

## ORIGINAL CONTRIBUTION

# Characteristics of Child Passenger Deaths and Injuries Involving Drinking Drivers

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**M**OTOR VEHICLE-RELATED injury is the leading cause of death for children and young people aged 1 to 24 years in the United States.<sup>1</sup> From 1985-1996, 24% of motor vehicle-related deaths among children involved alcohol; 68% of these alcohol-related deaths involved motor vehicle occupants.<sup>2</sup> While the relation of alcohol to the traffic deaths of teenaged drivers is well established,<sup>3</sup> there is little information on the role of alcohol in the traffic deaths of younger passengers. In a summary of 1997 traffic safety statistics, the National Highway Traffic Safety Administration (NHTSA) reported that nearly half of the alcohol-related child traffic deaths involved child passengers riding with drivers who had been drinking alcohol.<sup>4</sup> However, this analysis did not separately consider the alcohol-related deaths of child passengers, pedestrians, and bicyclists.

Our recent brief report used national crash data to examine alcohol involvement in the deaths of child passengers, pedestrians, and bicyclists.<sup>2</sup> However, we did not specifically evaluate the characteristics of drinking driver-related child passenger deaths. The only other work we have found that provides any detail on alcohol-related child passenger deaths reported that a drinking driver may be more likely in-

**Context** Motor vehicle-related injury is the leading cause of death for children and young adults aged 1 to 24 years in the United States. Approximately 24% of child traffic deaths involve alcohol.

**Objective** To examine characteristics of crashes involving child passenger deaths and injuries associated with drinking drivers to identify opportunities for prevention.

**Design, Setting, and Participants** Descriptive epidemiological analysis of 1985-1996 data from the Fatality Analysis Reporting System on deaths among US child passengers (aged 0-14 years) and 1988-1996 data from the General Estimates System on nonfatal injuries.

**Main Outcome Measures** Child passenger death or injury by driver characteristics (eg, driver age, blood alcohol concentration, and driving history).

**Results** In 1985-1996, there were 5555 child passenger deaths involving a drinking driver. Of these deaths, 3556 (64.0%) occurred while the child was riding with a drinking driver; 67.0% of these drinking drivers were old enough to be the parent or caregiver of the child. Of all drivers transporting a child who died, drinking drivers were more likely than nondrinking drivers to have had a previous license suspension (17.1% vs 7.1%) or conviction for driving while intoxicated (7.9% vs 1.2%). Child restraint use decreased as both the child's age and the blood alcohol concentration of the child's driver increased. In 1988-1996, an estimated 149 000 child passengers were nonfatally injured in crashes involving a drinking driver. Of these, 58 000 (38.9%) were riding with a drinking driver when injured in the crash.

**Conclusions** These data indicate that the majority of drinking driver-related child passenger deaths in the United States involve a child riding unrestrained in the same vehicle with a drinking driver. Typically, the drinking driver transporting the child is old enough to be the child's parent or caregiver.

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involved when a child passenger dies while riding in an older vehicle.<sup>5</sup> In this article, we examine driver, passenger, and crash characteristics for child passenger deaths and injuries involving drinking drivers to identify opportunities for prevention.

## METHODS

For deaths, we analyzed 1985-1996 data from the Fatality Analysis Reporting System.<sup>6</sup> This database is maintained by the NHTSA and is a census of all police-reported motor vehicle crashes on public roadways that result in the death of at least 1 occupant or nonmotorist, such as a pedestrian or bicyclist, within 30

days of the crash. For drivers without available alcohol test results, the NHTSA estimates the distribution of blood alcohol concentrations in 1 of 3 categories (<2.17 mmol/L, 2.17-21.6 mmol/L, and  $\geq$ 21.7 mmol/L [ $<10$ , 10-90, and  $\geq$ 100 mg/dL, respectively]) using a discrimi-

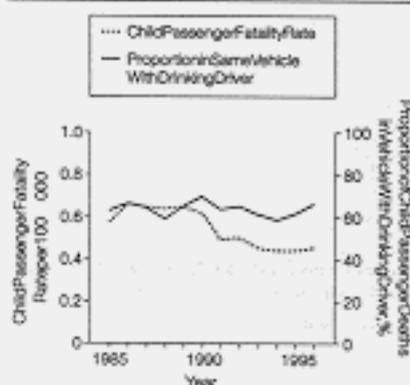
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See also pp 2245 and 2291 and Patient Page.

