. States with MM laws have generally not modified their impaired driving laws so that where the officer can demonstrate the driver is impaired or where the state has a drugged driving law that includes any detection of cannabis as a violation, MM users can be charged with impaired driving. Such states offer an opportunity to study the effects on the enforcement of cannabis-impaired driving following the passage of MM laws, including attempts to use the doctor's certificate as a bar to prosecution. These states also offer an opportunity to determine the extent to which the public is aware that MM laws do not protect them against impaired driving citations and whether they have received any information from the physicians about use of cannabis while driving.

If marijuana use were to be legalized in a state, as a failed 2010 initiative in California attempted to do,[80] it is unlikely that a ZT law for cannabis will be enacted. However, although it is well-established that cannabis can impair driving ability, as previously noted, it is impossible to

establish an impairment level for cannabis because the relationship between the concentration of THC and marijuana metabolites in blood, urine and oral fluids is complex.

VI. Conclusions about the Current State of Drugged Driving Knowledge

This review of studies demonstrates that drugged driving is a significant domestic and international problem and supports these facts:

1) There are many drugs with potentially impairing effects on driving.

2) While blood and urine laboratory tests are widely available, and some laboratories are exploring oral fluid testing, oral fluid tests that produce rapid results and can be read onsite for use by law enforcement have significant limitations, notably cost, and limited scope and sensitivity. This underlines the need for improved technology and research. Cannabis and benzodiazepines are difficult to detect in oral fluid with onsite tests; however, the 2007 NRS showed a high percentage of both cannabis and benzodiazepine positives when oral fluids were collected at the roadside and sent for laboratory testing. Rapid onsite urine tests are inexpensive and provide a viable option for use as an initial screening tool at police stations and can be used without further development. However, unlike onsite breath tests for alcohol, today onsite urine test results are not widely accepted for presentation in court without being confirmed by a laboratory analysis of a urine or blood sample.

3) While there are confounding issues in drugged driving, they must not deter future progress in developing and implementing an effective drugged driving research agenda, as well as appropriate public policies, public education programs, drug treatment initiatives, and enforcement strategies. Central to these efforts is developing an ongoing system to monitor trends in drug use among drivers, especially those killed or injured.

RESEARCH RECOMMENDATIONS

To achieve the ONDCP *National Strategy*'s goal to reduce rates of drugged driving by 10% by 2015, significant scientific, policy, law, and enforcement changes will likely have to take place to identify the best practices in the US and abroad in each of the Strategy's suggested tactics to reduce drugged driving. This report sets the stage for new drugged driving research priorities. All of these research recommendations are relevant to the *National Strategy* and to understanding the complex problem of drugged driving; however, some can be accomplished sooner than others. The highest priority research projects will be those that can be completed in time to reach the 2015 goals.

I. Evaluate Impaired Driving Laws

To set the stage for research into the effectiveness of drugged driving laws, it is important to first understand the current global drugged driving laws and practices. There are two main types of drugged driving laws in the US. The first pertains to Driving Under the Influence of Drugs (DUID), the so-called *affected by* standard, for which there must be evidence that the drug caused impairment. The second type of law is known as a *per se*, under which it is a criminal offense to drive with the presence of a drug or its metabolites in the body.[81] Future studies are needed on the effectiveness of both types of drugged driving laws.[82] A recent study attempted to assess the effect of passing *per se* drugged driving laws on the volume of drugged driving arrests and on conviction patterns but data to directly address those issues was unavailable. [83]

There are 17 US states with *per se* type drugged driving statutes which cover roughly 40% of all licensed drivers in the US and while *per se* laws permit easier prosecution of drivers, there is a lack of uniformity among these states. [84] In North Carolina and South Dakota, the *per se* drugged driving law pertains only to drivers under age 21.[85] Another example is the *per se* drug law in Minnesota does not include cannabis, the drug most frequently identified in impaired driver populations. [86]

Table 1. States with Drug *Per Se* Laws and Effective Dates [87]

STATE	*EFFECTIVE DATE OF DRUG PER SE LAW*
Drug *Per Se* Law for All Drivers	
Arizona	June 28, 1990
Delaware	July 10, 2007
Georgia	July 1, 2001
Illinois	August 15, 1997
Indiana	July 1, 2001
Iowa	July 1, 1998
Michigan	September 30, 2003
Minnesota	August 1, 2006
Nevada[e]	September 23, 2003
Ohio	August 17, 2006
Pennsylvania	February 1, 2004
Rhode Island	July 1, 2006
Utah	May 2, 1994
Virginia	July 1, 2005
Wisconsin	December 19, 2003
Illegal for Drivers Under Age 21	
North Carolina	
South Dakota	

Many individuals do not realize that even in US states where valid prescriptions are a permissible defense against *per se* drugged driving laws, drivers may still be prosecuted for impaired driving under the *affected by* standard. This standard is also used for alcohol – a perfectly legal substance for persons aged 21 and older which can be impairing at BACs lower than 0.08 g/mL. Law enforcement officers can determine if drivers are impaired by prescription drugs through the use of field sobriety tests. That impairment, plus other physical signs known to be associated with a particular drug, can be used by specially trained Drug Recognition Expert (DRE) officers in court testimony linking the impairment with a specific class of drugs. This emphasizes the need for physicians, pharmacists and dispenser labels to clearly warn the user not only of the risk of crash involvement but also of the risk of citation if apprehended driving while impaired by the medication. Prescription drug cases in which the driver has a valid prescription for the identified drug may be prosecuted under impaired driving laws like cases of alcohol use when the suspect refuses the BAC test but is convicted under the impaired driving statute. Thus, even if drivers who take medications according to a valid prescription are afforded an absolute, affirmative defense to the *per se* drug law they still may be prosecuted under the impairment provision if impaired driving is proven.

Per se drug laws are widely used in the developed world outside the US, including Western European nations, Australia and New Zealand. Countries in the European Union including Belgium, Finland, France, Portugal, and Sweden have zero tolerance *per se* laws against drugged

[e] Nevada has specific cutoff levels for certain prohibited substances

driving.[88] After Sweden implemented its ZT *per se* drugged driving laws, police arrested significantly more drugged drivers.[89] However, since that time the prevalence of drugged driving has not decreased among those tested possibly because of the high rate of recidivism among offenders.

Belgium uses a three-step process. After stopping a driver for a driving violation, an officer may conduct a SFST to detect impairment due to recent alcohol or drug use. If a driver fails the test, a rapid urine test is administered at the roadside in a mobile unit. If positive, the driver is prohibited from driving for 12 hours. A blood sample is obtained from the driver and tested using GC/MS technology with specific zero tolerance cutoff levels including 2 ng/mL for THC, 20 ng/mL for morphine and 50 ng/mL for amphetamine, MDMA, MDEA, MBDB, cocaine or benzoylecgonine.[90]

The drugged driving laws of countries including Finland and Sweden include illegal use of prescription drugs. In these countries, drivers found with legally prescribed medicines may be exempted from a drugged driving charge if they can provide a valid prescription; however, they may still be charged if their driving was judged impaired,[91] the same as in the US. Many countries have also passed legislation permitting roadside drug testing of drivers; however, there is much debate over the drug testing technology available for roadside testing as well as whether suspected impaired drivers who provide alcohol breath samples below the illegal limit should be drug tested. [92]

In the Australian province of Victoria, the Road Safety Amendment Act of 2000 established a "driving while impaired by drug" law and provided for a blood test for drug involvement. The law also authorizes police to conduct field sobriety test for drugs.[93] A positive blood test for drugs proves the offense subject to the determination that the driver's psychomotor impairment was consistent with the scientifically established impairment characteristics of the drug impairment. Thus while *per se*, their law requires a behavioral confirmation. The law also provided random testing for drugs, but the use of urine tests was rejected. However, in 2004 a random testing program using oral fluid was begun. The prevalence of the prohibited drugs specified in the 2000 legislation in drivers in fatal crashes has leveled off and remained stable since the law was enacted.

Law enforcement officials in the province of Western Australia are also permitted to conduct random roadside testing of oral fluid or blood to test for the same three drugs.[94] Onsite oral fluid screens are preceded by alcohol breath tests. If a driver provides a breath sample with a BAC below the illegal limit, drug screening is conducted using a roadside oral fluid drug test. If positive, the driver is tested at a "Breath and Drug Bus" with a secondary, different oral screen or blood drug test. If the second test is positive, the sample is sent for laboratory analysis and confirmation. The driver is ordered not to drive for 24 hours and is brought to court under a drugged driving charge.

