



Emergency department visits vs. fatalities among substance-impaired underage youths involved in motor vehicle crashes



Margaret E. Mattson,^{*} Rong Cai, Albert Woodward

Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Administration Services Administration, 1 Choke Cherry Road, Rockville, MD 20857 (overnight mail use 20850), USA

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ABSTRACT

Introduction: Emergency department (ED) visits resulting from motor vehicle crashes (MVCs) among individuals younger than 21 impaired by alcohol and/or drugs have been less studied than MVC fatalities. **Method:** Using data from 2004 to 2011, we compare the magnitude and pattern of national ED visit and mortality data for alcohol- and drug-impaired youths involved in MVCs. **Results:** Temporal patterns of ED visits are similar to those of fatalities, but the two differ in magnitude. The ratio of ED visits to fatalities is 3.5:1; alcohol related events involvement dominates other drugs in both categories. **Discussion:** The volume of injuries serious enough to warrant ED visits imposes significant health, social, and financial burdens. In ED visits, alcohol is the prime source of MVC morbidity burden; other drugs consistently contribute less. **Practical applications:** These incidents are persistent and require interventions aimed at multiple levels of prevention, including stricter corrective steps earlier in the impaired driving career to reduce subsequent incidents. ED visits for MVC injuries can be important “teachable moments.” Limitations of the study indicate the need for improved surveillance of underage substance-involved crashes.

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1. Introduction

The many adverse consequences of drinking and drug use among individuals younger than the legal drinking age of 21 have been well described over the last two decades. These consequences include mortality; serious morbidity; and social, legal, and psychological consequences (Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002; Hingson, Zha, & Weitzman, 2009). In particular, a major focus has been fatalities resulting from motor vehicle crashes (MVCs) among alcohol-impaired youths (Hingson, 2012; Hingson & Howland, 2002; Hingson & Winter, 2003). Recently, impairment by substances other than alcohol, including illicit drugs and misused pharmaceuticals, has begun to receive increased attention as a contributor to MVC mortality for this age group (Movig et al., 2004; National Institutes of Health, U.S. Department of Health and Human Services, 2010). However, the significant morbidity associated with MVCs by youths when alcohol and/or drugs have been involved in the crash has been less thoroughly examined than fatal outcomes.

An important measure of such serious morbidity is the extent of MVC-related emergency department (ED) visits by impaired youths. Visits to the ED following crashes reflect injuries serious enough to warrant prompt medical attention as well as MVCs' public health burden, monetary costs, and impact on individuals (Miller, Levy, Spicer, &

Taylor, 2006). Overall, motor vehicle traffic incidents are the second most frequent injury mechanism for ED visits and comprised 10% of all ED cases, or more than 4 million visits, in 2005 (Nawar, Niska, & Xu, 2007). In 2005, approximately 2,700 teens aged 16–19 were killed in traffic incidents; 282,000 were treated and released from the ED at a cost of more than \$25 billion. Less is known about MVC ED visits in which substances are involved. This article addresses similarities and differences in patterns of MVC-related ED visits compared with fatalities to inform approaches to targeted public health interventions.

1.1. MVC fatalities and alcohol impairment

Hingson and Winter (2003) systematically reviewed national mortality trends due to MVC fatalities and reported that in 1982, the first year that the National Highway Traffic and Safety Administration made its nationwide estimates, there were 26,172 alcohol-related traffic deaths for individuals of all ages. By 2002, when improvements from intervention efforts were evident, a 33% reduction had occurred—17,419 deaths overall. There was a disproportionate reduction in alcohol-related deaths for young adults compared to older persons. Among persons aged 16–20, alcohol-related traffic deaths declined by 56% from 5,144 to 2,329, a change due in part to legislation raising the drinking age. The decline was closely related to the blood alcohol concentration (BAC) involved, with the risk of a fatal crash being much higher for young impaired drivers than for non-impaired drivers of the same age or for older drivers (Centers for Disease

^{*} Corresponding author. Tel.: +1 240 276 1253.

E-mail address: margaret.mattson@samhsa.hhs.gov (M.E. Mattson).

Control and Prevention, 2013). Centers for Disease Control and Prevention (2012, 2013) national figures show further improvement by 2010, when 10,228 people of all ages were killed in alcohol-related crashes, representing about one-third of all traffic-related deaths in the United States. From 1991 to 2011, self-reported drinking and driving among high school students 16 and older declined from 22.3% to 10.3% (Centers for Disease Control and Prevention, 2012). In 2012, of the 3,115 drivers aged 15–20 involved in fatal MVCs, 23% had been drinking.

Despite these significant gains, a “zero tolerance” goal has not been reached, and substance-impaired driving by youths remains a public health concern. Nationally, in 2011, 10% of high school students 16 or older reported drinking and driving over the last 30 days, with 85% of drinking drivers reporting engaging in binge drinking (Youth Risk Behavior Survey; Centers for Disease Control and Prevention, 2012). Hingson and Winter (2003) report that, nationally, although fewer youths than those aged 21 or older reported drinking while driving, when they did drink and drive, youths drank more alcohol, with an average BAC three times higher than that of all drinking drivers.

Temporal patterns of drinking and associated consequences vary (Arfken, 1988) and are influenced by sociocultural factors (Room et al., 2012), although generally night time poses the highest risk, especially for youths. Studies of nighttime fatal crashes among youths show that, in fatal MVCs involving alcohol, as the BAC level in the driver increased, the odds of fatality increased for drivers aged 16–20 and 21–24. Drivers aged 16–20 in nighttime crashes were four times as likely as drivers in daytime crashes to have BACs of .15 or higher. According to the National Highway Traffic Safety Administration, 55% of fatal MVCs among teenagers occurred on Fridays, Saturdays, or Sundays (National Highway Traffic Safety Administration, 2010). Studies have associated nighttime driving, especially on weekends, with fatalities and other consequences (National Highway Traffic Safety Administration, 2013a; National Transportation Safety Board, 2013; Substance Abuse and Mental Health Services Administration, 2013).

