

The Need for Drugged Driving *Per Se* Laws: A Commentary

ROBERT L. DUPONT,¹ ROBERT B. VOAS,² J. MICHAEL WALSH,³
CORINNE SHEA,¹ STEPHEN K. TALPINS,⁴ and MARK M. NEIL⁵

¹Institute for Behavior and Health, Inc., Rockville, Maryland

²Pacific Institute for Research and Evaluation, Calverton, Maryland

³The Walsh Group, Bethany Beach, Delaware

⁴National Partnership on Alcohol Misuse and Crime (NPAMC), Washington, DC

⁵National District Attorneys Association, Alexandria, Virginia

Objective: Triggered by the new federal commitment announced by the Office of National Drug Control Policy (ONDCP) to encourage states to enact drugged driving *per se* laws, this article reviews the reasons to establish such laws and the issues that may arise when trying to enforce them.

Methods: A review of the state of drunk driving *per se* laws and their implications for drugged driving is presented, with a review of impaired driving enforcement procedures and drug testing technology.

Results: Currently, enforcement of drugged driving laws is an adjunct to the enforcement of laws regarding alcohol impairment. Drivers are apprehended when showing signs of alcohol intoxication and only in the relatively few cases where the blood alcohol concentration of the arrested driver does not account for the observed behavior is the possibility of drug impairment pursued. In most states, the term impaired driving covers both alcohol and drug impairment; thus, driver conviction records may not distinguish between the two different sources of impairment. As a result, enforcement statistics do not reflect the prevalence of drugged driving.

Conclusions: Based on the analysis presented, this article recommends a number of steps that can be taken to evaluate current drugged driving enforcement procedures and to move toward the enactment of drug *per se* laws.

Keywords *Per se*; DWI; DUI; DUID; Drugged driving; Drink driving; Drunk driving; Alcohol; Drugs

INTRODUCTION

Historically, attempts to control drugged driving have relied on impaired driving laws that require the prosecution to demonstrate (1) impaired driving behavior, (2) the presence of a drug in the body, and (3) a connection between the drug and the impaired behavior. Because enforcement based on this complex approach is difficult, drugged driving, compared to drunk driving, is seldom identified or prosecuted in the United States despite evidence that some drugs impair critical driving skills (Compton et al. 2009). To deal more effectively with drugged driving in the United States, there has been increased interest in applying *per se* illegal laws to make it a crime for a person to operate a motor vehicle with a specified level of certain drugs in his or her body. Such laws are based entirely on chemical test results and do not require evidence of driver impairment.

The 2010 *National Drug Control Strategy* released by President Obama and developed by the Office of National Drug Control Policy (ONDCP) announced a new initiative to decrease the prevalence of drugged driving by 10 percent by 2015 (ONDCP 2010). This initiative encouraged states to adopt drugged driving *per se* laws, provide increased training to law enforcement on identifying drugged drivers, and develop standard screening methodologies for drug testing laboratories to use in identifying the presence of drugs. This has led to the National Governors Highway Safety Association (GHSA) strengthening its policy on drugged driving to encourage states to enact laws that provide for distinct sanctions for drug-impaired driving (GHSA 2011). In addition, Mothers Against Drunk Driving (MADD) has announced a national coordinated effort to reach out to the underserved and growing number of drugged driving victims (Withers 2011). This article presents a commentary derived in part from a report by a committee of experts not involved in the ONDCP policy development (DuPont et al. 2011). It describes the background for the ONDCP proposals and explores their implications. This article does not attempt to review the extensive literature on the effects of drugs on driving behavior.

Received 25 April 2011; accepted 13 October 2011.

Address correspondence to Robert L. DuPont, Institute for Behavior and Health, Inc., 6191 Executive Blvd., Rockville, MD 20852. E-mail: bodbupont@aol.com

The recent focus on drug-impaired driving (DID) creates a valuable opportunity to update and improve the nation's approach to alcohol-impaired driving (AID). The goals of reducing alcohol and drugged driving, which were perceived previously to be distinct and even competitive, are increasingly recognized to be complementary. This article reviews current AID *per se* laws and then explores opportunities not only to build on this base but also to make changes in support of new efforts to reduce both alcohol and drugged driving. It reviews the reasons to establish DID *per se* laws based on the experience of applying AID *per se* laws, international experience with drugged driving *per se* laws, impaired driving enforcement procedures, and current drug testing technology.

ALCOHOL-IMPAIRED PER SE LAWS

AID *per se* laws prohibit a driver with breath alcohol concentration (BrAC) or blood alcohol concentration (BAC) in excess of a specified level from operating or exercising control over a vehicle. The vehicle does not need to be moving and the driver's behavior and appearance are not at issue. Conceptually, the court only needs to consider two questions: (1) Was the accused in control of the vehicle? and (2) Did the accused have a BAC at or higher than the designated limit? Theoretically, law enforcement officers need to present evidence on only those two findings. In Australia, impaired driving enforcement comes close to this model (Shultz et al. 2001). Random breath test laws allow police to stop any vehicle and require the driver to provide a preliminary breath test. A failed preliminary test or test refusal leads immediately to a mandatory evidential test, in which case a test failure or refusal is tantamount to conviction. In the United States where the BAC cutoff level is 0.08 g/dL in all 50 states, the routine enforcement of impaired driving is governed by state law and is more complex because it is covered by two types of laws. The first type is the AID law enacted by the states early in the last century (New York was the first state, in 1910) that require proof that the suspect was driving while impaired by alcohol. The second is the AID *per se* law that bases the offense on exceeding the "illegal limit." AID *per se* laws were enacted in the final decades of the 20th century after valid, reliable, and inexpensive BAC measurement procedures became available. Even though many, if not most, driving while intoxicated (DWI) convictions in the United States occur under the AID *per se* laws, the historic laws regarding impaired driving continue to control the arrest process.

Investigative Stops, Arrests, and Tests

In the United States, officers can only stop a person if they have an articulable, well-founded suspicion that the person committed, is committing, or is about to commit a crime (reasonable suspicion; *Terry v Ohio* 1968). In practice, this means that officers need more than a "mere hunch" (*United States v Arvizu* 2002). Officers can arrest someone if they reasonably believe that it is more likely than not that the person committed or was in the process of committing a crime (probable cause); the officers'

determinations are reviewed by courts based on the "totality of the circumstances" (*Illinois v Gates* 1983).

In practice, officers can stop a driver if they see the driver commit any type of traffic infraction or, in some states, if they witness the person driving in a way that suggests that something is amiss. When in this process officers encounter a driver who smells of alcohol or shows other signs and symptoms consistent with alcohol or drug use, the officer typically will administer a standard field sobriety test (SFST) to the driver. The SFSTs are a set of 3 tests developed by the National Highway Traffic Safety Administration (NHTSA; Burns 2003) for collecting the behavioral evidence necessary to determine whether someone is *impaired* by alcohol. The SFSTs were originally designed to detect impairment at BACs of 0.10 or higher (Burns and Moskowitz 1977) and were later validated for 0.08 BAC levels (Burns and Anderson 1995; Burns and Dioquino 1997; Stuster and Burns 1998; Tharp et al. 1981).

Though officers generally may request a driver to take the tests voluntarily without any kind of suspicion, they can only order a driver to take a test only under certain conditions. The standard necessary to coerce compliance is murky because the courts often use the terms *reasonable suspicion* and *probable cause* interchangeably when discussing these issues. Still, the majority of cases suggest that officers can require a driver to perform tests if they reasonably believe that the person committed a crime and the test would provide evidence of guilt or innocence (e.g., *South Dakota v Neville* 1983). In reality, however, officers cannot physically force someone to perform the SFSTs or to provide a valid breath sample.