Effectiveness of Drugged Driving Laws

There are clear differences between zero tolerance *per se* and DUID drugged driving laws. The 2010 *National Strategy* encourages states to adopt *per se* laws. While there is strong reason to believe that ZT *per se* laws represent the best practice for controlling drugged driving to date, there have been no studies which have demonstrated their effectiveness, so they cannot yet be characterized as "evidence based." This current lack of validation can be traced to the relative recent enactment of *per se* drugged driving laws and to the lack of an adequate criterion for measuring their effectiveness. The expected growth of such laws together with the improvements in the collection of drug information on fatally injured drivers described below should provide opportunities for evaluating *per se* laws. Research is needed to evaluate the impact of such legislation in the US as well as drugged driving laws in other nations to identify the most effective policies. These research studies should identify the laws' impacts on the prevalence of drugs in drivers on the road and in drug-related crashes. In most states police officers do not test drivers for alcohol or drugs if they refuse to provide samples (with exception to cases involve death or serious bodily injury), nor do officers drug test drivers who test at or above the illegal limit of 0.08 g/mL for alcohol. As changes in publicizing and enforcing drugged driving laws are made in conjunction with improved testing protocols, research studies will be of great value.

II. Evaluate and Improve Drugged Driving Data Collection

Current criminal justice and public health data systems appear to substantially underreport drugged driving prevalence. Generally, if an impaired driver is found to have an illegal BAC, a drug test is not administered resulting in official arrest statistics underreporting drug involvement. In cases where drug tests are administered and identify recent drug use, if a driver is convicted it is typically for one offense only. While a high proportion of fatally injured drivers are tested for alcohol as required by state law, drug tests, which are more expensive and not uniformly required, are administered much less frequently, resulting in underreporting. Existing and new sources for collecting this information should be studied to provide more accurate estimates of drugged driving.

There are also limitations to current standard drug testing panels for laboratories across the US and abroad. NIDA established a standard panel for laboratories to adopt in order to be accredited to conduct drug test Federal employees. This panel, known as the NIDA-5 or SAMHSA-5, includes amphetamine/methamphetamine, cocaine, cannabis (THC), phencyclidine (PCP), and opiates at specific screening and confirmation levels.[95] While this panel, with the recent addition of MDMA, is widely used, it does not contain other widely used drugs with potential to impair driving. The ever-changing chemical formulas used to synthesize illegal drugs are difficult, if not impossible, to detect using this standard drug screen. This plays a part in determining future research opportunities using the current drugged driving data collection systems. Expanding drug test panels and specimens collected beyond urine may provide more extensive detection of drugs over a longer period of time, including for example sweat patch tests for monitoring impaired driving offenders.

The *National Strategy* highlights four data collection systems in the US that include different types of information on drugged driving and proposes establishing another. While these systems represent the best current practices in drugged driving data collection and provide valuable information on this public health and safety problem, there are new research opportunities that will significantly improve the data they provide.

Fatality Analysis Reporting System

The Fatality Analysis Reporting System (FARS) within the National Highway Traffic Safety Administration (NHTSA) is a census of all crashes on US public roads resulting in one or more deaths within 30 days of the crash. This complex data collection and reporting system has a number of weaknesses related to drugged driving. Not all traffic deaths are autopsied. Not all pathologists investigating the deaths collect samples for testing. Not all samples are analyzed. Samples may be blood or urine which cannot be directly compared. Not all the laboratories performing the tests have the same scope and sensitivity. Not all test results are reported up to the state level and forwarded to the FARS database. As a consequence, even for alcohol the data collected for driver fatalities in FARS varies widely by state.[96] For example, in the 2008 FARS the BAC results were known for only 71% of all fatally injured drivers. Three states had known BACs for less than 30% of fatally injured drivers (Alaska 22%, Iowa 25%, and Tennessee 25%) and seven states had known BACs for less than 50%. Only ten states had rates of 90% or more and the highest was Washington State which had 93% of drivers with a known BAC. It is only because of a multiple imputation procedure to estimate BACs in those with missing results that the US has reliable national estimates.

The current status of alcohol test collection in the FARS just described reflects a 40-year effort. Research conducted using the FARS data for alcohol provides precedents for how future FARS drugged driving data can be collected and used. One relevant study indicates that the implementation of mandatory alcohol testing programs of commercial drivers which began in 1995 (including pre-employment, random, reasonable suspicion, and post-accident testing), was associated with a 23% reduction in alcohol-involvement in fatal crashes by commercial drivers.[97] Conducting and tracking drug test results of drivers in the FARS will provide similar analyses to track progress to reduce the prevalence of drugged driving.

The collection and recording of drug test information on fatally injured drivers is of much more recent origin for most states in the FARS. As a result, drug information is very much less complete. Further, states vary significantly in the number of drugs on which they collect information and the sensitivity of the cut-off specification for defining the presence of a drug. Due to these current deficiencies in drug data collection, and the substantial number of drugs that are relevant to driving, it will require a major effort and some considerable time to bring the quality of drug recording up to the current FARS standard for alcohol testing.

Since the FARS experience indicates great difficulty and time required to create a quality national drug crash record system, an interim system may be needed. One of the approaches advocated in the *National Strategy* is found in Chapter 7 entitled, *Improve Information Systems for Analysis, Assessment, and Local Management*. The National Strategy says it aims to, "develop a community early warning and monitoring system that tracks substance use and

problem indicators at the local level." It may be possible to form such a model system to collect drug data on all fatally injured drivers, similar to the alcohol system employed by NHTSA before FARS was established.

One possibility would be to sample FARS states with good medical examiner systems using the same scope as drugged driving research. Currently there are ten states in FARS that report drug data on 80% or more of their fatally injured drivers.[98] An initial study of the testing procedures in those states to determine the drugs they cover and the comparability of the analysis systems could help determine which states can be used for estimating the current drugged driving level in the US.

One of the aims of a national system would be to provide reliable data on evaluation of current prevention efforts and the identification of new emerging problems. New studies in this area could form the base for addressing many of the large gaps in the epidemiological literature on drugged driving, including identification of overrepresentation of certain drugs in crash risk statistics and development of studies on the relative risk of impairment for drugs or drug classes.

National Roadside Survey

The National Roadside Survey (NRS) estimates the prevalence of drinking and driving on the nation's roads. Beginning in 1973, every ten years NHTSA and the Insurance Institute for Highway Safety (IIHS) conducted the NRS. The fourth survey, conducted by NHTSA and PIRE in 2007, was the first to include drug testing in addition to standard alcohol testing, a much needed improvement.[99] The cost of the 2007 NRS was approximately $6 million. The *National Strategy* proposes decreasing the length of time between NRS administrations as a priority; more frequent NRS survey administration and analysis would provide information on drugged driving trends. It also would be valuable during intermediate years for the NRS to oversample in the FARS states with good drug information on fatally injured drivers and in those states that maintain good records on drugged driving convictions for the following reasons:

1) Currently, states lack sufficient numbers of both FARS cases and NRS cases to produce strong estimates of the relative risk presented by various drugs. The states with good drug test records on fatally injured drivers provide the possibility for calculating relative risk rates for drugs by contrasting the prevalence data from the NRS with the fatality data in the FARS. That has been done for alcohol[100] and is the system being employed by DRUID in Europe.

2) States with good drug test records for drivers convicted of drug impaired driving provide an opportunity to study the relationship of enforcement to prevalence in the driving public and may also provide an "early warning" system for detecting new drugs which may impair driving. NRS oversampling could be applied to localities that test a large percentage of their arrestees for the presence of drugs. Standard analysis of collected blood and oral fluid samples could be completed using uniform matrices, cut-off concentrations and confirmation processes used by the state in order to ensure compatibility of the results.

While the recent 2007 NRS has provided valuable data on the prevalence of drugs in the oral fluid or blood of the driving population, and the FARS provides limited information on drugs in fatal crashes where 30% involve alcohol, there is a need to evaluate what drugs are being used by drivers in injury crashes where alcohol is involved in only about 10% of the crashes. Tracking drug involvement in injured drivers is an important goal which is not provided by the FARS. Thus, there is a research need for the development of complementary approaches to those just described to reliably measure injury crashes that involve drugs to meet the *National Strategy*'s goal to reduce the prevalence of drugged driving by 10% by 2015. To meet this need, a system could be created to collect drug data on drivers admitted to trauma centers, sparking new research studies. Currently drug testing of blood is not done routinely in trauma centers because of cost, although some do drug screens on urine.

