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Trends in drug use among drivers killed in U.S. traffic crashes, 1999–2010

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ABSTRACT

Objective: Driving under the influence of drugs is a global traffic safety and public health concern. This trend analysis examines the changes in general drug usage other than alcohol, broad categories, and typical prescription and illegal drugs among drivers fatally injured in motor vehicle crashes from 1999 to 2010 in the U.S.
Methods: Data from the Fatality Analysis Reporting System were analyzed from 1999 to 2010. Drug prevalence rates and prevalence ratios (PR) were determined comparing rates in 2009–2010 to 1999–2000 using a random effects model. Changes in general drug usage, broad categories, and representative prescription and illegal drugs including, methadone, oxycodone, hydrocodone, barbiturates, benzodiazepines, and cocaine, were explored.
Results: Comparing 2009–2010 to 1999–2000, prevalence of drug usage increased 49% (PR = 1.49; 95% confidence interval [CI] 1.42, 1.55). The largest increases in broad drug categories were narcotics (PR = 2.73; 95% CI 2.41, 3.08), depressants (PR = 2.01; 95% CI 1.80, 2.25), and cannabinoids (PR = 1.99; 95% CI 1.84, 2.16). The PR were 6.37 (95% CI 5.07, 8.02) for hydrocodone/oxycodone, 4.29 (95% CI 2.88, 6.37) for methadone, and 2.27 (95% CI 2.00, 2.58) for benzodiazepines. Barbiturates declined in rate over the 12-year period (PR = 0.53; 95% CI 0.37, 0.75). Cocaine use increased until 2005 then progressively declined, though the rate remained relatively unchanged (PR = 0.94; 95% CI 0.84, 1.06).
Conclusions: While more drivers are being tested and found drug-positive, there is evidence that a shift from illegal to prescription drugs may be occurring among fatally injured drivers in the U.S. Driving under the influence of prescription drugs is a growing traffic concern.

1. Introduction

Motor vehicle collision remains one of the leading causes of injury mortality in the U.S. (Rockett et al., 2012). Research suggests that driving under the influence of drugs other than alcohol is a growing public health (Walsh et al., 2004) and global traffic safety concern (Morland, 2000; Movig et al., 2004). In the U.S., the prevalence of drug-involved driving was estimated to be 11–14% in 2007 (Lacey et al., 2009).

Driving under the influence of either illegal drugs or prescription medications may lead to driver impairment and/or an increased risk of motor vehicle collision. In regards to illicit substances, there are inconsistencies in the research concerning stimulants, such as cocaine or amphetamines, and driver cognizance (Kelly et al., 2004). As for prescription medications, benzodiazepines have been linked to an increased risk of motor vehicle collision (Walsh et al., 2004). There is evidence that those taking prescription opioids, such as oxycodone or hydrocodone, may be at an increased risk of traffic crash (Orriols et al., 2009). Contrarily, for the opioid methadone, there is no increased risk of motor vehicle collision associated with long term usage (Ogden and Moskowitz, 2004).

The specific drugs consumed by fatally injured drivers and changes in their use over time throughout the U.S., including the role of prescription medications, have been largely under studied. Findings from the 2007 U.S. National Roadside Survey indicated that the occurrence of prescription narcotics, particularly the opioids oxycodone, hydrocodone, and methadone, and depressants, such as benzodiazepines, were common among those that drive

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under the influence with a prevalence of 1.2–3.3% and 2.4–3.4%, respectively (Lacey et al., 2009). Findings from the 2007 National Roadside Survey also suggested that cannabinoids and cocaine were common among those that drive under the influence (Lacey et al., 2009). Even though cannabinoids were more prevalent than cocaine among drivers under the influence (Lacey et al., 2009), cannabis has been legalized for medicinal use in several states, making it not entirely illegal. Therefore, cocaine is perhaps more representative of illicit drug use among those who drive under the influence as it is a controlled substance typically not available outside of a healthcare institution.

Because of the potential for impairment and the prevalence of substance use among drivers, there is a need to discern how drug use is trending for public health intervention. Therefore, the purpose of this study is a trend analysis to examine the changes in drug use among fatally injured drivers in motor vehicle crashes from 1999 to 2010 in the U.S. Particular interest is given to changes in general drug usage, broad categories of drugs, and representative prescription medications and illegal substances including depressants, specifically benzodiazepines and barbiturates, opioids, explicitly methadone, hydrocodone, and oxycodone, and cocaine.