In some jurisdictions officers test drivers using preliminary breath testers (PBTs) after administering the SFSTs (Bill O'Leary, personal written communication, June 2011). In most jurisdictions, a PBT can only be used to help establish probable cause for arrest. These instruments are used as evidential tests in a minority of jurisdictions where they are regularly maintained, tested, and calibrated. The justification for the limited use of the PBTs at the roadside is probably the concern that the officers will become overly reliant on the test result and therefore fail to collect adequate behavioral data or overlook drugged drivers entirely. This policy comes at considerable cost, however, because the failure to screen suspects early in the investigation, particularly at checkpoints where interview time is short, often results in missing over-the-limit drivers, particularly those who have developed a tolerance to alcohol (Lund and Jones 1987). On average, police officers examine 6 suspects for each driver they arrest (Zador et al. 2001).

Use of Tests in the Courts

Though the Constitution permits officers to compel blood tests from individuals whom they have probable cause to arrest for DWI (*Schmerber v California* 1966), the states have enacted implied consent laws that allow suspects to refuse a chemical test at the cost of a short-term license suspension. Not surprisingly, refusal rates can be extraordinarily high in some states.

Currently, 10 to 80 percent of the drivers in such states refuse evidential BAC tests (Hedlund 2003; Voas et al. 2009).

Traditionally, prosecutors introduced breath test results in the same way they introduced other types of scientific evidence in court. This often necessitated calling an expert witness and resulted in lengthy trials. In an effort to ease admissibility and avoid the need to call expert witnesses, nearly all states have passed laws authorizing a state agency such as the state police department, the state health department, or the state department of justice to create breath testing rules and to approve instruments for court use. In exchange for relaxing the rules of evidence, many of these laws only permit the admission of tests given after a lawful DWI arrest. This results in an ironic situation in which prosecutors must demonstrate impairment even in cases in which drivers provide samples well over the illegal limit, just as required by the original laws regarding impaired driving enacted between 1910 and 1920.

Occasionally courts suppress the results from evidential tests conducted at the police station when officers are unable to establish reasonable suspicion or probable cause. This can frustrate the intent of the AID *per se* law, which is designed to impose strict liability on people who drive with BACs at or higher than the illegal limit. As a result, most prosecutors charge DWI suspects under both the AID driving and the AID *per se* law. This means that jurors can find drivers guilty if they believe the drivers were either impaired by alcohol or over the illegal limit. It also ensures that prosecutors can introduce evidence of the driver's impairment, which may be critical to jurors who are reluctant to convict those who did not injure anyone else.

Summary of U.S. Experience With Laws Regarding Alcohol-Impaired Driving

The passage of AID *per se* laws in the United States has increased the use of BAC evidence in the prosecution of DWI offenders and has made the prosecution of offenders somewhat more efficient and transparent. AID *per se* laws are based upon BAC limits and have encouraged the development of highly sophisticated breath-testing equipment. However, the basic system for apprehending and arresting, if not for convicting, DWI suspects remains dependent on demonstrating that alcohol is impairing the driver's behavior. With some exceptions, such as state laws requiring testing of drivers in fatal crashes or when serious bodily injury occurs, without behavioral evidence, a BAC test cannot be required and the AID *per se* law cannot be implemented. If, as in Australia, every impaired driving suspect (not just those for whom there is probable cause to make an arrest) were required to be tested, the AID *per se* laws would supersede the complexities fostered by the older laws regarding impaired driving in detection and arrest procedures.

CURRENT U.S. DRUGGED-DRIVING ENFORCEMENT PROGRAMS

Currently, drugged driving in the United States is a minor adjunct to DWI enforcement for alcohol. Generally, only if a driver has a BAC lower than the illegal limit (0.08) is an in-

vestigation undertaken to determine whether the suspect is impaired by a drug and should be required to submit to a blood or urine test—which the suspect can refuse. Overall, few drugged-driving cases are pursued by police because under the current laws regarding impaired driving, the suspect cannot be convicted unless the observed impairment can be directly linked to detected drugs. In addition, the laboratory analysis of blood or urine samples is expensive and usually involves a considerable delay to obtain results.

To address the lack of drugged driver prosecutions, NHTSA, with the support of the International Association of Chiefs of Police (IACP), has assisted law enforcement agencies with the development of drug evaluation and classification (DEC) programs. (The DEC program was originally developed by the Los Angeles Police Department in the early 1970s. Pilot programs in the United States began in 1987 and by 1989 DEC programs were expanded across the country.) These programs provide police officers training in the recognition of drug impairment symptoms in drivers (Walsh 2009), which qualifies them as drug recognition experts (DREs). DREs conduct evaluations of drugged driving suspects to determine whether the driver is impaired by a drug(s). As the ONDCP (2010, p. 24) noted,

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).

According to the International DEC Program (2011), an arresting officer typically reviews a driver's BAC and calls a DRE for evaluation when the BAC test results are not consistent with the driver's behaviors; thus, drugged drivers who have high BACs typically do not face a DRE evaluation. The role of the DRE is to observe the behavior and appearance of the driver under controlled conditions and to determine whether the suspect is impaired by a drug and identify the class of drug involved. If the case goes to trial, the DRE testifies for the prosecution, adding to any drug test result an expert opinion on the extent of impairment. DREs effectively identify drugged drivers (Adler and Burns 2010; Smith et al. 2002) and increase the number of drugged driving arrests (Pennsylvania State Police 2010). However, though DEC programs comprise the major law enforcement strategy used in the United States to enforce drugged driving laws, many jurisdictions currently have no access to DREs. DRE training is time consuming, as are the evaluations, which take about an hour to complete. Based on the annual DRE report (IACP 2009), nationwide there were a total of 21,818 DRE evaluations completed in 2009. Of these evaluations, 18,882 were enforcement evaluations conducted by 3396 DREs. These statistics show that 20 years after the founding of the program, a DRE completed on average only 5.5 enforcement

evaluations in 2009. This suggests that the DEC program is not currently scalable to the size of the drugged-driving problem.

DREs tend to be highly rated law enforcement officers who are promoted rapidly out of direct enforcement roles, which makes the maintenance of an adequate cadre of DREs difficult and may explain the low rates of evaluations. An effort has been made for DREs to train regular patrol officers to recognize drugged drivers and to administer drug tests. A process has been implemented through the creation of the Advanced Roadside Impaired Driving Enforcement (ARIDE) Program, a 16-hour program designed to address the gap between traditional law enforcement of the SFST and DEC programs. The ARIDE curriculum 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 detection of impaired driving. Upon completion of the ARIDE program, law enforcement officers have more skills to recognize a drugged driver, including an understanding of how drugs affect the human body, though the ARIDE program is not a substitution for DRE training (Glass 2008). Officers who complete the ARIDE will be prepared to call in a DRE for evaluation of a driver suspected of drugged driving. Broad expansion of ARIDE training may help increase the use of DREs in states with DEC programs. Unfortunately, the number of officers who have received ARIDE training is unknown and the extent to which the ARIDE program has increased DID arrests and convictions remains to be determined.

DRUGGED DRIVING RESEARCH

Controlled Substances

Three general classes of drugs can impair driving. The first is Schedule I controlled substances. (The Controlled Substances Act [Title 21 Chapter 13 United States Code]: Controlled substances are drugs that 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 5 categories, or schedules, according to their potential for abuse and medical risk.) These chemicals are commonly abused and lack approved medical uses by the Food and Drug Administration (FDA), such as heroin, Lysergic acid diethylamide (LSD), Methylenedioxymethamphetamine (MDMA), and marijuana. These drugs are listed as Schedule I by the Drug Enforcement Administration (DEA). Although some states have passed laws permitting the use of marijuana at the recommendation of a physician, marijuana use remains illegal under federal law (DEA 2011). Moreover, even states with medical marijuana laws have not generally changed their laws regarding impaired driving or their procedures for prosecuting impaired drivers, so marijuana users remain at risk for arrest under the laws regarding impaired driving.