This trial monitoring system may be capable of providing timely data to detect emerging problems and could be part of the national Community Early Warning and Monitoring System proposed by the *National Strategy*. It would provide a "national model for capturing community-level data that not only fill in the gaps in national policy-level information but also serve to identify regional and local drug problems. This system may serve as a near real-time drug information network that warns of emerging drug threats and provides ongoing information on the effectiveness of drug control policies and programs." Such a system may lead to establishing a real-time monitoring system that can provide timely information on new emerging trends in substance use and abuse and injury. In addition to providing valuable data on what drugs are being used by drivers in serious crashes, it would also provide actual drug levels. Such information is essential for developing more refined risk estimates for drugged driving for specific drugs. The data collected will form the basis for more in-depth studies such as identifying drugs overrepresented in injured drivers compared to the normal driving population through comparison with the NRS, comparison to control populations or by means of culpability assessment. Such studies are an essential component of targeting those drugs with the highest crash risk and determining the interactions of prescription and illegal drugs with alcohol.

Drug Evaluation and Classification Program

Research has demonstrated that high-visibility enforcement is one key to increasing deterrence, by increasing the perception of the risk of being arrested for impaired driving.[101] [102] Research has also shown that increasing the number of police on DUI patrol has reduced crashes.[103] There is currently no research on the effect of high visibility enforcement on reducing drug-related crashes. Research on the effect of increased impaired driving enforcement would be of great value. Without appropriate enforcement resources and evaluation, an unknown number of drug-impaired drivers will continue to drive until they cause a collision, or are released after being stopped because they produce a low or zero BAC.[104]

Law enforcement agencies can elect to train officers to become Drug Recognition Experts (DRE) through the Drug Evaluation and Classification Program (DEC) which provides training and documentation in the recognition of drug impairment symptoms in drivers.[105] The DEC program is currently one of the most widely used tools available for identifying driver impairment related to drug use in the US. The signs used by U.S. drug recognition experts are available for review.[106] Evaluations of DEC programs in the US have demonstrated its effectiveness for

identifying drug impaired drivers.[107] [108] DEC programs have also been reported to increase the number of drugged driving arrests.[109]

Every year the DRE coordinators for DEC programs in the US submit state DRE data to the International Association of Chiefs of Police (IACP) to complete their annual report. Based on the 2009 Annual Report of Drug Recognition Expert Section of the IACP report,[110] there are only four US states without DRE programs: Connecticut, Michigan, Ohio and West Virginia.

The data provided in this report are relevant to the number of DREs, the number of evaluations completed, DRE training status, etc.; however, the details of the DRE evaluations, including toxicological data, are not reported. Improving and expanding the DRE data collection program would significantly help the drugged driving field grasp the role of DREs and track prevalence rates of drugged driving and its enforcement. This valuable data set also would help in identifying prevalent types of driving impairment associated with different drug classes or combinations and would assist in interpreting the toxicology findings in future cases.

A study of DRE programs with high utilization and effective outcomes established through correlation of DRE results with toxicological confirmations will identify DRE best practices and determine the programs' potential effectiveness. This would provide evidence on the DRE program, support its use in court, and ensure that the best tools are in place for enforcement purposes.

There is great potential for wider use of DREs to identify impairment in drivers with legitimate prescriptions for impairing drugs when they fail SFSTs but test negative for both illegal drug use and alcohol at or above the illegal 0.08 g/mL BAC limit. In addition, DREs can play a significant role in the education and support of law enforcement officials dealing with drugged driving. To better inform law enforcement communities on how to implement successful DRE programs, research is needed to identify DRE best practices by comparing how programs function in various states. Identifying strategies that make the most use of these resources to reduce drugged driving including widespread drug testing is important for future program improvements to enforcement strategies. The future use and current limitations of DREs are discussed in the following section **IV. Identify and Evaluate Promising Models for Drugged Driver Identification, *Drugged Driving Offender Management***.

National Survey on Drug Use and Health and Monitoring the Future

Published annually by SAMHSA, the National Survey on Drug Use and Health (NSDUH) provides national and state-level data on the use of alcohol, tobacco and illegal drugs among persons ages 12 and older. Included in the NSDUH are questions about drugged and drunk driving behaviors. Monitoring the Future (MTF), a national annual survey funded by NIDA, provides data on substance use rates and attitudes of 8th, 10th, and 12th grade students, college students, and young adults. It also provides data on drugged and drunk driving behaviors. NSDUH and MTF are valuable resources highlighted by the *National Strategy*. These surveys have great value for providing comparison data with other drugged driving prevalence data. It is critical to identify ways to make more useful the annual data collections of these two surveys in the study of drugged driving and the study of attitudes toward and trends in prevalence of driving

after alcohol and drug use. For example, neither of these surveys contains adequate information on the driving exposure of their respondents.[111]

Another way to make these and other datasets more useful is to allow researchers to use the micro-data with geographic identifiers. A number of Federal agencies and data warehouses (e.g., Interuniversity Consortium for Political and Social Research, ICPSR) have made individual-level data with geographic identifiers available to researchers and there should be a renewed conversation about how to do this for routinely for national survey.

III. Improve Drugged Driving Education

Best Practices in Impaired Driver Education for Specific Groups

Treatment and education programs began to be incorporated in court sanctioning programs in the early 1970's with the creation of NHTSA-funded Alcohol Safety Action Programs (ASAPs) in 35 communities in the US.[112] For the past 40 years they have focused primarily on assisting drivers with alcohol problems to control their drinking. Since many of those treated had comorbid drug problems, methods for dealing with drug abuse have been added to the initial curricula. Currently the extent to which drug education and drug treatment is part of the typical court program is not well documented. Aside from determining the content and effectiveness of current programs, more information is needed on the effectiveness of offender screening methods in detecting drug abusers. There are six specific groups for which best practices in drugged driving education should be identified and developed.

First Time DUI Convicted Offenders. Education programs for first time impaired driving offenders were first developed by the federal ASAP initiative and strictly focused on alcohol use and did not include information about the interactions of alcohol and drugs. There have been no recent comprehensive assessments of the effectiveness of the typical 10 to 12 hour DUI education programs for first offenders for reducing recidivism. Many states use programs based on research performed in the 1970's. A meta-analysis of first DUI offender education programs covering the last 20 years might be undertaken both to study the program content and program effectiveness. Based on this background, research could be initiated to identify the most effective curricula for first time offenders which include both alcohol and drugs. Equally important is the identification of the best ways to present this information and how to make it appropriate to various at-risk groups. An evaluation of current curricula based on offender outcomes in terms of recidivism could be the starting point for this process.

Repeat DUI Convicted Drivers. Repeat impaired driving offenders are generally required by US courts to attend treatment three to six month programs. The last national assessment of such treatment efforts occurred twenty years ago. The extent to which current court treatment programs reduce DUI recidivism is unknown as is the extent to which they deal with drug problems. An up-to-date review of court treatment effectiveness is needed. Aside from courts dealing with impaired drivers, treatment programs managed by courts dealing with drug offenders should ensure that drugged driving information is included in their curricula. New research on the management of repeat impaired driving offenders using different methods including education and monitoring will be of importance as more drugged drivers are identified.

New Drivers. New, young drivers are the most at-risk for crashes on the roads and are also at risk for the most harmful effects of drug use. They can be reached through driver education programs that teach new drivers practical driving safety skills and provide information on driving laws, as well as non-traditional education methods such as driving simulators. These are important steps to deliver a clear, uniform message and such drugged driving prevention strategies are an essential part of any national education campaign. Research has shown that the average age of underage drivers in treatment for DUI offenses is 17,[113] demonstrating the need for improved intervention with the young.

Older Adults. As previously noted, the implications for prescription-based drugged driving is high among older adults.[114] The American Association of Retired Persons (AARP) is an organization that issues a monthly news magazine and regularly corresponds with its constituency and therefore may be an important voice in spreading the word regarding drugged driving. [115] In addition, automobile insurance companies may be willing to include information in their mailings to their customers. Adult leisure living communities may also be targeted to reach this age group. There are drugged driving research opportunities focused on older adults and related to their education, in particular about the impairing effects of prescription drugs. This is discussed in more detail under **VI. Conduct Drugged Driving Behavioral Research, *Prescription-based Drugged Driving Behavioral Research***.