2. Methods

2.1. Data source

The data for this analysis were obtained from the Fatal Analysis Reporting System (FARS). FARS is a publically available database maintained by the National Highway Traffic Safety Administration (NHTSA) (National Highway Traffic Safety Administration, 2012). States report motor vehicle crashes to the NHTSA when at least one person involved in the collision dies within thirty days of the incident (National Highway Traffic Safety Administration, 2012). Using strict quality control procedures, trained NHTSA analysts extract data from the state reported files (National Highway Traffic Safety Administration, 2012). Consequently, the FARS database contains detailed information relating to the crash, vehicles, and people involved (National Highway Traffic Safety Administration, 2012). As part of the reporting process, up to three drug test results per individual involved in the traffic collision can be documented in addition to a blood alcohol concentration; drugs administered after the collision are excluded from drug test results (National Highway Traffic Safety Administration, 2010, 2012). Drug tests administered to drivers can be accomplished via urine drug screens, blood, or combination (i.e. urine and blood tests) post-collision.

States differ in their consistency of drug testing. Not all fatally injured drivers are tested for drugs and alcohol and not all states consistently report their results. For example, in the FARS database from 1999 to 2010, the average drug testing percent of all states combined was approximately 48%. Over the 12-year time span, the average overall drug testing percent of individual states ranged from 1% (Maine) to 90% (Hawaii) (National Highway Traffic Safety Administration, 2010, 2012).

2.1.1. Study population

Because of the differences in states' drug testing and consistency of reporting, there were data quality concerns. A comprehensive analysis was conducted on each state regarding overall drug testing percentage of fatally injured drivers, percent of their population testing positive for drugs, and the proportion of drug results listed as 'Other'. To be included in this analysis, a state must have a drug testing percent ≥50%. If the state's drug positive rate was high (i.e. >70%) or low (<5%) and/or proportion of drug results listed as 'Other' was high (>70%), the state was excluded as this may have indicated a data quality issue. The following states met the inclusion criteria: Arizona, California, Colorado, Georgia, Hawaii, Illinois, Kentucky, Maryland, Massachusetts, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, South Carolina, Vermont, Virginia, Washington, West Virginia, and Wyoming. Analyses were limited to all fatally injured drivers who died between January 1st, 1999 and December 31st, 2010 with a known drug test result from states meeting the inclusion criteria.

2.2. Statistical analysis

Descriptive characteristics of drivers testing positive for at least one drug were compared to drivers testing negative. Statistical significance of nominal data was determined thru Pearson's Chi Square Tests or Cochran–Mantel–Haenszel statistics. Cochran–Armitage Trend tests with Modified Ridit scoring were performed on all ordinal data. Descriptive characteristics included age, gender, race, ethnicity, number of vehicles involved, a driving while intoxicated (DWI) conviction within the past 3 years, a previous crash within the past 3 years, blood alcohol concentration (BAC), the type of drug test administered, day, time, and year of the crash, how long the individual survived after the crash, and if they were a professional driver (i.e. held a commercial drivers license). With the exception of the variables indicating the type of drug test administered, professional driver status, and survival time, all variables were characterized similarly to previously published work (Brady and Li, 2013). The type of drug test administered post-collision was categorized as a urine, blood, or combination test. Professional driver status was dichotomized. Survival time was dichotomized into death within 1 h of collision or beyond.

BAC, measured in grams per deciliter (g/dl), was based on multiple imputed BAC levels determined by NHTSA (National Highway Traffic Safety Administration, 2012). The NHTSA has previously published extensive literature on their multiple imputation methods of missing BAC for drivers involved in fatal traffic collisions (Rubin et al., 1998; Subramanian, 2002). If BAC was missing for a driver, the NHTSA's validated model would impute 10 specific values of BAC across a range of possible values permitting the estimation of statistics including measures of central tendency and dispersion (Rubin et al., 1998; Subramanian, 2002). Therefore, the overall estimate of BAC value was generated from 10 imputations, and PROC MIANALYZE in SAS was used to combine estimates.

Prevalence and prevalence ratios were calculated for drug presence among all fatally injured drivers with a known drug test result for each of the variables described using log binomial regression. The prevalence ratio was shown to quantify whether the demographic characteristic was associated with either an increased or decreased occurrence of a drug positive result compared to a referent sub-group. Age 25–34, male gender, white race, non-Hispanic ethnicity, possessing a non-commercial driver's license, blood alcohol concentration of 0.00, no previous crash or DWI, a day time collision, multiple vehicle involvement, survival time less than 1 h, and a crash year of 1999 all served as referents.

Drug prevalence rates among drivers were assessed per year and by drug category or class. Any drug use was defined as testing positive for any one drug. Broad drug categories were grouped into drug classes including narcotics, depressants, stimulants, hallucinogens, cannabinoids, phencyclidine, or other. For specific, representative drugs, hydrocodone and oxycodone were grouped together separately from methadone as methadone is generally prescribed to treat opioid dependence (Mark et al., 2009). Benzodiazepines and barbiturates were used to assess depressants. Cocaine was used as a marker of illegal drug use because it is a controlled substance generally unattainable outside a healthcare institution.