The second group of chemicals associated with impaired driving is comprised of prescribed medicines that characteristically are sedating. These medicines have approved medical

uses but are frequently abused. Those that have abuse potential are typically Schedule II (e.g., oxycodone, methadone), Schedule III (e.g., Vicodin, buprenorphine), Schedule IV (alprazolam, clonazepam, diazepam), and Schedule V (e.g., Robitussin AC) controlled substances. The third group of chemicals includes medicines that can impair driving but are sold over-the-counter (OTC) without a prescription. These are medicines that can cause sedation but are not commonly abused (e.g., most antihistamines).

With respect to drug control enforcement, all Schedule I drugs are illegal and any use is illicit (unlawful). Schedule II through V drugs are legal if prescribed by a physician and taken as prescribed. However, use without a prescription or for purposes not related to the prescription is illicit use. Though the proper use of prescription drugs is legal, they, like the legal drug alcohol, are illegal if they produce impairment under traditional state laws regarding impaired driving that make it illegal to driver while impaired by alcohol or drugs.

Drugged Driving Research

As in the early days of AID enforcement during the first half of the last century, the evidence base for the risk involved in drugged driving is derived primarily from laboratory, simulator, and controlled driving research and from the prevalence of drug use by crash-involved drivers. The development of relative risk of crash data for drugged drivers is just getting underway. Because of the many drugs of potential interest and their different effects on different skills related to driving compared to alcohol, this research has yielded much more nuanced results. For example, evidence from laboratory studies of marijuana shows that it lengthens reaction time, impairs concentration and coordination, and reduces the ability to divide attention, a key driving task (Couper and Logan 2004). On the other hand, drivers under the influence marijuana appear to be more aware of their impairment than drinking drivers and may reduce their risk-taking (Lamers and Ramaekers 1999). Thus, interpretation of the significance of laboratory results on drug impairment is difficult.

Much of the evidence for the significance of drug use on driving impairment is derived from studies of the prevalence of drugs in arrested drivers (Asbjørg and Moorland 2008; Brookoff et al. 1994; Holmgren et al. 2007; Jones et al. 2007; Jones, Holmgren et al. 2009; Maxwell et al. 2009; Morland 2000) and crash-involved drivers (Biecheler et al. 2008; Centers for Disease Control 2006; Fix et al. 1997; Jones, Kugelberg et al. 2009; Marzuk et al. 1990; Schwilke et al. 2006; Soderstrom et al. 1988; Walsh et al. 2005). Although there have been a large number of such studies, variations in the substances studied and differences between the populations measured (arrested versus crash involved) have limited the amount of information available on any one drug. This has been further complicated by the tendency for drivers to use a combination of drugs or drugs in combination with alcohol. Further, appropriate non-crash and unarrested control groups have made interpretation difficult. Frequently, only self-report data on drug use from national surveys, which

are limited by the tendency to underreport illicit drug use, are available for comparison.

Relative Risk Studies

Although the substantial prevalence of drug users among arrested and crash-involved drivers is impressive, studies of the crash risk attributable to specific substances have been limited. The principle method for determining attributable risk for drugs employed to date has been responsibility analysis in which drivers are determined to be responsible for a crash based on an analysis of the crash report compared with crash-involved control drivers who are judged to be not responsible for the crash (Robertson and Drummer 1994). Terhune et al. (1992), Drummer et al. (2004), and Ogden and Morris (2010) have used this technique. Terhune et al. (1992) used the responsibility procedure with fatally injured drivers and found that, although marijuana or cocaine alone were not associated with an increase in crash responsibility, either one in combination with alcohol produced an increase in risk. Drummer et al. (2004) found that detection of any type of drug in a driver was significantly associated with crash culpability (OR = 1.7). They reported that drivers who were positive for Tetrahydrocannabinol (THC) and had a BAC \geq 0.05 were 2.9 times as likely to be responsible for the crash when compared with drug-free drivers with BACs \geq 0.05. Ogden and Morris (2010) reported on a culpability study of 442 drivers injured in crashes in Victoria and noted that though 51 percent of the drug-free drivers were responsible for their crashes, 75 percent of those with one drug, 77 percent of those with two drugs, 93 percent of those with 3 drugs, and 100 percent of those with 4 drugs were judged responsible.

European governments have shown a particular interest in establishing relative risk levels for drugs commonly found in drivers by establishing the IMMORTAL program in which several nations are participating (Assum et al. 2005). This effort promises useful relative risk data as the various studies are completed. A highly controlled drug relative risk study in the United States modeled on the alcohol relative risk study conducted by Blomberg et al. (2009) has been funded by the NHTSA and should be reporting shortly. These studies should provide substantial new information on the relative crash risk presented by at least a few of the many drugs that can impair driving.

Enforcement Studies

Europe and Australia have moved more rapidly in the enforcement of drugged-driving laws. As noted, nations such as Sweden and Australia allow random stopping and mandatory breath testing of motorists. This procedure has been extended to mandatory testing for drugs in some Australian provinces. Most of these programs have only recently been implemented, so only process information is currently available. The province of Western Australia has established a DID enforcement program involving random stopping and a roadside oral fluid screening test leading to a laboratory confirmation. Woolley and Baldock (2009) described the general success of the procedure, but no data

were presented on the effect on drugged-driving crashes. Davey et al. (2010) reported on a survey of motorists in Queensland, Australia, that indicated that the random DID enforcement program in that province is beginning to have a deterrent effect. The province of Victoria enacted a random oral fluid testing program in 2004 for methylamphetamine and marijuana and later added ecstasy. Boorman and Swann (2010) reported that the prevalence of those drugs in fatally injured drivers stabilized following the introduction of the program.

Summary of Drugged-Driving Research

In summary, our knowledge of the extent of the drugged driving problem is much more limited than for alcohol. As will be discussed in the next section, this lack of knowledge results from the many substances to be investigated, the complexity relative to alcohol of measuring the extent of drug usage in the body, and the varied effects that drugs have on driving skills and driving attitudes. Nevertheless, the high prevalence of drugs in crash-involved and arrested drivers and the limited relative risk data suggest that drugged driving is a significant traffic safety problem. Its potential importance was illustrated by the results of the 2007 National Roadside Survey, which found that, among weekend nighttime drivers (when drinking is most prevalent), more drivers were positive for drugs than for alcohol (Lacey et al. 2009).

PER SE LAWS BASED ON IMPAIRMENT SPECIFICATIONS

Because of the relatively straightforward relationship between alcohol concentration in the blood and behavioral impairment, there is a strong basis for establishing BAC limits based on the extent of impairment or crash risk associated with a given BAC. The success of setting such limits for alcohol control laws and enforcement has encouraged the attempt to apply similar impairment requirements to DID illegal per se laws. There is substantial doubt, however, that this can be done for more than a very few of the more than 100 substances that can impair behavior. In a 1985 consensus report on drug concentrations and driving, a group of senior scientists specified 5 requirements for establishing the use of drug results for determining driver impairment the way an alcohol concentration of 0.08 BAC is used to determine alcohol-caused impairment (Consensus Development Panel 1985):

- (1) The drug can be demonstrated in laboratory studies to produce a dose-related impairment of skills associated either with driving or with related psychomotor functions.
- (2) Concentration of the drug and/or its metabolites in body fluids can be accurately and quantitatively measured and related to the degree of impairment produced.
- (3) Such impairment is confirmed by actual highway experience.
- (4) Simple behavioral tests, such as can be done at the roadside by police officer with modest training, can indicate the presence of such impairment to the satisfaction of courts.
- (5) A range of concentrations of the drug can be incorporated in law relating to impaired driving as ipso facto evidence. (p. 2618)

Twenty-five years after that report, it is questionable whether driver impairment specifications for any drug can meet that standard. The development of impairment standards for drugs similar to the 0.08 *per se* standard for alcohol has failed, not for want of trying and not for want of serious research. This is because no standard relationship between blood levels of a drug or drug metabolites and impairment has been established (Committee on Alcohol and Other Drugs of the National Safety Council 2004; Consensus Development Panel 1985; Logan 1996). There are complex loops of impairment related to drug blood levels that vary considerably depending on the drug. As the blood concentrations rise and fall, the degree and nature of impairment at the same blood concentration vary depending on whether the subject is in acute intoxication or in withdrawal. Some researchers have attempted to conduct a meta-analysis of experimental studies examining the relationship between drug concentration and the impairment of driving-related skills (Grottenhermen et al. 2007). However, the inadequate evidence available from epidemiological studies limited their findings.