Law Enforcement. Law enforcement officials, particularly those working in highway safety, should be well informed on the prevalence of drugged driving and how to handle drugged drivers, as noted under **IV. Identify and Evaluate Promising Models for Drugged Driving Identification**, ***Best Practices in Identification of Impaired Drivers*.**

The General Public. Although research studies on the best ways to educate the general public on drugged driving are needed, there are a number of established education programs and campaigns in the US and abroad which are helpful to review when considering new research studies for education in the areas of substance use and driving behaviors. Evaluations of the following campaigns and programs could help establish the best practices on which to base future drugged driving education techniques.

Mothers Against Drunk Driving (MADD) is an organization that has led a three decades-long national campaign to educate the public on the dangers of alcohol-impaired driving. MADD has been and continues to be a key leader in drunk driving education and plays an important role in the development of policy, laws, and impaired driving research. [116] The work of MADD is recognized as having changed attitudes toward drinking and driving, pointing toward the reduction in the number of deaths and injuries in alcohol-related crashes.[117] The high standard MADD sets is one that drugged driving efforts could follow, joining forces to make a more significant impact on rates of impaired driving.

Many countries in the EU have implemented national education campaigns specific to drugged driving as part of prevention strategies.[118] In the United Kingdom, the Department for Transport (DFT) launched a national drugged driving campaign entitled, THINK! The first phase of the campaign launched in April, 2009 featured a new website, a national television commercial,

sponsorship at festivals, radio and online advertisements, as well as posters in bars and clubs throughout the country.[119] Campaign goals included facilitating discussion and understanding of the dangers and consequences of drugged driving and targeting drugged drivers to influence their behaviors. The specific message of the campaign is to dissuade drug users from driving, separate from dealing with the issue of drug use.

Law enforcement also plays an important part of the THINK! campaign; the message delivered to the public is that police are trained to detect recent drug use among drivers and can make roadside arrests for drugged driving.[120] The financial, driving, and criminal penalties for drugged driving also are outlined, as are the risks of driving impaired due to prescription drugs.

The Motor Accident Commission (MAC) is South Australia's compulsory third party insurer that provides insurance coverage for victims of crashes and implements national education projects to reduce the number and impact of crash-related injuries and deaths.[121] Its statewide drugged driving campaign includes television, radio, and multimedia advertisements as well as a website which provides information on the dangers of drugged driving, random roadside drug testing and enforcement, and penalties.

Similarly, the Transport Accident Commission (TAC) of Victoria, Australia that pays for treatment and benefits for people injured in transportation accidents has addressed the problem of drugged driving through a media education campaign.[122]

In the US researchers have had the opportunity to evaluate a number of national and local public media campaigns related to public health issues.[123] These studies have yielded a number of general principles that can be applied to informing the general public regarding the hazards of drugged driving and efforts to change risky behaviors.

These principles include:

1) Safety campaigns that accompany action programs such as the implementation of new laws or special enforcement efforts;

2) Public information programs that convey new knowledge and are continued for an extended period of time;

3) Programs based on behavioral theory and are pretested; and

4) Programs that are not just targeted at problem drivers but enlist members of the community, parents, community leaders and officials.

The coming decade will offer many opportunities for the development of effective public media programs based on new drugged driving laws, new drug sensing technologies and new enforcement procedures. Continuing evaluation efforts will be required to validate those programs which are likely to be expensive and ensure that, unlike some programs in the past, they are not ineffective or worse, counterproductive.

These types of campaigns are examples of how different countries have addressed impaired driving at the national level and may act as guidelines for how the US can improve its national education strategy in the future. However, research into the effectiveness of drugged driving media and education strategies is needed.

Future Drugged Driving Education

The *National Strategy* identified the need for a national effort to inform the US public about the public health and safety threat posed by drugged driving. Research is needed to identify and study best practices in drug and alcohol education and highway safety among these groups, resulting in the implementation of new innovative programs. As education programs are developed they must be evaluated for effectiveness through outcomes monitoring.

IV. Identify and Evaluate Promising Models for Drugged Driver Identification

Promising models for identifying the impaired driver on the road, and subsequent toxicological confirmation of the source of their impairment are needed to determine the best use of new and existing drug testing technology, and its application in the laboratory and in the field. Additionally, this should extend to the management and the rehabilitation of offenders.

Best Practices in Identification of Drugged Drivers

The *National Strategy* encourages increased training of law enforcement personnel to improve overall drugged driving enforcement. As previously mentioned, Drug Recognition Expert (DRE) programs comprise the primary law enforcement strategy currently used in the US to combat drugged driving. Although DREs are reported to effectively identify drug impaired drivers [124] [125] and increase the number of drugged driving arrests,[126] the DRE program "as-is" is not currently scalable to the size of the drugged driving problem. Based on the annual DRE report,[127] nationwide there were a total of 21,818 DRE evaluations completed in 2009. Of these evaluations, 84.7% or 18,882 were enforcement evaluations, as opposed to training or other evaluations. There were 3,396 evaluators from 42 of the 46 DRE states entering data in 2009. From these statistics, one can gauge that each DRE evaluator completed an average of 5.5 enforcement evaluations in 2009. This low annual rate is in part explained by the fact that many DREs are the highly rated law enforcement officers who rapidly are promoted out of direct enforcement roles.

The DRE program is composed of a three-phase training curriculum over 100 hours in duration, including Pre-School, DRE School, and Field Certification.[128] Throughout this program, DREs are trained and certified to detect and identify persons impaired or affected by both alcohol and/or drugs, using Standard Field Sobriety Tests (SFSTs) as the foundation of the program.

A related program is the Advanced Roadside Impaired Driving Enforcement (ARIDE) program which is a 16-hour course designed to address the gap in enforcement training between SFST and the DRE program. ARIDE encourages the utilization of DREs for drug impairment detection, requires successful demonstration of SFST requirements and stresses the importance of obtaining appropriate specimens from drivers for testing and impaired driving detection.[129]

These programs provide valuable education to law enforcement and are likely to be a focal point for the US strategy to combat and enforce drugged driving laws as new systemic improvements in drugged driving enforcement practices are identified and implemented. An evaluation of high-functioning and well connected ARIDE and DRE programs would be helpful to establish these best practices.

An evaluation of alternatives to a DRE examination as a prelude to drug testing is necessary if drugged driving enforcement is to reach the scale of the drugged driving problem, matching the enforcement needs of drunk driving. The identification and evaluation of non-DRE law enforcement strategies, in the US and abroad, targeting drugged and drunk drivers will be of great value as efforts are made to expand drugged driving enforcement at the national level. Conducting a survey of police agencies on the practical aspects of collection of specimens including oral fluid from impaired driver suspects may help to identify best practices.

Since the 2007 NRS and a number of studies of crash-involved drivers demonstrate that many drivers have both alcohol and drugs in their systems, a study of the proportion of all arrested impaired drivers that are drug users could provide the basis for estimating the extent to which simply increasing current drunk driving enforcement efforts would reduce the drugged driving problem.

Drugged Driving Offender Management

Identifying the best practices in offender management would be a helpful tool to guide future drugged driving policy and research. Unlike traditional approaches to DUI offenders, which emphasize separating drinking from driving through license restrictions and more currently vehicle alcohol interlocks, drug rehabilitation programs have focused on substance use and abuse. Recently, programs for impaired drivers such as Driving While Impaired (DWI) Courts, which are modeled on Drug Courts, have picked up this emphasis. For example, South Dakota's 24/7 Sobriety Project focuses directly on the problem of substance abuse and addiction. All participants in 24/7 Sobriety are prohibited from consuming alcohol and/or illegal drugs while under the supervision of the program. The 24/7 Sobriety Project targets high-risk repeat DWI/DUI offenders; with rare exception all participants have been arrested at least one prior time, with 48% having three or more offenses.[130]

Participants in 24/7 Sobriety must submit to either twice-daily alcohol testing, usually occurring at the local sheriff's office, or continuous transdermal alcohol monitoring using an ankle bracelet. Offenders are subject to random urinalysis drug tests or must wear sweat patches to monitor drug use. This combination of testing methods ensures effective monitoring of all substance use. Treatment is an important part of any program dealing with substance abuse; 24/7 Sobriety participants who are dependent and require treatment can receive it.

