

Epidemiologic Research Needs for Drugs Other Than Alcohol

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INTRODUCTION

Epidemiologic research is an essential component of the problem-definition process in traffic safety. For defining the drug-crash problem, this process involves

- Estimating how many crashes involve “drugged” drivers;
- Determining if drugged drivers are more involved (over represented) in crashes than other drivers;
- Determining whether any overrepresentation is due to drug impairment or to some other coincident factor; and
- More detailed definition of drugged-driving and drugged drivers so that effective methods can be devised for dealing with the problem.

The literature suggests that there are enough traffic crashes involving drugged drivers to warrant proceeding to the second step, but without further progress in the second step, it cannot be said that drugged driving is or is not a significant societal problem. In this respect, the state of knowledge about the drug-crash problem is about where the state of knowledge about the alcohol-crash problem was in 1938 when Holcomb conducted his landmark study in Illinois comparing the blood alcohol concentrations of a sample of drivers who were involved in personal injury crashes with a sample of drivers who were not involved in crashes but who had been using the same roads as the crash-involved drivers.

BACKGROUND

Our understanding of the current state of knowledge is based on a recent review of the drug crash literature from 1988 through 1994 that we conducted for the NHTSA. In that review we found that the epidemiologic literature on drugs and driving has continued to grow since 1987. However, nearly all of the new studies are in two areas: drug presence in drivers involved in traffic crashes and drug presence in drivers suspected of drugged driving violations. Only one U.S. study was found that examined drug presence in drivers not involved in crashes, and that study was concerned only with drivers of large trucks. No study assessed drug-crash risk by comparing the drug use of drivers who were involved in crashes with that of a similar group of drivers who were not involved in crashes.

The literature indicates that chemical tests of drivers in crashes were performed most often for marijuana, cocaine, amphetamines, benzodiazepines, and opiates. With respect to fatally injured drivers, the percentage of North American drivers positive for marijuana was in the 7 to 13 percent range. The percentages of each of the other four drugs amounted

to less than 10 percent, except in one study of cocaine in New York City which reported a figure of 14 percent.

The percentage of marijuana-positive North American drivers with nonfatal injuries was greater than that for North American drivers with fatal injuries by a factor of two or more. This is opposite the case for alcohol for which the percentage of involvement in fatally injured drivers is roughly twice that for nonfatally injured drivers. The incidence of the other four drugs did not appear to differ greatly for fatally injured drivers and for drivers suffering non-fatal injuries.

We note that all but one of the North American studies of drugs in nonfatally injured drivers involved drivers who had presented at emergency rooms (usually at a trauma center) and had then been admitted to a hospital. The subjects in the other study (Waller et al., 1995) were not necessarily admitted to a hospital and were drug-positive only about half as often as those who had been admitted to a hospital. This admissions factor may be related to the very high percentage of drug involvement reported in trauma-center studies.

Fatally injured truck drivers (only one study) had higher percentages of marijuana and amphetamines than did the fatally injured car drivers.

Foreign countries varied with respect to the percentages of crash-involved drivers with given drugs. Two British studies and two Australian study found much smaller percentages of drivers positive for drugs of abuse than did a Norwegian study, which in turn, had percentages more in the range of those found in the North American studies.

Only one U.S. study dealt with drugs in drivers using the road but not involved in a crash, and its subjects were tractor-trailer truck drivers at one location in Tennessee. The study found that some 30 percent of the drivers were positive for marijuana, cocaine, or stimulants. By contrast, a much larger roadside survey conducted chemical analyses of the saliva of drivers of vehicles of all types in Germany found less than 5 percent of the drivers to be positive for a similar range of drug types.

Drug-crash risk continues to be an unknown quantity. The single recent North American study (Terhune et al., 1992) addressing risk used the responsibility-analysis approach and found no increased fatal-crash risk associated with marijuana or cocaine alone, but a possible association of multiple drug use with increased crash responsibility. An Australian study also using the responsibility analysis approach found that only alcohol had a statistically significant increased risk of fatal-crash responsibility. The relative risk for cannabis (computed as an odds-ratio with $p = 0.065$) was actually less than one, suggesting a beneficial effect of marijuana use. We note also in passing that the percentage of fatally injured trailer-truck drivers in an eight-state sample who were drug-positive was roughly the same as that found in the Tennessee tractor-trailer truck drivers using the road but not involved in a crash.

The literature did not provide much useful information about drug use among drivers who are stopped or arrested for traffic violations, suggesting "ballpark" estimates for drivers arrested for driving while intoxicated in the 1 to 10 percent range. These studies indicate strongly that relatively high percentages of such drivers who are also suspected of "drugged" driving by the police and are evaluated by drug recognition experts are positive for a number of drugs that could impair driving performance.