Tolerance to a drug also plays a role in the level of impairment observed, as it does for alcohol. Individuals may respond differently to the same drug dose depending on genetics, drug metabolism, age, weight, sex, disease, as well as history of use. Moreover, drug–drug and drug–alcohol interactions cause great differences in how an individual behaves under the influence of a drug at various tissue levels. It is not practical to study all of the drugs of abuse under the almost limitless range of circumstances that can affect driving behavior. Therefore, setting impairment thresholds based on blood levels of drugs or drug metabolites for illegal drugs is not a viable option for a comprehensive drugged-driving prevention program. Even if one or two drugs could be found that meet the standards of the 1985 consensus panel, the sheer number of dangerous substances make it easy for illicit users to switch from a prohibited drug to one not covered by the law. This ability to switch rapidly from drug to drug would likely overwhelm the impact of a single drug law. Modern designer drug technology makes it possible to slightly alter a substance to change its chemical composition sufficiently to make it no longer technically illegal while still presenting a danger equal to or greater than the original.

If drugged-driving enforcement is held to the impairment evidence standard set by the 1985 consensus document, which envisioned impairment standards for drugs being defined in the same way as the 0.08 BAC limit is defined for alcohol, there will never be an effective, comprehensive drugged-driving enforcement program. No amount of additional research can solve this complex problem by establishing impairment levels for hundreds of different substances and their thousands of potential combinations. A common example to make this point is methadone, a synthetic opioid used in the treatment of opioid addiction. Methadone-maintained patients show no evidence of impairment after dose stabilization. However, a single dose of methadone, even at much lower doses than the levels typically administered to patients on methadone, is not merely impairing but can be fatal to an intolerant person (Department of Health

(England) 2007; Harding-Pink 1993). No amount of research will establish a tissue level of methadone that is impairing for all drivers. If set for the tolerant driver, such a tissue level is lethal for the intolerant driver. If set for the intolerant driver, the level is not associated with impairment for the tolerant driver. There is no biological test for tolerance.

PER SE LAWS BASED ON ZERO TOLERANCE

Rather than attempting to identify impairing drug levels in body fluids of drivers, the technology will only support the detection of a drug in the body. The issue arises then as to whether measures of presence of drugs—that is, *per se* laws that make any reliably measureable amount of an illegal substance in a driver an offense—can be fairly and effectively applied in law enforcement and will such laws be effective in reducing crash involvements? This zero-tolerance approach is already being applied in Sweden and Australia where drivers can be stopped at random and tested for illegal drugs.

Requiring Proof of Impairment for Arrests Limits Random Application of Drug Zero Per Se Laws

Unlike Australia's and Sweden's RBT programs in which vehicles can be stopped at random and drivers can be required to provide a breath test, impaired-driving enforcement in the United States requires the police officer to observe aberrant driving before stopping a vehicle and to have probable cause to arrest a driver before a breath test can be required. As described in the section on alcohol enforcement, the burden of proof of impairment must be in the officer's report. If that is inadequate, a test cannot be required, and if the test has been administered, it can be barred from entry on the court record. Because of this requirement, which is based on the Fourth Amendment, U.S. drivers are screened for impairment before a chemical test is administered.

In this environment, the role of the chemical test is more related to determining the source of the impairment than whether the impairment exists. Currently, U.S. zero-tolerance DID *per se* laws are being applied to individuals who have been found to be impaired by alcohol because the officers in the field have been trained to detect alcohol-impaired drivers and use the SFSTs designed to detect alcohol impairment. Because establishing limits for combinations of drugs and for combining alcohol and drug use is not feasible, zero tolerance for drugs in combination with alcohol is an appropriate approach to controlling the substantial risk presented by combining drug use with alcohol (e.g., Ramaekers et al. 2000; Sexton et al. 2000, 2002).

Unimpaired Illicit Drug Users

Thus, under current enforcement procedures only those whose impaired-driving behavior is documented by a police officer will be subject to drug testing. This screen will, of course, protect both legitimate and illegitimate drug users who manage their substance use to avoid impairment. As noted, several states with *per se* laws provide an additional protection for prescription drug users by making possession of a valid prescription an absolute

affirmative defense against prosecution under the *per se* law. This will prevent prosecution of prescription holders who are not impaired. Of course, prescription users whose driving is impaired by a drug will, as is currently the case, be subject to conviction under the traditional law regarding impaired driving.

The requirement for probable cause to believe that the driver is impaired to justify requiring a chemical test protects both the legitimate prescription user and the illegitimate use by substance abusers who are not impaired. But unlike prescription users they will not enjoy the absolute bar against prosecution under zero *per se* drugged driving laws. There appears to be some political support for barring any driving by individuals with drug use disorders. Five states (California, Colorado, Idaho, Kansas, and West Virginia) have made it illegal for any drug addict or habitual drug user to drive a vehicle in their states (Lacey et al. 2010). There is some research evidence that individuals with drug arrests have more traffic violations and crashes than the general population (Marowitz 1994).

Summary of Per Se Laws

In sum, many substances interacting with alcohol or other drugs or alone pose a risk to drivers and the road-using public. The relationship between concentration in blood and behavior is sufficiently complex that the development of *per se* impairment levels for drugs does not appear to be practical or feasible. Further, impairment limits would not deal with the risk presented by multiple drug or drug and alcohol combinations. Because currently nearly all arrests are based on signs and tests that indicate alcohol impairment, detection of an illegal drug in an arrested driver demonstrates the use of both alcohol and illegal drugs. This suggests that states use the zero-tolerance *per se* standard to extend the current DID laws that apply only to cases where impairment can be attributed to a drug or combination of drugs. The Fourth Amendment requirement that driver impairment be established before a chemistry-based test can be administered will protect prescription users who use drugs legally from being arrested under the *per se* standard. They will have the additional protection of a bar against prosecution under the *per se* law but, if impaired, can, as is currently the case, be prosecuted under the traditional state laws regarding impaired driving.

U.S. DRUG *PER SE* LAWS

In 2010, Lacey et al. (2010) surveyed the DID laws in the 50 states and identified 15 with drug *per se* laws. Three of the 15—Nevada, Ohio, and Virginia—had established non-zero specifications (i.e., impairment levels) for the drug-impaired driving offense. The remaining 12 (Arizona, Delaware, Georgia, Illinois, Indiana, Iowa, Michigan, Minnesota, Pennsylvania, Rhode Island, Utah, and Wisconsin) had established zero tolerance levels, meaning that any reliably measured presence of the substance in the body while driving is an offense. The substances prohibited varied among the states. In some states DID *per se* laws apply only to Schedule I, illegal drugs that are not prescription medicines. In other states the *per se* laws specified zero tolerance for prescribed medicines used by drivers who do

not have valid prescriptions. As noted above, they found that 5 states (California, Colorado, Idaho, Kansas, and West Virginia) specify that it is illegal for any drug addict or habitual user of drugs to drive a vehicle in that state. Finally, they identified two states (North Carolina and South Dakota) whose DID *per se* laws make it illegal for individuals under 21 to drive with any amount of a prohibited substance in their blood.

Lacey et al. (2010) attempted to determine the extent to which drug *per se* laws were increasing DID arrests and convictions. Obtaining quantitative data was hampered by the lack of separate recording of convictions based on drugs from those that are based on alcohol impairment. They noted that what little data they could find suggested that *per se* laws did increase arrests. They reported that the traffic safety professionals they contacted in *per se* states were supportive of such laws and indicated that though *per se* laws did not change the actual enforcement process, they believed that such laws made successful prosecution of drugged driving more likely.

