Disease-a-Month 62 (2016) 72–116

Contents lists available at ScienceDirect

Disease-a-Month

journal homepage: www.elsevier.com/locate/disamonth

Issues in driving impairment

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Introduction

Motor vehicle crashes (MVC) are an important cause of morbidity and mortality in developed and developing countries, including the United States. While simple human error is an unavoidable cause of MVC, the increased risk of driving errors due to pharmacologic or physiologic impairment is potentially avoidable. The act of driving is a combination of complex tasks and impairment in one or more of those complex tasks results in driving impairment. Numerous causes of driving impairment have been identified. These include alcohol, illicit drugs, licit medications, fatigue, distraction, as well as a variety of medical conditions. We describe the scope of driving impairment as a public health problem, the measurement of driving impairment, and review important causes of impaired driving.

Public health implications

Alcohol-impaired driving

The public health and economic costs associated with impaired driving are formidable. In the United States alone, alcohol-impaired driving kills between 13,000–18,000 people per year accounting for approximately 40% of all driving-related fatalities (Table 1).[1] That rate equates to 3 people being killed every 2 h in alcohol-related MVCs or one death every 51 min. The majority of fatalities are vehicle occupants. In addition, alcohol-related MVCs are more likely to involve pedestrian fatalities than non-alcohol-related MVCs. In 2010, alcohol-impaired driving caused 40.6% of all fatalities but 47.2% of pedestrian fatalities.

Alcohol-related MVCs cost the United States $52 billion dollars per year or about 21.7% of all MVC-related economic costs.[2] Intangible costs such as physical pain and lost quality-of-life raise the total cost of alcohol-related MVCs to a staggering $236 billion dollars. The majority of economic costs associated with alcohol-impaired driving (84%) involve drivers operating a motor vehicle above the legal blood alcohol concentration (BAC) of 0.08 mg/dl. Alcohol-impaired

http://dx.doi.org/10.1016/j.disamonth.2016.02.002

Table 1
Alcohol- and non-alcohol-related MVC fatalities in the United States.

	2006	2007	2008	2009	2010
Total deaths	42,708	41,259	37,423	33,808	32,885
Alcohol related	17,738	17,157	15,450	14,188	13,365
Non-alcohol related	24,970	24,102	21,973	19,620	19,520
Percent alcohol related	41.5	41.6	41.3	42.0	40.6

Adapted from Chambers et al.[1]

driving is disproportionately associated with economic costs due to injury and death, reflecting a greater risk of injury and death in alcohol-related MVCs. Alcohol-impaired driving accounts for only 14% of economic costs of MVCs with property damage only, 17% of nonfatal injury MVCs, but 48% of fatal MVC economic costs.

Prevalence of drugged driving

The reported prevalence of drugged driving varies between studies, which may be accounted for in part by the region or country in which the study was performed, whether all drivers were tested (e.g., random sample) or only drivers who were involved in a MVC or were exhibiting abnormal driving behaviors, and which specific drugs were included in the study.

In a study of fatally injured drivers in Los Angeles County conducted in 1987–1988, alcohol was present in 41%, barbiturates in 2%, cocaine in 8%, PCP in 0.5%, and cannabinoids in 18.5% of blood samples from deceased drivers. Approximately 25% of drivers with positive blood alcohol also tested positive for one or more drugs of abuse with cocaine and marijuana being the drugs most frequently combined with alcohol.[3] In a study of drivers killed in MVC in Spain from 1991–2000, one or more psychoactive substances were detected in 50.1% of drivers.[4] Alcohol was the most commonly detected substance (43.8%) followed by illicit drugs (8.8%) and medicinal drugs (4.7%). Cocaine metabolite was the most commonly detected illicit drug (5.2%), while benzodiazepines were the most commonly detected medicinal drug (3.4%). Combinations of illicit and medicinal drugs were frequently detected.

In Great Britain, 4.7% of 386 drivers tested randomly were positive for drugs of abuse as compared to 22.9% of 411 drivers who were fatally injured in a MVC.[5,6] A study from Victoria, Australia in 2009 of injured drivers taken to the hospital, 12.5% of drivers had illicit drugs in their blood with THC being the most common (9.8%) followed by methamphetamine (3.1%) and 3,4-methylenedioxy-methamphetamine (MDMA) (0.8%).[7] In another large study of randomly tested drivers in Victoria in 2004–2005, 2.4% of drivers were positive for any drug with 2.1% positive for methamphetamine, 1.3% positive for MDMA, 0.7% for THC, and 0.6% for THC and amphetamines.[8] Overall, 80% of positive drug tests were reported in males. In a random representative sample of Spanish drivers who underwent oral fluid testing, 11% were positive for illicit drugs while 6.6% were positive for alcohol ($>0.05\%$), with the most common illicit drugs being cannabis (7.7%) and cocaine (3.5%).[9] Benzodiazepines were reportedly identified in 1.6%.

Of concern, driving while impaired by drugs may be on the increase. Brady et al. analyzed the Fatality Analysis Reporting System (FARS), a census of fatal US MVCs, to report the prevalence of alcohol and non-alcohol drugs in drivers who had died within 1 h of a MVC from 1999 to 2010. They limited their analysis to states that performed toxicology testing on over 80% of their driving fatalities. Their sample size consisted of 23, 591 subjects. The prevalence of non-alcohol drugs showed a statistical significant increasing trend during the study period with alcohol prevalence remaining stable. Cannabis prevalence tripled from 4.2% in 1999 to 12.2% in 2010. Cannabinoids were found to be the most prevalent non-alcohol drug detected in fatally injured drivers during this study period.[10]

Roadside oral fluid drug testing of 80,000 drivers in Queensland, Australia from 2007 through 2012 demonstrated an increase in the prevalence of drugged driving from 2% at study outset to