1.2. MVC nonfatal outcomes and impairment by nonalcohol substances

The literature on nonfatal MVC injuries and injuries associated with substances other than alcohol, such as illicit drugs and pharmaceuticals, among younger drivers is much smaller than the literature on mortality among alcohol-impaired young drivers.

The sparseness of literature on nonalcoholic substances relative to literature on alcohol reflects a lack of solid epidemiologic data partly because of measurement issues, such as variation in coverage of drugs, completeness of assessment, and sensitivity and specificity in toxicology screens used in different jurisdictions. In addition to these testing issues, legal cutoffs for determining impairment for nonalcoholic substances vary from state to state, and, also, logistical and cost considerations make these studies challenging to conduct.

It has been established that many drugs, both illicit and legally prescribed, can affect safe driving by altering alertness, judgment, and spatial and motor skills (Office of National Drug Control Policy, 2010). The most frequently identified drug in impaired drivers other than alcohol is cannabis. Tests have shown that exposure reduces critical driving tasks such as reaction time, attention, and controlling the position of the vehicle. Overall, its contribution to crash risk is lower than that of alcohol (Romano, Torres-Saavedra, Voas, & Lacey, 2014), occurring in about 10% of fatally injured drivers, versus 40% for alcohol (Brady & Li, 2013). The risk of a MVC after cannabis use is approximately twofold (Hartman & Huestis, 2013); Li, Brady, and Chen (2013) found that the relative risk for a fatal injury increases to 23 when marijuana is combined with alcohol. Impairment varies with individual factors (e.g., smoking technique). Using marijuana in combination with alcohol reduces compensatory driving control strategies (Sewell, Poling, & Sofuoglu, 2009). Blows et al. (2005) found that the risk for car crash injuries for habitual users is higher than for nonhabitual users.

Approximately one in eight drivers tested positive for illicit drugs while driving at night or weekends according to the National Roadside Survey (National Highway Traffic Safety Administration, 2007). In 2010, a similar fraction of high school seniors reported driving after smoking marijuana in the 2 weeks prior to responding to the 2010 Monitoring the Future instrument (Asbridge, 2014; Blows et al., 2005; Hartman & Huestis, 2013; Sewell et al., 2009). Asbridge found that 44% of male and 9% of female college freshmen reported driving after using marijuana in the past month (Asbridge, 2014).

Although these and other data on self-reports of prevalence of driving under the influence of nonalcohol drugs are available, less data have been published on nonfatal outcomes. Extant studies are limited in their ability to understand the national impact of nonfatal outcomes of MVCs. For example, they may not have focused on youths (National Highway Traffic Safety Administration, 2007, 2010), may be confined to regional studies in the United States (Kelly, Darke, & Ross, 2004; Walsh et al., 2004), or may have been conducted in other countries (Drummer, Gerostamoulos, & Batziris, 2003; Perez et al., 2009; Wiese Simonsen et al., 2013), where norms and laws concerning substance use while driving differ from those in the United States (Perez et al., 2009; Wiese Simonsen et al., 2013). Few studies have addressed temporal aspects and riskiest days of the week and hours of the day in nonfatal MVCs involving substances other than alcohol. One study found that abuse of prescription drugs is not associated with day of the week (Spiller, Bailey, Dart, & Spiller Sarah S., 2010).

1.3. Research questions

The rationale for the study is that there is a gap in the literature because most data on MVCs in underage substance-impaired youths emphasize fatalities, with greater stress on alcohol-related MVCs than on other substances of abuse. Although fatality data for young drinking drivers certainly speaks to the need for intervention, the true magnitude of the public health burden and opportunities for intervention cannot be fully assessed without accounting for nonfatal outcomes resulting in ED visits and the consequences of impairment by substances other than alcohol.

The main objective of this study is to determine the magnitude and pattern of morbidity by examining ED visit data for MVCs associated with substance use (both alcohol and drugs) involving individuals younger than 21 and comparing these patterns to a descriptive census of all fatal MVCs. We use a temporal framework to identify the times of day and days of the week of highest risk for both fatal and nonfatal crashes by substance use categories of alcohol and nonalcohol drugs. An additional objective is to characterize the groups involved in ED visits and fatalities by presenting demographic comparative statistics.

2. Materials and methods

2.1. Data

Data were drawn from two sources. The Drug Abuse Warning Network (DAWN) is conducted by the Substance Abuse and Mental Health Services Administration's Center for Behavioral Health Statistics and Quality (SAMHSA/CBHSQ). SAMHSA is part of the U.S. Department of Health and Human Services. DAWN data are derived from a national probability sample of ED visits involving recent use of any drug for any reason. The Fatality Analysis Reporting System (FARS) is a yearly census of all MVCs involving a fatality that is compiled by the National Highway and Safety Administration of the U.S. Department of Transportation. This study uses data from 2004 to 2011.

DAWN is a public health surveillance system that monitors drug-related ED visits using a probability sample of approximately 240 yearly participating hospitals to produce annual nationally representative estimates of drug-related ED visits for the United States and selected metropolitan areas (Substance Abuse and Mental Health Services Administration, 2013). DAWN cases are selected from ED charts

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