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On-road all-terrain vehicle (ATV) fatalities in the United States

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ABSTRACT

Background: The study was designed to describe the characteristics of all-terrain vehicle (ATV) rider fatalities and fatal crashes involving ATVs that occur on public roads. *Methods:* Information on fatal crashes occurring on public roads during the years 2007–2011 was obtained from the Fatality Analysis Reporting System (FARS). *Results:* There were 1,701 ATV rider deaths during the 5-year study period, including 1,482 drivers, 210 passengers, and 9 with unknown rider status. An additional 19 non-ATV occupants, primarily motorcyclists, died in crashes with ATVs. About half of the ATV passenger deaths were teenagers or younger, and the majority of passenger deaths were female. Ninety percent of the fatally injured drivers were 16 or older, and 90% were male. The crashes were most likely to occur in relatively rural states, and in rural areas within states. Only 13% of drivers and 6% of passengers killed wore helmets. Forty-three percent of the fatally injured drivers had blood alcohol concentrations (BACs) of 0.08% or greater. Seventy-five percent of the fatal crashes involved single ATVs; 5% involved multiple ATVs but no non-ATV vehicles, and 20% involved ATVs and non-ATVs, usually passenger vehicles. Speeding was reported by police as a contributing factor in the crash for 42% of ATV drivers in single-vehicle crashes and 19% of ATV drivers in multiple-vehicle crashes. *Practical applications:* Although ATVs are designed exclusively for off-road use, many ATV occupant deaths occur on roads, despite most states having laws prohibiting many types of on-road use. Attention needs to be given to ways to reduce these deaths.

1. Introduction

All-terrain vehicles (ATVs) are gasoline or diesel-powered motorized vehicles, with oversize, low-pressure tires. Some ATVs have a straddle seat for the operator, and handlebars for steering control. Others, often called a side-by-side ATV, a recreational off-highway vehicle, or Utility Terrain Vehicle (UTV) have a bench seat or bucket seats for the driver and passengers and a car-like wheel for steering. ATVs are designed for travel off road on unpaved surfaces, and are primarily used for recreation. They also are used for some work-related purposes, for example, farming, and policing and patrolling public lands, where various terrains have to be navigated. In some rural and remote areas they serve general transportation purposes (U.S. Government Accountability Office, 2010). UTVs are a growing segment of the ATV market, but little data are available on the number of fatalities in those vehicles. ATVs were introduced in the United States in the early 1970s. Their popularity has increased markedly since that time, accompanied by concerns about the crashes and injuries that resulted, especially in regard to those younger than 16 (American Academy of Pediatrics, 2000; U.S. Government Accountability Office, 2010). The Consumer Product Safety Commission (CPSC), the federal agency responsible for regulating the safety of ATVs, conducts a yearly census of ATV rider deaths that occur on public roads, private roads, and off road. Counts are based on death certificates and a variety of other sources (CPSC, 2013). CPSC reports that it only includes straddle-type ATVs in its database and excludes UTVs. The CPSC dataset, obtained by the authors, indicates that between 1986 and 1998, ATV rider deaths averaged 227 per year but increased rapidly thereafter to more than 800 in 2007, the last year for which CPSC data are complete. Only limited exposure data are available, but CPSC estimates that there were 10.6 million ATVs in use in the United States in 2010, compared with 5.6 million in 2001 (CPSC, 2013).

ATVs are not intended for on-road use and have design features that can increase risk when operated on paved surfaces (Specialty Vehicle Institute of America, 2013; U.S. Government Accountability Office, 2010). However, the majority of ATV rider deaths now occur on roads. State studies report that 57% of ATV rider fatalities in Iowa during 1982–2009 took place on public or private roads, and nearly two-thirds of the ATV rider fatalities in West Virginia during 2005–2007 occurred on public roads (Denning, Jennisen, Hartland, Ellis, & Buresh, 2013b; Helmkamp, Ramsey, Hass, & Holmes, 2008). Analysis of the CPSC data indicates that in 2007, for the 93% of ATV rider deaths for which location was identified, 492 (65%) of the 758 deaths occurred on public and private roads. Moreover, there has been a greater increase in on-road than in off-road deaths in recent years.

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Between 1998 and 2007, on-road deaths increased from 128 to 492 (284%); off-road deaths increased from 110 to 266 (155%).

There also has been an age shift in ATV rider deaths, with decreasing proportions of those younger than 16 involved. CPSC data indicate that the percentage of ATV rider deaths younger than 16 ranged between 23 and 28% during 1999–2004 but between 14 and 17% during 2006–2011 (2008–2011 data are preliminary; CPSC, 2013). This trend appears related to the increasing proportions of ATV rider deaths that take place on roads. In a study based on CPSC data, there was a smaller proportion of ATV rider deaths younger than 16 in on-road compared with off-road crashes (Denning, Harland, Ellis, & Jennissen, 2013a).

Studies of ATV operators killed in crashes have found evidence of low helmet use and significant alcohol involvement (Denning et al., 2013a; Denning et al., 2013b; Hall, Bixler, Helmkamp, Kraner, & Kaplan, 2009; Lord, Tator, & Wells, 2010). In the Denning et al. (2013a) study based on CPSC data, lower helmet use and higher alcohol use were found more often in on-road than in off-road fatalities. However, alcohol information was available only for a subset of the drivers, a limitation of other studies as well (U.S. Government Accountability Office, 2010).

Regulations and laws and their enforcement are important ways of attempting to reduce ATV crashes, especially those occurring on public roads. CPSC regulations have included a ban on the sale of three-wheeled ATVs and the requirement that manufacturers must put labels on ATVs, warning that they should not be used on paved roads, that DOT-compliant motorcycle helmets should be worn, and that ATV operators should not carry passengers (which adds to vehicle instability).