In addition to *per se* DID laws covering drivers of private vehicles, any detection of an illegal drug(s) is a violation for commercial drivers; there is no accepted level of drug use (Walsh 2009). Since 1988, the nation's 10 million commercial drivers have been held to the zero-tolerance *per se* standard for illegal drugs including marijuana, cocaine, amphetamines, phencyclidine (PCP), and opiates (49 CFR §40 2010). Research has also indicated that the implementation of mandatory alcohol testing programs of commercial drivers in 1995 was associated with a 23 percent reduction in alcohol involvement in fatal crashes by commercial drivers (Brady et al. 2009). Although the procedures and consequences of the zero-tolerance drug standard for commercial drivers and the general population of drivers are different, the fundamental reasons for using the zero-tolerance standard are the same.

EVIDENTIAL AND FIELD TESTS FOR DRUGS

Following arrest, impaired driving suspects are typically brought to the police station where almost all evidential testing occurs. Breath testing at the police station provides both a BAC measure and a record for use in court. Testing for drugs generally requires the collection of a blood or urine sample that must be sent to a laboratory for analysis, making results unavailable for a variable period, depending upon the distance to the laboratory and the laboratory's backlog of cases. This can involve delays of more than a month. Recent technological developments have produced screening tests for urine and oral fluid that indicate the presence of a drug at the police station while processing the arrest so a decision can be made regarding the need for collecting a fluid sample for laboratory analysis. In Europe, these screening methods are being tested for use at the roadside by arresting officers. To be fully useful, field tests for drugs, whether conducted at the police station or at the roadside, require two elements: a capability to provide an onsite indication of the presence of a drug and a provision for capturing a sample that can be analyzed in an appropriately equipped laboratory.

Current practices for driver drug testing are closely tied to the limitations of existing testing technologies and the ease of collection and testing of different specimen matrices. Existing systems have evolved independent of any national guidance. The legacy is a patchwork of inconsistent practices regarding which drugs are tested for, at what cutoffs or detection thresholds, and the circumstances under which drug tests are conducted.

Drug tests identify the presence only of the chemicals in a sample that are specified on a particular test panel (DuPont et al. 2009). As a drug test panel expands, the cost for the testing increases. The most commonly used drugs are included in a standard panel known as the SAMHSA-5 (from the Substance Abuse and Mental Health Services Administration): marijuana, cocaine, amphetamine/methamphetamine, morphine/codeine, and PCP. Ecstasy (MDMA) was recently added to this now standard panel of 6.

All but 5 states (Alabama, Alaska, Massachusetts, New Jersey, and West Virginia) have passed implied consent laws requiring drivers to submit specimens for drug analysis. Typically the law specifies the types of specimen matrices authorized for drug analysis (e.g., blood, urine, saliva, or other bodily fluids). The two primary specimen matrices that have been used in DID enforcement practice to date are blood and urine for evidential tests. There has been growing interest in laboratory-based oral fluid testing, with the result that 16 states now allow the collection of other bodily substances for DWI enforcement (Walsh 2009). Blood provides the most information about a subject's state of intoxication because it correlates relatively well with impairment and is advantageous because it 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 typically requires transportation of the subject to a phlebotomist or clinic to collect the sample, though in some states (e.g., Arizona) police officers are trained phlebotomists. Valuable time is lost and many highly impairing drugs can disappear from the bloodstream during this timeframe. Urine is also difficult to collect at roadside, although it could be collected at the police station more easily. Urine and oral fluid testing have been forensically accepted in recent years because they use the same highly reliable laboratory procedures.

Oral fluid testing is far less invasive and more easily accomplished than a blood or urine collection. A specimen can be collected promptly at the roadside and tested later (Bosker and Huestis 2009). Currently available onsite oral fluid tests suitable for roadside administration are reliable but fail to identify a large proportion of recent marijuana use that is identified by urine tests. Because of advancing technology, improvement in sensitivity can be expected in onsite oral fluid testing. The same technology is used to identify drugs from various specimens, including blood, urine, and oral fluids. This technology permits reliable detection of specific drugs using all of these specimens.

Most states do not specify detection (e.g., zero tolerance) drug levels for blood and urine drug testing, making such levels unnecessary for oral fluid testing. This is because states rely on

laboratories to use the highest quality equipment and technicians available to detect recent drug use. There is a move toward standardization of approaches for drug testing, particularly the most commonly found substances among drivers, which would provide consistency and make comparisons across drugged driving detection data more useful.

Current onsite devices for roadside testing of urine and oral fluid are limited to around 6 to 10 drugs or drug classes and have variable sensitivity and reliability in the field. Several countries that have taken steps as early adopters of the existing generation of test devices have had to accept high false-negative rates for marijuana, in particular, because the currently available onsite tests are not as sensitive to the lower levels of marijuana chemicals found in these specimens. This means that many drugged drivers are missed. However, identifying even a smaller percentage of drugged drivers using current onsite technology is better than the current system of no testing for drugs other than alcohol. There is a great need to improve onsite drug test technology, especially tests using oral fluids. The focus of these efforts should be on portability, ruggedness, improved sensitivity and specificity, a printed record of the field test, and an expanded scope of drugs identified.

The fact that drug tests are limited by the specific panels used (and increased cost per test) is the ultimate "Achilles heel" of drug testing. The emergence of designer drugs, created to avoid illegal limitations and drug tests, has only compounded this serious problem. It is, however, mitigated somewhat by the fact that most nonmedical users of the less commonly used drugs use multiple drugs simultaneously, often including the most widely used drugs. This has been demonstrated in a statewide sample of Maryland parolees and probationers who were urine tested. Ninety-six percent of those who tested positive for at least one drug in an expanded 31-drug screen had previously tested positive for at least one drug in the SAMHSA-5 drug panel (Wish et al. 2009). Similar results were found in an initial pilot study of Maryland parolees and probationers (Wish et al. 2006). These studies demonstrate that if a SAMHSA-5 drug panel is used, some of the drugs will be missed, but many users of the less commonly used drugs will be identified as nonmedical drug users, reflecting the fact that many people who use less common drugs of abuse also use one or more commonly used drugs (Maryland Drug Early Warning System 2005).

OPPORTUNITIES AND ISSUES FOR DRUGGED DRIVING PER SE LAWS

The enactment of zero-tolerance DID *per se* laws for illegal drugs offers multiple possibilities for increasing the intensity of drugged driving enforcement and creating greater deterrence of drugged driving. In approaching these opportunities it must be acknowledged that they are inevitably intertwined with the existing AID enforcement system that began with modest legislation strengthened over time as new technologies became available. New requirements must not conflict with AID enforcement or

add to the already heavy burdens of police agencies and courts without also increasing their resources. Currently, unlike AID *per se* laws, there is no evidence that the enactment of a DID *per se* law by a state has reduced the number of crash injuries on its highways, which is why evaluation of these new laws is essential. Among the opportunities for increasing the current knowledge of the significance of drugged driving and the ability to detect and prosecute drugged drivers are the following.

Improvement of Drug Testing Technology

Drug detection is a field that continues to develop more complexities. Because there are many impairing drugs that are used nonmedically and an ever-increasing number of synthetic drugs used in varying combinations, it is important to develop testing technology to detect a wider range of drugs. There is a growing opportunity for toxicology laboratories to develop low-cost tests that would cover multiple drugs for use in drugged-driving enforcement. In the interim, smarter drug testing offers an affordable and adaptive strategy to the changing drug-using environment (DuPont and Graves 2005). This strategy includes testing all samples for the standard panel and randomly rotating the testing for a variety of additional drugs. When one of the drugs on that wider net shows up commonly it can be placed in the standard panel. This approach has been used successfully by the U.S. military and in the criminal justice system. Screening for a relatively small number of the most commonly used drugs will identify a large percentage of the users of the less commonly tested drugs (Maryland Early Warning System 2005). However, there will be some individuals who purposely use synthetic chemical drugs designed to evade detection, so special attention should be given to developing new tests that could quickly adapt to these new drugs.