Any alcohol or drug use results in an immediate, short-term jail stay. In addition, bench warrants are issued for any participant who does not report for testing. These clear expectations of program compliance and alcohol and drug-free behavior enforced by immediate sanctions have great promise for reducing impaired driving recidivism; however a rigorous study of the program is needed. Initial reviews of alcohol and drug test data are dramatic: [131] [132]

- 99% of twice-daily alcohol tests completed were negative for alcohol; 66% of twice-daily alcohol tested participants are fully compliant during their tenure in the program, having never tested positive
- 78% of participants monitored by bracelet were compliant and test negative throughout their tenure
- 98% of urine tests were negative
- 92% of sweat patch tests were negative

An evaluation report on the long-term effects of South Dakota's 24/7 Sobriety Project upon DUI recidivism demonstrated that the program was successful in addressing offender sobriety while individuals are in the program.[133] Individuals who participated in twice-daily breath tests had lower rates of DUI recidivism when compared to individuals who did not participate in the program. For repeat offenders, even minimal days of participation in 24/7 Sobriety reduced recidivism rates. Individuals with at least 30 days or program participation demonstrated an even greater reduction in recidivism.

However, as an editorial review of this program states, "the 24/7 Sobriety Program's seeming success is so dramatic as to be provocative."[134] A new thorough evaluation should include information on the number of participants meeting criteria for abuse and dependence and follow up with participants after program completion to determine long-term results.

Research into the identification and evaluation of best practices in managing drugged and drunk driving offenders like 24/7 Sobriety should be given high priority. There should be a specific focus on substance use monitoring and its impact on recidivism. A question of particular interest will be whether enforced abstinence is therapeutic and reduces consumption over the long-term following release from supervision.

In addition, the best ways to link offender management to treatment need to be explored with special reference to the strategy used in Hawaii's Opportunity Probation with Enforcement (HOPE) known as "behavioral triage."[135] [136] In this model, rather than sending all offenders to treatment, they are all offered treatment at the outset but treatment is only provided to those who request it. All offenders are carefully monitored to achieve stable abstinence from alcohol and nonmedical drug use. Those who fail abstinence monitoring are referred to treatment. Because most offenders in HOPE can achieve abstinence without treatment, behavioral triage greatly reduces the costs of care and reserves scarce and expensive treatment for those who need it most. Research is needed to determine if offenders who use treatment to succeed in monitoring have more stable post-monitoring outcomes than those offenders who do not use treatment.

V. Standardize Drugged Driver Testing

Current Precedents and Opportunities in Drug Testing

Just as the identification of drunk drivers depends on alcohol testing, the identification of drugged drivers depends on accurate and reliable drug testing. The widespread use of drug testing started in the US workplace in the late 1980s in response to concerns about transportation safety. Regulations of the Federal Motor Carrier Safety Administration (FMCSA) require testing of all drivers required to obtain commercial drivers' licenses.[137] While there is a zero tolerance law which requires that the drivers' rigs be immediately taken off the road for 24 hours if they have a measurable BAC, if they have a BAC of 0.04 g/mL or above they lose their commercial licenses for one year. There is no level of illegal drugs that is legally accepted for commercial drivers outside the detection cut-off levels for each drug.[f] Since 1988, the nation's 10 million commercial drivers have been held to the zero tolerance *per se* drug standard where any detection of illegal drugs is a violation.

The current practices for driver drug testing are closely tied to the limitations of existing testing technologies and to ease of collection and testing of different specimen matrices. There are also two areas where fundamental research efforts which could assist in effective detection, deterrence and data collection: point of contact drug testing technology and the development of standardized laboratory approaches for drug testing in support of drugged driving enforcement.

Specimen Matrices

The two primary specimen matrices which have been used in drugged driving research and enforcement practice to-date are blood and urine. There has been growing interest in laboratory based oral fluid testing, and 16 states now allow for the collection of other bodily substances, including oral fluid, for DUI enforcement.[138] Blood gives the most information about a subject's state of intoxication because it correlates relatively well with impairment, is tested in a laboratory using the currently accepted state-of-the-art technology, and is invariably admissible in court. It is, however, the most invasive procedure and requires transportation of the subject to a phlebotomist or clinic to collect the sample. Valuable time is lost and many highly impairing drugs can disappear from the blood stream during this timeframe. Some states have attempted to address this by training law enforcement officers to draw blood. Urine is equally difficult to collect at roadside, although it could be collected at the police station more easily. However, urine may provide less information about impairment.

Oral fluid testing is far less invasive than a blood or urine collection. A specimen can be collected promptly at the roadside and tested later. In the laboratory, oral fluid is tested by an initial screening followed by GC/MS or LC-MS/MS drug confirmation, providing the same or better information than blood.[139] However, as previously noted, currently available onsite (i.e. roadside) oral fluid devices are less sensitive and specific than laboratory-tested oral fluid, onsite urine tests or blood tests.

[f] The SAMHSA thresholds for detection of opiates and amphetamine/methamphetamine were increased in the past and consideration of lowering these to the original levels are advised.

An issue with the use of oral fluid for forensic purposes that is while it correlates well with blood with regard to the presence of a substance, since different metabolites are detected in oral fluid than in blood for a number of substances, quantitative measures from the two substrates do not correlate well. Over the history of the use of breath tests rather than blood for DUI cases, the relation of breath to blood concentration produced considerable controversy in the courts until laws were passed separately specifying the concentration in each medium. A similar problem will likely arise as the use of oral fluid increases because, like the alcohol breath test, its ease of use in the field or police station. Specifying cut-off levels by reference to concentrations in blood will invite challenges based on the evidence for the correspondence specified. With the use of the *per se* standard, the issue of correlation of oral fluid concentration and blood concentration and the correlation of either with impairment become of little significance. With the *per se* standard, the cut-off levels for oral fluid tests are set to be relatively easily achieved by laboratories and not by correlation with impairment or blood levels.

The area of specimen matrices presents several opportunities for research, some of which are discussed in more detail:

- Development of improved, more uniform and standardized procedures for testing in drugged driver and fatally injured driver populations
- Development of breath tests for detection of recent use of impairing drugs
- Development of reliable, rapid oral fluid test devices that can be read at the roadside
- Assessment of interpretability of oral fluid results relative to impairment
- Assessment of the utility of oral fluid test results in drugged driving prosecution and trial outcomes

Point of Contact Drug Testing (POCDT) Technology

The development or adaptation of current laboratory based immunoassay tests for roadside use is a drugged driving research priority. Current instrumental approaches are designed for automation and throughput, which is not the priority at roadside. Consequently, the laboratory based instruments tend to be floor or bench mounted technologies with robotics, plumbing, waste stream management and intensive computer-based data processing capabilities, which make them unsuitable for use in police stations or police vehicles. Commercial companies in this market profit from the volume of tests sold, making it worthwhile for them to invest in this technology for laboratory use. The current test volume for law enforcement or offender monitoring in the field is low, reducing the commercial incentive for innovation.
This fact underlines the need for government support for the development of technologies for this specific application. As noted, oral fluid has emerged as the optimum sample type for reasons of ease of collection, collection proximate to the time of driving, and because it eliminates the need for transportation of subjects and Emergency Medical Technician (EMT) or phlebotomist time and costs to collect the samples.

Current POCDT devices are limited to 6 to 8 drug classes, have variable sensitivity, and poor reliability in the field. Internationally, countries that have taken steps as early adopters of the existing generation of test devices have had to accept high false negative rates which mean many impaired drivers are missed. However, identifying even a relatively small percentage of drugged

drivers using current POCDT technology is better than identifying none at all. Ongoing efforts should be made to optimize both the technology for this application, and its deployment in the field, in law enforcement practice and in familiarization of criminal justice professionals with all this technique has to offer.

The convergence of the improved understanding of drug transfer into oral fluid and the statutory authority for collecting and testing these samples makes it crucial that efforts be made to improve POCDT drug testing technology. The focus of these efforts should be on portability, ruggedness, improved sensitivity and specificity, recording of the field test device with a printed record, and expanded scope of drugs identified.

Standardization of Laboratory Approaches for Drug Testing

It is essential to develop improved and consistent practices for testing in drugged driving investigations in forensic toxicology laboratories. Current systems have evolved independent of any national guidance. The legacy is a patchwork of inconsistent practices, in terms of what drugs are tested for, at what cut-offs or detection thresholds, and in what circumstances drugs are tested for, if at all, in the presence of alcohol. The net result is an inability to compile any national statistics to properly and fully describe the extent of the drugged driving problem, and consequently an inability to measure the success of any preventive or remedial measures put in place. In many cases, regulation is not necessary and may stifle innovation.

