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COCHRANE CORNER

Family fun—family tragedy: ATV-related deaths involving family members

All-terrain vehicle (ATV) riding is a very popular recreational activity, which has experienced increased participation worldwide since the early 1990s. In the USA alone, the US Consumer Product Safety Commission (CPSC) estimates that nearly seven million four-wheel ATVs were in use in 2004 with some 23 million riders.¹ A 2005 statewide random digit telephone survey of 1243 West Virginia households provided evidence that ATV riding is a very popular and family-based event in all regions of the state. With a population slightly less than two million, 30% of sampled households own an ATV, and an estimated 460 000 ATVs are in use throughout West Virginia.²

As ATV riding has become an immensely popular family-oriented activity, the availability and use of ATVs has led to increased exposure to hazardous and unsafe conditions that have resulted in hundreds of deaths and thousands of injuries nationally. In fact, the estimated number of deaths associated with ATVs has risen nearly 180% from 276 deaths in 1995 to 767 in 2004 (the most recent year for which annual fatality data are available from the CPSC). Estimated non-fatal injuries requiring emergency room treatment rose over 150% from 53 600 visits in 1996 to 136 700 in 2005.¹ West Virginia's 138 deaths during the period 2002–2005 accounted for over 6% of all ATV-related deaths in the country—second only to Kentucky's 143 deaths.¹ This proportion and ranking will probably increase with the 52 deaths recorded in the state in 2006 and an additional 19 through May 2007.

Recreational riding often involves not only the driver/operator but passengers as well. There has been little attention directed towards passengers, however. A title and abstract review of over 120 ATV peer-review papers worldwide over the past two decades indicates that there have been no studies that have focused solely on passenger deaths and more specifically on family relationships between driver and passenger. A 2004 study by Aitken *et al*³ used youth and adult focus groups to gather information on riding with families, double riding, and safety behaviors. Efforts to improve

safety awareness and practice among children were stressed.

A brief review of fatal ATV crashes in West Virginia between 2001 and mid-2007 found that 21% (48 of 225) of the crashes involved ATVs carrying passengers. Forty six percent (22 of 48) of these victims were passengers; 57% of the victims were male with an average age of 33.0 years, and the remainder female with an average age of 21.5 years. Sixteen percent of these crashes involved alcohol. The proportion of passengers involved (21%) is slightly greater than the 18% noted by the CPSC in their 2001 technical review of National Electronic Injury Surveillance System data⁴ and the 17% of passenger cases identified in West-Central Illinois between 1994 and 2001.⁵ The objective of this study was to further review West Virginia's ATV crashes involving passengers and determine family relationships (eg, father–son, grandmother–grandson, sister–sister, husband–wife) between the driver and passenger, and to estimate the economic burden of these deaths.

METHODS

The crash victim's position on the ATV and any potential family relationships between the driver and passenger were determined through a review of a comprehensive database of West Virginia ATV deaths maintained by the author. Data were primarily derived from death certificates, with supplemental information provided from medical examiner reports, police reports, local media accounts, and CPSC investigation reports, when available. The Pacific Institute for Research and Evaluation provided cost estimates based on a human capital approach that incorporates medical, work loss (wages), and quality of life components.^{6,7} Estimates are presented in 2004 US dollars at West Virginia price levels.

RESULTS

From 2001 to mid-2007, 11 fatal ATV crashes involved various combinations of family relationships. The victims from these events accounted for 24% of the deaths in the 48 crashes where passengers were aboard. Seven of the 11 victims were male. The mean age of the victims was 28.3 years (range 5–73 years) with

females slightly older than males: 31.8 and 26.3 years, respectively. Passengers were about 3 years older than drivers: 29.8 and 26.4 years, respectively. One of the crashes involved alcohol. Six (three male and three female) victims were passengers and five were drivers (four male and one female). The three youngest victims aged 5 (male), 8 (male), and 8 (female) years were all passengers.

Helmets were generally not worn by the victims; there was no requirement to do so until 2005 and then only for riders under 18 years of age.⁸ The passenger or driver not killed was slightly injured in six of the 11 fatal events. In one of the scenarios involving a grandparent and grandchild, the 6-year-old grandson was driving the ATV when his grandmother was thrown from the ATV during an out of control U-turn. Two of the nine crashes involved multiple passengers (ie, twin 5-year-old grandsons, and a young girl and her cousin). All of these crashes involved rollovers or flipping on embankments and inclines, or collisions with fixed objects such as trees and gates. Table 1 provides additional details about the fatal incidents.

Two other ATV crashes not detailed in table 1 involved family members but did not directly involve passengers. In the first, a 49-year-old helmeted female was riding with her husband (on a separate ATV) when she lost control, left the trail, and hit a tree. In the second, a 34-year-old non-helmeted male was hit from behind by another ATV driven by his brother who had his wife aboard as a passenger.

The estimated overall mean cost (in 2004 US dollars) for each of the 11 ATV-related fatalities described above was US\$3.0 million; about 65% (US\$1.96 million) of this cost was related to quality of life, 34% (US\$1.03 million) to work and wages, and 1% (US\$.01 million) to medical services.