States have the authority to adopt laws governing ATV use. Based on a search of state laws, using the Lexis Research System, Appendix A provides information about when ATVs can be used on the road, who must wear helmets, and when passengers are permitted.

Most states prohibit the use of ATVs on public roads, except for specific uses. Some of the most common permitted on-road uses of ATVs are: they can cross a road to move from one trail or field to another; can be used in work-related operations, such as utility maintenance, law enforcement, emergency services, or land surveying; and can be used when allowed by local ordinances.

Eight states require all ATV operators on public roads to wear helmets; 4 states require all ATV operators on public lands to wear helmets; 8 states have age-related helmets laws, which usually apply to riders younger than 18; and two states require some riders on public roads to wear helmets but make exceptions for riders engaged in farming. Most of these laws also pertain to passengers. Thirteen states have laws prohibiting passengers, but allow them for UTVs.

The objective of the present study was to extend findings from the limited number of prior studies that have addressed on-road ATV rider deaths. The study is based on information in the Fatality Analysis Reporting System (FARS), a census of fatal motor vehicle crashes on public roads, which has not been used in prior ATV studies. The CPSC data are limited in information about the crash events and driver actions, whereas FARS has extensive information on these factors, based on on-scene and follow-up investigations by police officers and other information. FARS, unlike CPSC, also provides information on blood alcohol concentrations (BACs) for all ATV drivers. The analyses of FARS data may suggest opportunities for intervention.

A historical look at ATV rider fatalities in FARS indicates that there were 35 driver or passenger on-road fatalities in 1982, the first year they were explicitly identified. ATV rider deaths increased to more than 300 yearly beginning in 2003 and reflect the shift to older ages of fatally injured ATV riders. In 1982, 54% of the 35 ATV riders killed were younger than 20, compared with 19% of the 305 riders killed in 2011 (Insurance Institute for Highway Safety, 2013a).

The present analyses were based on fatal crashes during the years 2007–2011, the most recent year for which FARS data are currently available. As explained below, the results presented in this paper are based primarily on data for straddle-type ATVs, although in some cases UTVs may have been coded as straddle-type ATVs. This provides a contemporary portrayal of ATV rider crash deaths on public roads in the United States.

2. Methods

Information on ATV rider deaths and their crashes on public roads was extracted from FARS for the 5-year 2007–2011 period. FARS uses body type code 90 for ATVs, which FARS specifies as those including three or four wheels. In addition to straddle-type ATVs, UTVs may have been coded as body type 90 by state FARS analysts during the study years. The vehicle identification numbers (VINs) could be decoded for 51% of the vehicles in this study. And of those VINs, 94% were straddle-type ATVs.

FARS includes data on all motor vehicle crashes that occur on public traffic ways and in which a death occurred within 30 days of the crash. Information on the crash and the people involved is based on police crash reports, death certificates, coroner/medical examiner reports, and other state data sources.

All states and the District of Columbia have laws making it illegal to drive a motor vehicle on a public road with a BAC of 0.08% (0.08 g alcohol per 100 ml blood) or higher. Since 1982, FARS has included information on the BACs of all drivers. BACs are based on blood alcohol chemical tests or, if test results are missing, an imputed BAC value, based on crash characteristics known to be related to alcohol use (Subramanian & Utter, 2003). Fatally injured drivers with known BACs were examined, and the results were essentially the same.

For most variables, the data are presented for fatally injured drivers and passengers (state, ages, helmet use, sex, time of day, day of week, month, urban/rural, and road type). BACs are presented for fatally injured ATV drivers only. The number of fatal crashes involving ATVs is displayed for the following: the number and type of vehicles involved (e.g., one ATV, two ATVs, one ATV, and one non-ATV); the first harmful event (e.g., striking a tree); crash configuration (e.g., ATV rear ended by passenger vehicle); speed limit; and the specific location of the crash (e.g., on road, on shoulder). FARS also provides driver contributing factors (e.g., speeding, not keeping in proper lane), based on police judgments, for each driver and a vehicle maneuver (e.g., turning left) for each vehicle. FARS also has a "roadway surface type" variable, which indicates if the road is paved or unpaved. Based on the FARS roadway function class variable for both rural and urban roadways, the study combined the following as minor roads: minor collector, local road, collector, and local road. For major non-interstate roads, the study combined principal arterial, minor arterial, major collector, and other principal arterial and minor arterial.

3. Results

3.1. Driver and passenger deaths and their characteristics

There were 1,701 ATV rider deaths reported in FARS during 2007–2011: 368 in 2007, 377 in 2008, 335 in 2009, 316 in 2010, and 305 in 2011. The 1,701 deaths included 1,482 drivers (87%), 210 passengers (12%), and 9 people (1%) for whom rider type was not known. In crashes in which rider type was known, 1,450 (87%) involved driver deaths only, 177 (11%) involved passenger deaths only, and in 32 crashes (2%) both drivers and passengers were killed (32 drivers, 33 passengers).

ATV rider fatalities occurred in every state during 2007–2011, except the District of Columbia and New Hampshire. The most deaths occurred in Kentucky (122), Pennsylvania (97), West Virginia (96), and Texas (95). Table 1 shows the numbers of ATV rider deaths and death rates per population for all the states and the District of Columbia, ranked from highest to lowest death rate. The top 10 states based on death rates were West Virginia (104.9 per 10 million), Wyoming (69.6), Kentucky (56.7), Montana (47.1), Idaho (36.3), Vermont (35.3),