Professional organizations in the toxicology community have taken steps to standardize these practices, and those efforts should be supported through study, research and outcomes assessment. Organizations that accredit forensic toxicology laboratories currently doing drugged driving analysis, specifically the American Board of Forensic Toxicology (ABFT) and the American Society of Crime Laboratory Directors Laboratory Accreditation Board (ASCLD-LAB), should be engaged and encouraged to include the scope (the number of substances they are capable of testing) and sensitivity from the revised recommendations in their accreditation standards. These organizations currently employ or are pursuing ISO standards (e.g. ISO 15189, or 17025) which would align laboratory practices internationally. Many laboratories are already regulated by these two boards and could quickly be brought towards standardization. Federal accreditation standards for forensic laboratories are currently under consideration by Congress;[140] this offers the opportunity to raise the standards for all forensic laboratories and to provide funding specifically for this purpose. At this unique time when interest in reducing drugged driving and improving performance of forensic toxicology laboratories is occurring, the opportunity should not be missed to establish good standards for drug testing of blood, oral fluid and urine.

In 2005 the American Academy of Forensic Sciences (AAFS) and Society of Forensic Toxicologists (SOFT) Drugs and Driving Committee conducted a survey of laboratories supporting the DRE program. Data collected on sample type, screening method scope and sensitivity, and confirmatory method scope and sensitivity demonstrated highly inconsistent practices. Guidelines were developed and published.[141] The stated goal was to return to these laboratories after the guidelines had been in place for a period of time and assess how practices had changed. The guidelines were published in 2007 and the survey has not yet been repeated.

Repeating this survey of laboratories specializing in drugged driving casework testing would determine their current practices and the degree of compliance with the published recommendations. This study may also stimulate the revision of the 2007 guidelines to reflect the needs of drugged driving enforcement programs.

A comprehensive data collection study of drug use by drivers in states with good FARS alcohol compliance rates and appropriate laboratory infrastructure would be of tremendous value and permit examination of different driver populations including all fatally injured driving dying within four hour of a crash, all surviving drivers of fatal crashes, and all drivers arrested for DUI whether alcohol or drug is the primary suspected substance. This study would provide a demonstration of the use of best testing practices and would provide both baseline and time series data to assess the effectiveness of interventions, education and deterrence campaigns.

The best testing practices and protocols using current drug testing technology should be implemented by law enforcement agencies while researchers continue to develop more optimal technologies. These practices should include standardization of drug testing specimen collection procedures at various testing locations.

While a wide range of data from around the world shows that the presence of drugs among drivers is high, while testing for drugs of abuse among drivers remains rare. As noted, this is in part because most impaired drivers who provide breath samples at or above the illegal BAC limit are not drug tested and there is no data on the prevalence of drug use among drivers suspected to be impaired. New research studies could help to understand and change this situation by increasing the testing of both arrested and crash-involved drivers and by supporting roadside surveys. This new research would provide more information on the extent of the drugged driving problem.

It is also the disparity between the number of drugged drivers on the roads and the number of drug tests administered to drivers suspected of impaired driving that leads to the widespread assumption that alcohol poses the largest, or only, problem on the highways and that the role drugs play is small. For example, in the state of Maryland, 23,714 arrests were made for DUI in 2008.[142] While Maryland statute's definition of DUI includes alcohol and/or drugs, only 708 arrests were made specifically for driving under the influence of drugs, roughly 3% of the total DUI arrests.[143] Just as arrest data likely underestimate actual rates of both drunk and drugged driving, it also highly unlikely that drugged driving accounts for such a low percentage of the DUI problem.

VI. Conduct Drug Impairment Research

Although there has been 30 years of research into the effects of drugs on driving; more extensive research is needed. Studies documenting the effects of cannabis use[144 145 146 147] on driving vary considerably, as do those on the effects of other drugs,[148 149] including those on simulated driving.[150 151 152 153 154 155 156 157 158 159] Overall, studies conclude that most drugs of abuse negatively affect driving ability, particularly when used in combination with other drugs including alcohol. Study methodologies to date however have been inconsistent, with behavioral tests being selected randomly, according to researcher preference rather than with a view to

challenging specific domains of the overall driving task. As a result studies often address only a portion of the effect of the drug relative to driving such as reaction time, or attention, or coordination. This has resulted in inconsistent information about the overall effect of the drug on driving skills and abilities.

An expert panel convened by NHTSA in 2008 and 2009 determined that there is inadequate information available to classify drugs according to driving risk or produce a list of drugs which are "safe" for drivers to use.[160] The panel agreed that this is because there is a "lack of (a) common, standardized protocol for assessing the impairing potential of drugs." To improve standardization and ensure that all aspects of a drugs impairing potential are studied, the panel defined five behavioral domains that make up the complex driving task and designed an experimental matrix that would challenge all of these. This approach ensures that drugs can be compared to one another to allow selection a drug with a lower overall risk of impairment for the patient, and studies can be compared to one another across epidemiological or demographic groups to evaluate other potentially confounding factors such as age or disease. The panel's recommendations adopted an approach of providing options to researchers in selecting the tests to challenge each domain, but stress the importance of ensuring that all are included.

This practical approach needs to be validated by research on emerging therapeutic drugs, selecting drugs with anticipated impairing potential based on their pharmacology and toxicology, and evaluating through various iterations of the recommended protocol to establish its effectiveness and evaluate the outcomes in terms of an improved ability to make patient recommendation.

The challenge of identifying specific blood concentrations of drugs other than alcohol that correlate with specific levels of impairment is compounded by many factors as described above. Inter-individual differences in response, different rates of metabolism, metabolic and behavioral tolerance, the role of polypharmacy and drug interactions, and factors related to the passage of time between driving and collection of a blood sample, all make it difficult to correlate blood concentrations to a specific degree of impairment. By analogy, it is well-known that the same blood concentrations of an opioid drug that may be lethal to a non-tolerant person could fail to fully control pain of a drug-tolerant person. Similarly, a blood drug concentration that produces no observable impairment in that tolerant individual could be profoundly impairing to a new or occasional drug user. There are currently no laboratory tests that identify tolerance. Unlike the case with alcohol, laboratory or driving simulator studies of driving impairment, which produce evidence of the potential for impairment, are unlikely to produce definitive evidence of critical blood drug concentration thresholds above which impairment can be assumed.

This perspective is important because it is all too often assumed that the problem of finding specific levels of specific drugs other than alcohol that cause "impairment" is simply a matter of additional study. Appreciation of these limitations is critical in pointing the way toward wider evaluation of the *per se* standard.

Using the *per se* standard for illegal drug use, and an impairment standard when the driver has a legitimate prescription for a potentially impairing medicine, is relatively easy to implement. It is the model that has been for commercial drivers in the US for more than two decades.

Additionally, that standard is easy to communicate to the public: that any illegal drug use, including illegal use of prescription drugs is a drugged driving violation. Communicating the fact that impaired driving as a result of prescription drug use will be more difficult.

With this understanding, the urgent research question for drugs other than alcohol has shifted from studying the relationships between blood concentrations of myriad of different drugs and their impairment effects to the study of strategies to reduce drugged driving and the public safety problems that result from such drug use. Such research will inform and improve future policies, programs, laws and enforcement.

Conduct Case-Control Drug Risk Studies

The relative risk studies conducted by Borkenstein[161] and others[162] were the gold standard research programs in the effort to convince researchers, opinion leaders and governmental officials that there was a strong basis for enacting *per se* alcohol laws. NHTSA has funded the first case-controlled drug relative risk study in the US which is currently underway and should be completed by the end of 2011. In contrast to the single substance of alcohol, the drugged driving problem involves many substances. A single case-control study is unlikely to produce enough data to evaluate more than one or two drugs. The current effort may need to be expanded and extended to cover the major drugs of abuse.

Conduct Comprehensive Assessments of Drugs Most Frequently Encountered in the Drugged Driver and Fatally Injured Populations for their Impairing Effects

Using the NHTSA methodology that currently is being developed[g], a series of new research studies to systematically test both licit and illicit drugs for their effects on skills critical to safe driving would build this currently inadequate knowledge base. Alertness/arousal, attention and processing speed, reaction time/psychomotor functions, sensory perceptual functions, and executive functions, etc., can all be affected by drugs. Understanding more about how drugs impact these critical function domains and how they relate to driver deficits that cause impairment will contribute to motor vehicle engineering improvements, a better informed public, and better informed medical professionals. Relationships between these domains and impairment should be compared to the medication warning systems adopted in the EU, and those warning systems should be evaluated for their effectiveness.