In sum, the main reason for this review was to identify and assess recent scientific research that might enable one to make better estimate of the magnitude of the drug-crash problem in the United States. We have found that such research indicates that

- The percentage of drug-positive drivers in crashes is lower than the percentage of alcohol-positive drivers in crashes, but still not negligible.
- The role of drugs as a causal factor in traffic crashes involving drug-positive drivers is still not understood. Drug risk factors are still not known, with some evidence suggesting little or no increase in crash risk at drug levels being detected by current chemical test procedures. Further, such procedures do not enable one to predict whether a driver testing positive for a drug, even at some measured level of concentration, was actually impaired by that drug at the time of crash. This is in sharp contrast to alcohol where blood alcohol content (BAC) measurements can provide a good estimate of impairment.

Another complicating factor is the role of drugs taken in combination with alcohol. Most of the percentages given above are the percentage with drugs alone plus the percentage with drugs in combination with alcohol. For many drugs, a drug in combination with alcohol accounts for a significant percentage of the occurrences of that drug in crash victims. Waller et al. (1995) found that roughly one-half of the occurrences of drivers positive for marijuana, cocaine, and/or opiates had elevated BACs, and that the crashes of drivers testing positive for drugs alone were very similar to the crashes of drivers testing negative for both alcohol and drugs. This adds further doubts about the role of drugs in the impairment of crash-involved drivers, and suggests that it may be much smaller than had been suspected.

Thus, the literature does not allow one to say whether drugged driving is or is not a significant societal problem, although there is some evidence to suggest that if it is, then its magnitude is considerably less than the drunk driving problem.

We recommend that a program of research be undertaken to assess the traffic-crash risk associated with the potentially impairing drugs that appear at this juncture to be the most prevalent in serious traffic crashes in the United States. These drugs are marijuana, cocaine, amphetamines, and benzodiazepines. This research program should compare the drug use of drivers who were involved in crashes with that of a similar group of drivers who were not involved in crashes. The program should concentrate first on fatal crashes and should be of sufficient geographic scope to enable some reasonable assessment of the general magnitude of any drugged-driving problem nationwide to be made. We recognize that such a research program poses some formidable difficulties, especially with respect to drugs in on-the-road, noncrash-involved drivers. Nevertheless, work must begin if further progress is to be made in defining the drug-crash problem in this country.

This paper outlines some critical research needs and priorities for overcoming this barrier to progress in drug-impaired driving research.

RESEARCH NEEDS AND PRIORITIES

Measurement and Quantitation of Drugs

We Don't Know: The number of fatal-crash involved drivers who are impaired by which drugs.

Research Issue: Update the report by Terhune et al. (1992) on the incidence and role of drugs in fatally injured drivers.

Likelihood of Success: Very high.

Effects: Would provide current information for use in designing risk studies.

Other: This research should be conducted periodically.

Measurement and Quantitation of Drugs

We Don't Know: How many noncrash involved drivers are impaired to what extent by which drugs?

Research Issue: As a starting point, determine appropriate means of quantitating controlled substances in on-the-road drivers.

Likelihood of Success: Good if realistically funded.

Effects: Would enable meaningful research on drug-crash risk to begin.

Other: Legal constraints, perceived as well as actual, could be crucial to success.

Magnitude of the Drug-Crash Problem

We Don't Know: The relative risk of a drug-related traffic crash of a given level severity (e.g., fatal, injury, property damage).

Research Issue: As a starting point, what is the relative risk of a fatal crash associated with various levels of controlled substances?

Likelihood of Success: Good for an initial study of a few drugs in one or a few jurisdictions.

Effects: Would greatly facilitate the allocation of resources to the entire area of drug-impaired driving.

Other: There are many obstacles to overcome, foremost among which is the issue of quantitation of drugs in the field. Varying drug usage patterns over time could also present a problem, necessitating periodic updates of the research. Responsibility analysis has been suggested as alternative approach to risk analysis.

Magnitude of the Drug-Crash Problem

We Don't Know: Alternative methods for determining drug-crash risk.

Research Issue: Identify risk analysis techniques that could be transferred from other disciplines (e.g., the medical sciences) to obviate the need for obtaining specimens from roadside surveys.

Likelihood of Success: Worth a try.

Effects: Would greatly simplify the determination of risk, thus leading to a defensible plan for addressing (or not addressing) drug-impaired driving.

Other: Would not cost very much and cannot hurt.

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