DISCUSSION

Since 1988, all ATVs manufactured in the USA have been voluntarily labeled with multiple safety warnings including not carrying passengers.⁹ The presence of just one passenger—whether situated behind the driver or in front of him or her (ie, on the driver's lap or on the handlebars)—

Table 1 Family-related ATV deaths in West Virginia, 2001–mid 2007

Year	Total annual deaths	Month occurred	Gender, position on ATV, relation	Age of decedent	Crash event	Injury	Comments
2001	20	July	Male, passenger, grandson	5	ATV went over embankment and flipped when ATV was put in reverse	Massive head injuries	No helmets; grandmother was driving ATV with twin 5-year-old grandsons as passengers. She and surviving grandson treated and released
2002	27	March July	Female, driver, mother Male, passenger, grandfather	34 73	ATV went off dirt road and hit tree ATV plunged down a steep embankment on a private dirt road	Massive head trauma Multiple trauma	Daughter was a passenger 12-year-old grandson was the driver; he had little experience operating an ATV
2003	35	May	Female, passenger, grandmother	56	ATV went out of control in U-turn causing victim to fall and hit head on pavement	Closed head injury	Passenger not helmeted. 6-year-old grandson driving ATV
2005	39	June	Male, passenger, son Female, passenger, sister	8 8	3-wheeled ATV struck steel gate at cemetery entrance ATV went out of control on a road curve and rolled over	Blunt head trauma Multiple head and chest injuries	Father was driving ATV; no helmets No helmets; 14-year-old sister was the driver, slightly injured. Sisters were visiting their mother
2006	52	May	Male, driver, grandson	10	ATV went into ditch causing passenger to fall off; ATV came out of ditch and flipped over on driver	Crushing force trauma	No helmets; grandfather was passenger
		July August	Female, passenger, wife Male, driver, brother	29 25	ATV left road and hit tree ATV went out of control on rural road	Blunt trauma Traumatic brain injury	Husband was driver and also injured Driver and passenger not helmeted. Brother riding as passenger
		August	Male, driver, father, uncle	49	ATV flipped backwards on a steep hill	Multiple	Driver not helmeted; daughter and nephew riding as passengers treated and released
2007*	19	May	Male, driver, brother	14	ATV hit utility pole at high speed doing "wheelie"	Multiple	No helmets. Younger brother was passenger and was slightly injured

*Through May 2007.

Key points

- Family members, as either the driver or passenger, were involved in nearly one-quarter of ATV crashes in West Virginia from 2001 to mid 2007, where there were passengers riding the ATV.
- Parents, or other responsible adults, are the key to safe, family-oriented ATV riding; adults must act responsibly by following the manufacturer's safety guidelines and through the use of safe riding techniques.
- The economic costs associated with these deaths is US\$3 million for each fatality, but the longer-term psychological impact on families is incalculable.
- Further consideration should be given to restricting the use of ATVs by children, with potential caveats for those demonstrating appropriate skills and body size.

impairs the safe operation and maneuverability of the ATV, especially one built for only one rider. To safely steer and control the ATV, the driver must be "rider active" and have the ability to make quick body shifts combined with acceleration and braking.¹⁰ The presence of passengers can easily and very quickly upset the delicate balance and control that the ATV driver must maintain, whether the ATV is operated in the USA or any other country. Historical review of West Virginia fatalities involving passengers from 1990 forward has shown that the dynamics of the crash event often differs between the driver and passenger resulting in different types of injuries and survival. Rodgers¹¹ suggests that driver/passenger status does not affect fatality risk to any significant degree.

The operation of ATVs by young children exacerbates the passenger/driver issue. In the 11 cases presented in this brief report, four of the drivers were 6, 12, and 14 (two) years of age. Children this age often do not possess the physical size, strength, coordination, and maturity to

safely operate an ATV, particularly adult-sized ATVs, which can weigh over 500 pounds and attain speeds in excess of 50 mph.¹² Youth often do not physically fit the adult-size ATVs they operate; arm length to reach grip throttles and leg length and foot size for breaking and shifting are often compromised.¹²

A number of consumer groups and professional medical organizations, including the Consumer Federation of America, the American Academy of Orthopaedic Surgeons (AAOS) and the American Academy of Pediatrics (AAP), have long advocated that passengers not be allowed on ATVs.¹³⁻¹⁵ Model legislation proposed by both the AAOS and the AAP recommends the prohibition of passengers and the use of ATVs for all children younger than 16 years of age.^{14 15} The data presented here strongly support this recommendation and debunk continual industry attempts to portray ATV riding as legitimate and safe family-oriented fun.

Although the economic costs associated with these deaths have been quantified and categorized, the hidden societal costs and the psychological devastation of families when one member dies in the presence of another are overwhelming and incalculable. Certainly, there are far more healthy and safer family-oriented outdoor activities such as hiking and bicycling, which could help to combat obesity and sedentary lifestyles among children and youth, a growing public health concern worldwide.

It is good for families to recreate and play together, but it is not safe to do so on the same ATV, especially those not designed to carry passengers. To ensure a fun and safe family experience, parents and other adults must supervise children, use common sense, and lead by example. If care givers are going to allow their children to operate an ATV, they must understand and explain the risks associated with them. If children and youth are operating an ATV on their own, parents must know where and how they are riding and encourage safe riding practices (ie, no passengers, wearing a helmet, not on a paved surface, and following manufacturer's guidelines including the operation of age-appropriate sized youth models).

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