Other similar research studies on the impairing effects of drugs could utilize resources such as the University of Iowa's National Advanced Driving Simulator (NADS) with current drug-using subjects, which has not to date been used for drug driving impairment studies.

[g] NHTSA has empanelled an expert group of pharmacologists, epidemiologists, toxicologists, psychologists and research scientists to recommend a protocol for assessing drugs at greatest risk for causing driver impairment. A report is expected in late 2010.

Assessment of Risk for New Prescription Drugs

New medications, especially those with known central nervous system effects, including sleep medications, pain medications, antidepressants, anxiety drugs, anticonvulsants, muscle relaxants, etc., should be quantitatively assessed for their effects on skills critical to safe driving. NHTSA has developed a recommended protocol which utilizes standardized, validated behavioral testing methods to assess the effect of the drug on measures that are predictive of crash risk. These measures include laboratory-based testing of driving-related abilities, driving simulation testing, and use of over-the-road naturalistic studies of driving performance. The behavioral information is integrated with toxicological, pharmacological and epidemiological data to develop an impairment score for the medication. Assessing the effects on skills critical to driving would allow both patients and prescribers to assess a new medication with the highest therapeutic value and low driving risks consistent with individual patient needs. These tests might be conducted with subjects given acute doses of the medications and with subjects on stable doses for weeks or even months to assess the role of tolerance in driving impairment. Research should also be directed at separating the effects of the high driving risk characteristics of individuals who choose to use drugs and the acute effects of the drug itself.

Drugs could be rated on their performance in the assessments suggested above. This may encourage drug developers and manufacturers to consider driver safety in their development and marketing processes. Recommendations for physician and patient education need to clearly distinguish between initial dosing and dose escalation from stable dosing over time so that concerns about possible effects (especially of acute administration) do not unnecessarily discourage appropriate medical treatments.

Studies should also be conducted to improve computerized warning systems for drug interactions that have implications for driving.

VII. Conduct Drugged Driving Behavioral Research

Prescription-based Drugged Driving Behavioral Research

New research is needed to determine the complex relationship between knowledge of prescription drug risks and driving behaviors, including whether the extent of knowing the risks of drugged driving changes drug use and driving behaviors. This includes both driving behaviors for illegal and legal use of prescription drugs as well as the impact of education on physicians who prescribe potentially impairing medications. It is important that the prescription and intended medical use of medicines is balanced with the need to reduce illegal nonmedical use and abuse of prescription drugs.

Example areas of potential future research that can inform the role of education in reducing prescription-based drugged driving include:

1) *Prescription Drug Warnings*. Research may be able to determine whether it is an appropriate and effective education strategy to specifically indicate that impaired driving resulting from a substance can result in arrest and conviction for impaired driving.

2) *Physician Education*. It is unknown whether physician-patient education is an effective strategy. The American Medical Association (AMA) provides a strong organization for distributing and promoting drugged driving information to its members, which supports the strategy of physicians warning their patients to avoid driving when taking a drug they prescribe that may impair driving.[163]

3) *Regulating Pharmacies and Educating Pharmacists.* Aside from their formal education and continuing reviewing of the literature, pharmacists are dependent of full disclosure by drug producers to be adequately aware of the risk of a particular drug for driving. As the movement toward electronic medical records for all citizens materializes, an important feature may include recording prescriptions that can impair driving. Consumers may also be encouraged to register with pharmacies in order that their list of prescribed drugs can be rapidly checked against new prescriptions.

Improved prescription drug warnings and physician and pharmacist education and pharmacy regulation may in turn inform older adults as well as all patients taking legal prescription drugs with potentially impairing effects.[164] Unlike the warnings found on legal drugs like alcohol and cigarettes, receiving direct warnings accompanied by instructions from physicians and pharmacist may be more meaningful; however, research to determine the effects of these education strategies is needed. Also important is that such warnings can help remove "lack of knowledge" as an excuse for driving when using high-risk medications.

General Drugged Driving Deterrence

As drugged driving laws are improved and enforcement measures increased, research will be needed to determine how general deterrence laws and enforcement impact the prevalence of drug-using drivers on the road and the frequency of drug-involved crashes. Alcohol law and enforcement measures are highly visible and may serve as models for this research. Such studies will have to control for alcohol driving laws, vehicle mileage, the economy and other factors which have been shown to impact drunk driving crashes.

VIII. Conduct Related Treatment Research

Screening, Brief Intervention and Referral to Treatment

As drugged driving offender management programs evolve, the role of treatment in maintaining sobriety may also be studied. Screening, Brief Intervention and Referral to Treatment (SBIRT) could offer a strategy to identify DUI or drugged driving offenders that meet the criteria for alcohol and/or drug abuse or dependence. Many offenders are not assessed until after a second or third offense. As SAMHSA explains, "screening quickly assesses the severity of substance use and identifies the appropriate level of treatment… Brief intervention focuses on increasing a person's awareness of substance use as well as encouraging changes in behavior… Referral to treatment offers access to care for individuals who are in need of treatment for substance abuse."[165] Research on the effectiveness of SBIRT to improve outcomes with illegal drug use is

sparse but promising [166] [167] [168] while there is substantial evidence in support of SBIRT in the alcohol field[169] [170] including primary care settings.[171] Utilizing SBIRT with first time DUI and drugged drivers may identify individuals in need of treatment and intervene earlier in their substance-using careers before another offense takes place involving more severe sanctions and requiring more intensive monitoring. Research into the use of SBIRT with first-time and repeat DUI offenders could be of immense value to both areas of drugged driving enforcement and substance abuse treatment.

Virtually every jurisdiction screens and/or assesses convicted offenders in the criminal justice system (CJS); however SBIRT is based on self-report and it is relatively easy for DUI offenders to calibrate their responses to any screening test to avoid detection as dependant or abusive substance users.[172] For this reason, there is great need for adaptive programming even in systems that use traditional screening and assessment.

One way to ensure that treatment is effective long-term is through effective substance use monitoring[173] backed by an appropriate sanctions and rewards system based upon the principles of contingency management.[174] [175] This has implications for populations both receiving and not receiving treatment. While most jurisdictions provide some form of treatment to CJS offenders, most cannot afford to provide high level treatment to all CJS offenders who could benefit from it. Consequently, some jurisdictions provide treatment to all who want it but require it only from those who are unable or unwilling to comply with orders of abstinence as demonstrated by failed alcohol or drug tests. As previously noted, the use of Behavioral Triage to select which DUI offenders to mandate into treatment should be studied because this strategy has the potential to manage treatment costs.

As more drugged drivers are identified, prosecuted, and managed, research will be needed to improve the testing and evaluation of SBIRT and contingency management models with this population of drugged drivers. The following are questions that research can help answer:

- Which screening questions are needed?
- What are the most effective interventions at different ages?
- What factors in CJS discourage or prevent offenders who need treatment from taking advantage of it?
- Do certain behaviors of drugged drivers accurately indicate impairment?
- How does medical reimbursement affect identification of drugged drivers in medical settings?
- How can laws prevent non-reimbursement if alcohol and/or drug use is identified?

CONCLUSIONS

Although the study of drugged driving is more than four decades old, strategies to address it are fragmented, data collection is poor and inconsistent, and resources for translating research and existing knowledge into effective policy are lacking. The US lags significantly behind Europe and Australia in its investment in drugged driving research and in applying the lessons learned to saving lives and reducing injuries. The evidence that drugged driving is a serious public health and safety problem in the US is strong, as is the evidence that current efforts to combat it are grossly inadequate.

Three key factors make this a propitious time to remedy these defects:

1) The attention brought by the release of the 2007 National Roadside Survey and the 2009 FARS data has made the public aware the nature of the drugged driving problem,
2) The recognition of the opportunity drugged driving enforcement and education play in the 2010 *National Drug Control Strategy*, and,
3) The emergence of better technologies for drug testing.