Enactment of Laws Providing for Drug Testing of All Drivers in Injury Crashes

Currently, most states have laws requiring BAC testing, and some require drug testing, of all fatally injured drivers. These requirements have been put in place primarily to provide data for crash record systems rather than for enforcement. Laws requiring the testing of drivers in injury crashes for statistical purposes, though providing protection against prosecution have long been advocated but have not generally been implemented. The need for information on drugged driving may encourage revisiting this concept. Testing of drivers' involvement in a sufficiently serious crash that results in injuries requiring hospital treatment, though not demonstrating alcohol or drug involvement in itself, should provide the basis for the suspicion required by the Constitution for conducting a mandatory alcohol test or a drug test, or both, given the known relationship between alcohol and crash risk. Passage by the states of such mandatory drug testing laws may be a deterrent to impaired driving and will likely improve the courts' ability to successfully prosecute drugged drivers.

Increase the Funding for Improved Drugged-Driving Record Keeping and Evaluation of Per Se Drugged-Driving Laws

Because national attention has only recently been focused on the drugged-driving problem, drugged driving research and related key record keeping has been limited. Only about 20 of the 50 states report drug involvement on at least 80 percent of their fatally injured drivers to the Fatality Analysis Reporting System (FARS; Hingson et al. 2010; Romano and Voas 2011), the nation's census of fatal crashes. To adequately determine the extent of the U.S. drugged-driving problem this level of reporting must be improved. The National Roadside Survey of Alcohol and Drug Use by Drivers (Lacey et al. 2009) provides an important means of tracking progress in reducing drug use by drivers and needs to be mounted more frequently than once a decade. Of key importance is the evaluation of new drugged driving *per se* laws as they are enacted because, currently, the evidence for their effectiveness is limited to applications outside the United States, which may not be applicable to this country (Boorman and Owens 2010; Boorman and Swann 2010; Davey et al. 2010; Woolley and Baldock 2009).

Analyze Drugs in Addition to Alcohol in Mandatory Blood Testing Programs

One new program that would support detection of both AID and DID enforcement is the movement underway in Arizona, Utah, and some locations in California to make provision for blood testing (by force if necessary) of all suspects arrested for DWI to eliminate implied consent BAC test refusals. This has increased blood testing in some states to as high as 80 percent of the DWI arrestees. To accomplish this goal, officers are trained as phlebotomists so that a blood sample can be collected in the police station. Because these blood samples must be sent to a laboratory for analysis, a drug screen and verification could be conducted if additional funds and staff for such tests were provided. Given the frequency of drugs found in studies of arrested drivers, a routine screening of blood tests conducted on drivers arrested for AID should reveal a substantial number of drug users. Based on the work of Ross (1973), it can be expected that publicizing that all drivers arrested for AID offenses are being tested for drugs could deter the estimated 10 to 50 percent of AID drivers who are also positive for drugs. It is even possible that it may have a spillover effect on AID drivers who are not using drugs because many may fear drug testing despite not using a drug. A potential limitation on this procedure is that most states adopting the mandatory blood draw procedure will use it primarily for suspects who refuse the breath test for alcohol because the breath test is less expensive and provides immediate results. For offenders who agree to a breath test rather than a blood draw, an attractive option would be to collect an oral fluid sample that could be analyzed on site.

Add the Use of Drugs to Enhanced Sanction Laws

An existing opportunity to implement the *per se* concept to current AID adjudication programs is provided by the existing state laws that have established enhanced sanctions for high

BAC (generally 0.15 or greater) DWI offenders (McCartt and Northrup 2004). Such enhanced sanctions are based, in part, on the evidence that very high BAC drivers are more likely to exhibit alcohol use disorders and therefore require longer, more intensive treatment programs and extended periods of supervision to protect the driving public. Comorbidity of illegal drug and alcohol abuse presents a similar problem. Thus, existing enhanced sanction laws could be amended to provide that the presence of an illegal drug would be a basis for enhancing penalties.

Enact Legislation Requiring Drug Tests on All DWI Arrestees

The number of states adopting a procedure that requires blood testing of all DWI arrestees is likely to be limited by the cost of adopting the system. A more immediate and comprehensive method for achieving the drug testing of all DWI arrestees would be for states to enact legislation to require both alcohol and drug testing. A number of states already allow for additional tests for drugs. This might be accomplished by adding incentive provisions to current highway safety legislation, which included funding for testing. Drug testing all DWI arrestees would be limited by the high refusal rates for evidential tests previously described. It is not likely that suspects who refuse the breath test would agree to a blood or urine test. Adding the drug test requirement might require an increase in the penalties for test refusal. Further, to make laboratory testing viable, a low-cost method available at the police station for the initial screening of fluid samples would be required to avoid excessive laboratory analysis expenses.

Add Drug Use to Underage Zero-Tolerance Laws

All 50 states have enacted zero-tolerance laws for youth age 20 and younger. It is important that with the emphasis on avoiding underage alcohol-impaired driving we do not encourage DID among youthful drivers. Maxwell et al. (2009) reported a reduction in the number of underage offenders driving under the influence (DUI) entering treatment in Texas with a primary problem with alcohol and an increasing tendency for young offenders to report problems with other drugs, particularly marijuana. Current zero-tolerance laws are justified on the basis that alcohol is an illegal substance for those age 20 and younger. Clearly illegal drugs or misuse of medications is also illegal for youths as it is for adults. Two states have already written such prohibitions into their laws regarding drugged driving. Thus, banning drug use by underage drivers could be done, likely with strong support.

All of these actions would provide support for the enactment of comprehensive *per se* drug laws by providing additional information on which to base such laws and by providing a means of evaluating the *per se* law once in place.

CONCLUSIONS

Evidence continues to accumulate that drug use by drivers is a significant and growing highway safety problem (NHTSA 2010). DID enforcement has been a limited adjunct to AID

enforcement and has been enforced primarily through laws regarding impaired driving that require the demonstration of impairment rather than using *per se* laws. The new interest in drug-involved drivers is encouraging the enactment of DID *per se* laws that make any amount of an illegal substance in the body of a driver a criminal offense, including drugs that are illegal under federal law and/or illicit use of medical drugs without a valid prescription.

Zero-tolerance DID laws can be integrated into current AID laws and law enforcement procedures in a way that not only does not adversely affect AID enforcement but also enhances drugged driving efforts. For the 15 states that currently have drugged-driving *per se* laws, a federal requirement calling for mandatory drug testing of all drivers suspected of DWI, which provided funding for these tests, could significantly improve identification of DID offenders. Such testing would provide additional data on the magnitude of the drugged-driving problem. *Per se* laws are currently being considered on a state-by-state basis. Action on these new state and federal opportunities should strengthen both alcohol and drug enforcement and improve highway safety.

ACKNOWLEDGMENTS

This article is a by-product of the Institute for Behavior and Health, Inc.'s, Driving While Intoxicated/Drugged Driving Committee established in 2010. That committee developed a white paper on drugged driving for the National Institute on Drug Abuse. The authors acknowledge the contribution to this policy paper by those who commented on the manuscript: Jane Maxwell, PhD, and David Wallace. The participation of these committee members in the development of this article does not necessarily mean that they agree with all of its contents. The authors are solely responsible for the conclusions presented.