Now is the time to consolidate what is known about drugged driving and to inform effective policies, laws and programs based on that knowledge and experience base. The US needs to extend the impact of drugged driving research into the development of a new generation of evidence-based drugged driving prevention and educational programs as well as affordable and practical policies and practices. Improved testing technology also is needed with more sensitive rapid onsite oral fluid tests and the development of practical and affordable breath tests for recent drug use being high priorities in that effort. While these testing technologies are being developed, use of current drug testing technology with standardized protocols should be implemented and evaluated for best practices. It may be possible to partner with other government organizations that have a vested interest in these processes including the National Institute of Justice (NIJ) among others. Further research correlating drug use and driving impairment is necessary. A successful response to the problem of drugged driving holds the promise of improving highway safety, creating an important new path to long-term recovery and improving the effectiveness of all drug abuse prevention and treatment efforts.

APPENDIX A: EXCERPTS FROM THE 2010 NATIONAL DRUG CONTROL STRATEGY

The following excerpts are quoted from the 2010 *National Drug Control Strategy*.[176]

Excerpt from Preface from Director Kerlikowske

> Drugged driving has now been identified at higher levels than alcohol-impaired driving.

Excerpt from National Drug Control Strategy Executive Summary

> Curtailing drugged driving by encouraging. States to establish and enforce laws that impose penalties for the presence of any illicit drug while driving and by launching a national effort to educate the public about the serious public health and safety threat posed by drugged driving.

Excerpts from Introduction: Launching a New Approach to America's Drug Problem

> **National Drug Control Strategy Goals to be Attained by 2015**
>
> Goal 2: Improve the public health and public safety of the American people by reducing the consequences of drug abuse.
>
> 2c Reduce the prevalence of drugged driving by 10%.

Excerpt from Chapter 1. Strengthen Efforts to Prevent Drug Use in Our Communities

> ***5. Preventing Drugged Driving Must Become a National Priority on Par with Preventing Drunk Driving***
>
> Americans know the terrible consequences of drunk driving and are becoming more aware of the dangers of distracted driving. Drugged driving poses similar threats to public safety because drugs have adverse effects on judgment, reaction time, motor skills, and memory. According to the latest National Roadside Survey conducted by the National Highway Traffic Safety Administration (NHTSA), more than 16 percent of weekend nighttime drivers tested positive for drugs. This troubling news demands a response on a level equivalent to the highly successful effort to prevent drunk driving. The Department of Transportation (DOT) has already taken some important steps including publicizing the survey and adding drugged driving to its public discussions of drunk and impaired driving. However, considering the severe public safety risk posed by drugged driving, much more needs to be done to enhance safety on America's roads and highways.

Actions

A. Encourage States To Adopt *Per Se* Drug Impairment Laws [ONDCP]

State laws regarding impaired driving are varied, but most State codes do not contain a separate offense for driving under the influence of drugs (DUID). Therefore, few drivers are identified, prosecuted, or convicted for DUID Law enforcement personnel usually cite individuals with the easier to prove driving while intoxicated (DWI) alcohol charges. Unclear laws provide vague signals both to drivers and to law enforcement, thereby minimizing the possible preventive benefit of DUID statutes. Fifteen states have passed laws clarifying that the presence of any illegal drug in a driver's body is *per se* evidence of impaired driving ONDCP will work to expand the use of this standard to other states and explore other ways to increase the enforcement of existing DUID laws.

B. Collect Further Data on Drugged Driving [ONDCP, DOT/NHTSA, HHS/NIDA, NIAAA]

Much greater efforts are required by Federal and local agencies to focus on the serious drugged driving threat, but these efforts must be built on a strong foundation of accurate data. Data sources to track drugged driving among the overall population include SAMHSA's National Survey on Drug Use and Health and NHTSA's National Roadside Survey of Alcohol and Drug Use by Drivers. In addition, NHTSA's Drug Evaluation and Classification program captures information on drug evaluations conducted on drivers arrested on suspicion of impaired driving. Further, the Fatality Analysis Reporting System, known as FARS, provides testing results for drivers in fatal car crashes FARS data on drug use for 80 percent or more of all fatally injured drivers is available for 15 states. The National Roadside Survey of Alcohol and Drug Use by Drivers is the only survey of non-crash-involved drivers using a specific biomarker (generally a blood or saliva test) that confirms the presence of drugs in those who volunteer to participate in the survey NHTSA has conducted the National Roadside Survey on a 10-year cycle, most recently in 2007. The Survey estimates the use of alcohol and other potentially impairing drugs by drivers. Federal drug control agencies will reduce the length of time between National Roadside Surveys as one measure of progress on drugged driving.

C. Enhance Prevention of Drugged Driving by Educating Communities and Professionals [ONDCP, DOT, HHS/SAMHSA, DOJ, ED]

There has been insufficient effort to educate all relevant stakeholders, including government agencies, parents, schools, faith communities, community coalitions, and medical professionals, about the serious threat posed by drugged driving. ONDCP will provide educational materials on drugged driving in as many venues as possible, as this information can be of value to a broad range of individuals. Doctors can help by learning to recognize patients with substance use problems. Parents can help by talking to their children about alcohol and drugs and the dangers of driving after drinking alcohol or using drugs. Communities can reinforce the message that there are serious consequences associated with abusing alcohol or drugs Individuals who use drugs can seek help and make the choice to live a drug-free life. ONDCP will work with stakeholders to launch a national initiative to greatly expand our efforts to reduce drugged driving.

D. Provide Increased Training to Law Enforcement on Identifying Drugged Drivers [DOT, HHS/NIDA]

As with drunk driving, visible enhanced enforcement has a powerful preventive effect. The Drug Evaluation and Classification Program is a standardized, systematic method for law enforcement officers to determine whether observed driver impairment is due to drug use and, if so, to identify the category or categories of drugs involved. More than 6,000 law enforcement officers have received extensive training and have been certified as Drug Recognition Experts (DREs). In the training, participants learn basic drug terminology and pharmacology and how to identify the seven categories of drugs and the indicators of impairment. Training is complete when the participant demonstrates proficiency as a DRE and fully meets the national standards established by the International Association of Chiefs of Police (IACP). Recently, this training program has added more options to enable officers to gain a basic level of training in a short period. Expanding expertise among law enforcement officers in identifying impairment from drug use is a vital public safety priority, and DOT is directed to consult with law enforcement partners on how to supplement current efforts, as well as to seek advice from NIDA on how research findings can be taken into account in the design of the program as they emerge.

E. Develop Standard Screening Methodologies for Drug-Testing Labs to Use in Detecting the Presence of Drugs [HHS/NIDA, SAMHSA, DOT/NHTSA, ONDCP]

There are several important scientific issues that must be resolved to establish effective policies and laws on drugged driving. Better methods and technology to detect drug use by drivers would have a preventive effect and greatly facilitate the enforcement, prosecution, and adjudication under existing drugged driving laws. First, research must be conducted to develop standards for laboratory screening methodologies for detecting drugged driving. Secondly, research must be conducted to better specify the adverse effects of drug consumption on driving. This information will facilitate the development of model State drug laws to address drugged driving NIDA will work with its Federal partners to begin this important research.

Excerpt from Chapter 7. Improve Information Systems for Analysis, Assessment, and Local Management

A. Develop and Implement Measures of Drug Consumption [HHS/SAMHSA, NIDA, DOJ/NIJ, BJS, ONDCP]

Economic analyses of drug use and drug markets are essential to assessing the effectiveness and cost-effectiveness of drug control policies and programs. Yet the two most critical variables needed to assess the impact of drug policy are lacking: (1) how much of the commodity of interest (drugs) is consumed and (2) its price (for a discussion of drug prices, see item 1D above). Consumption refers to the amount of the substance consumed over a given period of time. Prevalence is simply the proportion of the population who use drugs in a given period (e g , the past week, month, or year). None of the existing government surveys provides a completely reliable estimate of the total amount of drugs consumed by Americans. Finally, even if these two essential data

elements were available nationally, they need to be available at the community level if they are to be useful in local policy development and measurement. SAMHSA, NIDA, NIJ, BJS, and ONDCP will work to develop and implement measures for estimating total drug consumption, including surveys of heavy users.

APPENDIX B: AUTHOR CONFLICT OF INTERESTS

From January 2007 – December 2010 Stephen K. Talpins, J.D. served as Vice President of Industry Relations for Alcohol Monitoring Systems, Inc., (AMS) which manufactures the Secure Continuous Remote Alcohol Monitor (SCRAM), an ankle bracelet that detects alcohol use transdermally.

Robert L. DuPont, M.D., Barry K. Logan, Ph.D., Corinne L. Shea, MA, and Robert B. Voas, Ph.D. do not have associations with alcohol, drug or equipment companies.

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