REFERENCES

- Adler EV, Burns M. *Drug Recognition Expert (DRE) Validation Study, Final Report to Governor's Office of Highway Safety*. Phoenix, Ariz: Governor's Office of Highway Safety; 1994.
- Asbjørg SC, Moorland J. Frequent detection of benzodiazepines in drugged drivers in Norway. *Traffic Inj Prev*. 2008;9(2):98–104.
- Assum T, Mathijssen MPM, Houwing S, et al. *The Prevalence of Drug Driving and Relative Risk Estimations; a Study Conducted in Netherlands, Norway and the United Kingdom*. 2005. IMMORTAL Deliverable D-R4.2.
- Biecheler MB, Peytavin JF, Group S, Facy F, Martineau H. SAM survey on "drugs and fatal accidents": search of substances consumed and comparison between drivers involved under the influence of alcohol or cannabis. *Traffic Inj Prev*. 2008;9(1):11–21.
- Blomberg RD, Peck RC, Moskowitz H, Burns M, Fiorentino D. The Long Beach/Fort Lauderdale relative risk study. *J Safety Res*. 2009;40:285–292.
- Boorman M, Owens K. An evaluation of the deterrent value of random breath testing (RBT) and random drug testing (RDT) across Australia. Paper presented at: International Conference on Alcohol, Drugs and Traffic Safety (ICADTS); August 22–26, 2010; Oslo, Norway.

- Boorman M, Swann P. Victorian impaired driving legislation (2000) and random roadside oral fluid legislation (2004): theory and results of 2 different enforcement strategies. Paper presented at: International Conference on Alcohol, Drugs and Traffic Safety (ICADTS); August 22–26, 2010; Oslo, Norway.
- Bosker WM, Huestis MA. Oral fluid testing for drugs of abuse. *Clin Chem*. 2009;55:1910–1931.
- Brady, JE, Baker SP, DiMaggio C, McCarthy ML, Rebok GW, Li G. Effectiveness of mandatory alcohol testing programs in reducing alcohol involvement in fatal motor carrier crashes. *Am J Epidemiol*. 2009;170:775–782.
- Brookoff D, Cook CS, Williams C, Mann CS. Testing reckless drivers for cocaine and marijuana. *N Engl J Med*. 1994;331:518–522.
- Burns M. An overview of field sobriety test research. *Percept Mot Skills*. 2003;97(3 pt 2):1187–1199.
- Burns M, Anderson EW. *Field Evaluation Study of the Standardized Field Sobriety Test (SFST) Battery*. Denver, Colo: Colorado Department of Transportation; 1995.
- Burns M, Dioquino T. *Florida Validation Study of the Standardized Field Sobriety Test (SFST) Battery*. Washington, DC: National Highway Traffic Safety Administration; 1997.
- Burns M, Moskowitz H. *Psychophysical Tests for DWI Arrest*. Springfield, Va: National Technical Information Service; 1977.
- Centers for Disease Control. *Alcohol and Other Drug Use Among Victims of Motor-Vehicle Crashes—West Virginia, 2004–2005*. Washington, DC: Centers for Disease Control and Prevention; 2006.
- Committee on Alcohol and Other Drugs of the National Safety Council. *Priorities and Strategies for Improving Investigation, Toxicology and Prosecution of Drug Impaired Driving Cases: Findings and Recommendations*. Seattle, Wash: National Highway Traffic Safety Administration; 2004.
- Compton R, Vegega M, Smither D. *Drug-Impaired Driving: Understanding the Problem and Ways to Reduce It (A Report to Congress)*. Washington, DC: US Department of Transportation, National Highway Traffic Safety Administration; 2009. Available at: <http://www.nhtsa.gov/staticfiles/nti/pdf/811268.pdf>. Accessed September 19, 2011.
- Consensus Development Panel. Drug concentrations and driving impairment [consensus report]. *J Am Med Assoc*. 1985;254:2618–2621.
- Couper FJ, Logan BK. Addicted to driving under the influence—a GHB/GHL case report. *J Anal Toxicol*. 2004;28:481–484.
- Davey J, Freeman J, Palk G. Deterring the drug drivers: a study into the initial impact of oral random roadside drug testing. Paper presented at: International Conference on Alcohol, Drugs and Traffic Safety (ICADTS); August 22–26, 2010; Oslo, Norway.
- Department of Health (England). *Drug Misuse and Dependence: UK Guidelines on Clinical Management*. London, England: Department of Health (England), the Scottish Government, Welsh Assembly Government and Northern Ireland Executive; 2007. Available at: http://www.nta.nhs.uk/uploads/clinical_guidelines_2007.pdf. Accessed July 25, 2011.
- Drug Enforcement Administration. *The DEA Position on Marijuana*. Washington, DC: Drug Enforcement Administration; 2011. Available at: http://www.justice.gov/dea/marijuana_position.pdf. Accessed July 5, 2011.
- Drummer OH, Gerostamoulos J, Batziris H, et al. The involvement of drugs in drivers of motor vehicles killed in Australian road traffic crashes. *Accid Anal Prev*. 2004;36:239–248.
- DuPont RL, Goldberger BA, Gold MS. Clinical and legal considerations in drug. In: Ries RK, Fiellin D, Miller SC, Saitz R, eds. *Principals of Addiction Medicine*. 4th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2009:1499–1507.
- DuPont RL, Graves H. *Smarter Student Drug Testing*. Rockville, MD: Institute for Behavior and Health; 2005.
- DuPont RL, Logan BK, Shea CL, Talpins SK, Voas RB. *Drugged Driving Reaseach: A White Paper*. Bethesda, Md: National Institute on Drug Abuse; 2011. Available at: http://www.whitehouse.gov/sites/default/files/ondcp/issues-content/drugged-driving/nida_dd_paper.pdf. Accessed September 26, 2011.
- Fix LJ, Leaverton PE, Buchan BJ, Walsh JM. Prevalence of drug use in persons injured or killed in vehicular related accidents. In: Mercier-Guyon C., ed. *14th International Conference on Alcohol, Drugs, and Traffic Safety*. Annecy, France: ICADTS; 1997:751–756.
- Glass S. A.R.I.D.E: giving officers the tools they need to recognize drug-impaired drivers. *Between the Lines*. Winter 2008:17.
- Governors Highway Safety Association. State highway safety group broadens drugged driving policy as national summit convenes [news release] October 13, 2011. Available at: http://www.ghsa.org/html/media/pressreleases/2011/20111013_drugs.html. Accessed October 14, 2011.
- Grotenhermen F, Leson G, Berghaus G, et al. Developing limits for driving under cannabis. *Addiction*. 2007;102:1910–1917.
- Harding-Pink D. Opioid toxicity. *Lancet*. 1993;341:665–666.
- Hedlund JH. *Breath test refusals: state laws; refusal rate trends; can refusals be reduced?* Paper presented at: Traffic Research Board Annual Meeting; January 16, 2003; Washington, DC.
- Hingson R, Winter M, Heeren T. Alcohol and drug use in fatally injured drivers in states that test over 80% for both alcohol and drugs. Paper presented at: The Tri-Annual Meeting of the International Conference on Alcohol, Drugs and Traffic Safety; August 22–26, 2010; Oslo, Norway.
- Holmgren A, Holmgren P, Kugelberg FC, Jones AW, Ahlner J. Prevalence of illicit drug and poly-drug use among drug-impaired drivers in Sweden. *Traffic Inj Prev*. 2007;8:361–367.
- Illinois v Gates*, 462 US 213 (1983).
- International Association of Chiefs of Police. *The 2009 Annual Report: The Drug Recognition Expert Section of the International Association of Chiefs of Police*. Alexandria, Va: International Association of Chiefs of Police; 2009. Available at: <http://www.decp.org/oversight/2009AnnualReport.pdf>. Accessed April 22, 2011.
- International Drug Evaluation and Classification Program. Alexandria, Virginia. Available at: <http://www.decp.org/experts/12steps.htm>. Accessed April 22, 2011.
- Jones AW, Holmgren A, Kugelberg FC. Concentrations of scheduled prescription drugs in blood of impaired drivers: considerations for interpreting the results. *Ther Drug Monit*. 2007;29:248–260.
- Jones AW, Holmgren A, Kugelberg FC. Driving under the influence of cannabis: a 10-year study of age and gender differences in the concentration of tetrahydrocannabinol in blood. *Addiction*. 2009;103:452–461.
- Jones AW, Kugelberg FC, Holmgren A, Ahlner J. Five-year update on the occurrence of alcohol and other drugs in blood samples from drivers killed in road-traffic crashes in Sweden. *Forensic Sci Int*. 2009;186:56–62.
- Lacey J, Brainard K, Snitow S. *Drug Per Se Laws: A Review of Their Use in States*. Washington, DC: National Highway Traffic Safety Administration, Department of Administration; 2010. Available at: http://www.nhtsa.gov/staticfiles/nti/impaired_driving/pdf/811317.pdf. Accessed July 5, 2011.

- Lacey JH, Kelley-Baker T, Furr-Holden CDM, et al. *2007 National Roadside Survey of Alcohol and Drug Use by Drivers: Drug Results*. Washington, DC: National Highway Traffic Safety Administration; 2009. Available at: <http://www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/811249.pdf>. Accessed September 19, 2011.
- Lamers CTJ, Ramaekers JG. Marijuana and alcohol effects on visual search and general driving proficiency. *J Psychopharmacol*. 1999;13(3 suppl A):A53.
- Logan BK. Methamphetamine and driving impairment. *J Forensic Sci*. 1996;41:457–464.
- Lund AF, Jones IS. Detection of impaired drivers with a passive alcohol sensor. In: Noordzij PC, Roszbach R, eds. *Alcohol, Drugs and Traffic Safety 'T86*. New York, NY: Excerpta Medica; 1987:379–382.
- Marowitz LA. *The Relationship Between Drug Arrests and Driving Risk*. Sacramento, Calif: California Department of Motor Vehicles, Research and Development Section; 1994.
- Maryland Drug Early Warning System. *DEWS Investigates: Identifying Maryland Public School Students Who Have Tried Multiple Drugs*. College Park, MD: Center for Substance Abuse Research, University of Maryland, College Park; 2005.
- Marzuk PM, Tardiff K, Leon AC, Stajic M, Morgan EB, Mann JJ. Prevalence of recent cocaine use among motor vehicle fatalities in New York City. *JAMA*. 1990;263:250–256.
- Maxwell JC, Freeman J, Davey J. Too young to drink but old enough to drive under the influence: a study of underage offenders as seen in substance abuse treatment in Texas. *Drug Alcohol Depend*. 2009;104:107–112.
- McCart AT, Northrup VS. Effects of enhanced sanctions for high-BAC DWI offenders on case dispositions and rates of recidivism. *Traffic Inj Prev*. 2004;5:270–277.
- Morland J. Driving under the influence of medication and various substances other than alcohol. *Tidsskr Nor Laegeforen*. 2000;120:2148–2150.
- National Highway Traffic Safety Administration. *Drug Involvement of Fatally Injured Drivers*. Washington, DC: National Highway Traffic Safety Administration's National Center for Statistics and Analysis; 2010.
- Office of National Drug Control Policy. *National Drug Control Strategy, 2010*. Washington, DC: Office of National Drug Control Policy; 2010.
- Ogden E, Morris C. The relationship between responsibility for vehicle accident and presence of drugs in blood of injured drivers. Paper presented at: International Conference on Alcohol, Drugs and Traffic Safety (ICADTS); August 22–26, 2010; Oslo, Norway.
- Pennsylvania State Police. *Pennsylvania State Police Make Record Number of DUI Arrests in 2010 - DUI-related Crashes Investigated by Troopers Decrease Slightly*. April 21, 2011. Available at: http://www.portal.state.pa.us/portal/server.pt?open=512&objID=4451&PageID=457781&mode=2&contentid=http://pubcontent.state.pa.us/publishedcontent/publish/cop_public_safety/state_police/news/articles/pennsylvania_state_police_make_record_number_of_dui_arrests_in_2010.html. Accessed December 6, 2011.
- Procedures for transportation workplace drug and alcohol testing programs. 49 CFR §40 (2010).
- Ramaekers JG, Robbe HW, O'Hanlon JF. Marijuana, alcohol and actual driving performance. *Hum Psychopharmacol*. 2000;15:551–558.
- Robertson MD, Drummer OH. Responsibility analysis: a methodology to study the effects of drugs in driving. *Accid Anal Prev*. 1994;26:243–247.
- Romano E, Voas RB. Drug and alcohol involvement in four types of fatal crashes. *J Stud Alcohol Drugs*. 2011;72:567–576.
- Ross HL. Law, science and accidents: The British Road Safety Act of 1967. *J. Legal Stud*. 1973;2:1–78.
- Schmerber v California*, 384 US 757 (1966).
- Schwilke EW, dos Santos MIS, Logan BK. Changing patterns of drug and alcohol use in fatally injured drivers in Washington State. *J Forensic Sci*. 2006;51:1191–1198.
- Sexton BF, Tunbridge RJ, Board A, et al. *The Influence of Cannabis and Alcohol on Driving*. Crowthorne, UK: TRL Limited; 2002.
- Sexton BF, Tunbridge RJ, Brook-Carter N, et al. *The Influence of Cannabis on Driving*. Crowthorne, UK: TRL Limited; 2000.
- Shultz RA, Elder RW, Sleet DA, et al., and the Task Force on Community Preventive Services. Reviews of evidence regarding interventions to reduce alcohol-impaired driving. *Am J Prev Med*. 2001;21(4 suppl):66–88.
- Smith JA, Hayes CE, Yolton RL, Rutledge DA, Citek K. Drug recognition expert evaluations made using limited data. *Forensic Sci Int*. 2002;130(2–3):167–173.
- Soderstrom CA, Trifillis AL, Shankar BS, Clark WE, Cowley RA. Marijuana and alcohol use among 1023 trauma patients: a prospective study. *Arch Surg*. 1998;123:733–737.
- South Dakota v Neville*, 459 US 553 (1983).
- Stuster J, Burns M. *Validation of the Standardized Field Sobriety Test Battery at BACs Below 0.10 Percent*. Washington, DC: National Highway Traffic Safety Administration; 1998.
- Terhune KW, Ippolito CA, Hendricks DL, et al. *The Incidence and Role of Drugs in Fatally Injured Drivers*. Washington, DC: National Highway Traffic Safety Administration; 1992.
- Terry v Ohio*, 392 US 1 (1968).
- Tharp VK, Burns M, Moskowitz H. *Development and Field Test of Psychophysical Tests for DWI Arrests*. Washington, DC: National Highway Traffic Safety Administration; 1981.
- United States v Arvizu*, 524 US 266 (2002).
- Voas RB, Kelley-Baker T, Romano E, Vishnuvajjala R. Implied-consent laws: a review of the literature and examination of current problems and related statutes. *J Safety Res*. 2009;40(2):77–83.
- Walsh JM. *A State-by-State Analysis of Laws Dealing with Driving Under the Influence of Drugs*. Washington, DC: National Highway Traffic Safety Administration; 2009.
- Walsh JM, Flegel R, Atkins R, et al. Drug and alcohol use among drivers admitted to a level-1 trauma center. *Accid Anal Prev*. 2005;37:894–901.
- Wish ED, Billing A, Rinehart C, Artigiani E. *The Maryland Adult Offender Population Urine Screening (OPUS) Program Final Report*. College Park, MD: Center for Substance Abuse Research, University of College Park; 2009.
- Wish ED, Rinehart C, Hsu M, Artigiani E. *DEWS Investigates: Using Urine Specimens From Parolees/Probationers to Create a Statewide Drug Monitoring System*. College Park, MD: Center for Substance Abuse Research, University of Maryland, College Park; 2006.
- Withers J. Drugged driving: a growing threat on our roadways. 2011. Available at: <http://www.madd.org/blog/drugged-driving.html>. Accessed October 14, 2011.
- Woolley JE, Baldock MRJ. *Review of Western Australian Drug Driving Laws*. Adelaide, South Australia: Centre for Automotive Safety Research, University of Adelaide; 2009.
- Zador P, Krawchuck S, Moore B. *Drinking and Driving Trips, Stops by Police, and Arrests: Analyses of the 1995 National Survey of Drinking and Driving Attitudes and Behavior*. Washington, DC: National Highway Traffic Safety Administration; 2001.