**Table 1.** Driver Blood Alcohol Concentration and Driver Status in Crashes Involving Child Passenger Deaths, United States, 1985-1996\*

Driver Blood Alcohol Concentration, mmol/L†	Status of Drinking Driver in Fatal Crash		Total Child Passenger Deaths
	Transporting Child, No. (%)	Not Transporting Child, No. (%)	
2.17-21.6	1274 (35.8)	483 (24.2)	1757
≥21.7‡	2282 (64.2)	1516 (75.8)	3798
Total	3556	1999	5555

\*Data from the Fatality Analysis Reporting System of the National Highway Traffic Safety Administration.  
 †Refers to the highest driver blood alcohol concentration when there was more than 1 drinking driver in a fatal crash.  
 ‡21.7 mmol/L (100 mg/dL) is the legal blood alcohol limit in most states.

**Figure 1.** Fatality Rate for Child Passengers Killed While Being Transported by Drinking Drivers and Proportion of Drinking Driver-Related Child Passenger Deaths Involving a Drinking Driver in the Same Vehicle, United States, 1985-1996

Data from the National Highway Traffic Safety Administration, Fatality Analysis Reporting System.<sup>4</sup> A drinking driver is a driver with a measurable blood alcohol concentration, regardless of whether it was above the legal limit. A child passenger is a passenger aged 0 to 14 years at the time of the crash.

nant analysis of known information.<sup>7</sup> For the crashes studied in this article, blood alcohol concentrations were imputed for approximately one third of records. To assess the impact of the imputed blood alcohol distributions on our results, we analyzed the data both with and without the records with imputed alcohol information. We found no meaningful difference in any of the associations when records with imputed alcohol levels were excluded. We therefore present the results including records with estimated blood alcohol concentrations.

For nonfatal injuries, we analyzed 1988-1996 data from the General Estimates System.<sup>8</sup> This database is also maintained by the NHTSA and became

operational in 1988. This system uses a stratified probability sample of all police-reported crashes in the United States. Information from approximately 48 000 police crash reports from 400 police jurisdictions is abstracted each year. Alcohol involvement is coded in this system as yes or no; specific blood alcohol concentrations are not available in the General Estimates System.

Rates were calculated using population counts from the US Census.<sup>8,9</sup>

## RESULTS

### Deaths

From 1985-1996, 19 768 child passengers aged 0 through 14 years died in motor vehicle crashes in the United States. Of these, 5555 (28.1%) involved a drinking driver (a driver with any measurable blood alcohol concentration  $\geq 2.17$  mmol/L [10 mg/dL]). Of all child passenger deaths, the proportion that involved a drinking driver decreased from 30.9% (470/1520) in 1985 to 23.2% (395/1701) in 1996.

Of the 5555 child passenger deaths that involved a drinking driver, 3556 (64.0%) occurred while the child was riding with a drinking driver (TABLE 1). Of the 3556 child passengers who died while riding with a drinking driver, 2085 (58.6%) died in single-vehicle crashes and 1471 (41.4%) died in multiple-vehicle crashes. A total of 1999 child passengers died in multiple-vehicle crashes in which the child's driver had not been drinking, but another driver had been drinking alcohol.

Fatality rates for child passengers killed while being transported by a drinking driver declined from 1985 through 1990 but remained virtually unchanged

from 1991 through 1996 (FIGURE 1). Among child passenger deaths involving a drinking driver, the proportion that died while riding in the same vehicle as a drinking driver was similar from 1985 through 1996. In each of these 12 years, approximately two thirds of the child passengers whose deaths involved a drinking driver were riding with such a driver when they died (Figure 1).

We examined the age groups of the pairs of drinking drivers and their child passengers who were killed. Combinations of drivers aged 21 years and older with passengers younger than 5 years (35.5%), drivers aged 25 years and older with passengers aged 5 through 9 years (22.4%), and drivers aged 35 years and older with passengers aged 10 through 14 years (9.1%) made up more than two thirds of the total. The combination of drivers aged 15 through 20 years with passengers aged 10 through 14 years made up just 12.5% of the driver-passenger pairs.

Of the drivers involved in a crash in which a child passenger in their vehicle died, drinking drivers were more likely than nondrinking drivers to have been previously convicted of driving while intoxicated or to have had their license suspended or revoked (TABLE 2). Overall, 7.9% of the drinking drivers and 1.2% of the nondrinking drivers had 1 or more prior convictions for driving while intoxicated during the 3 years prior to the date of the fatal crash (prevalence ratio, 6.6). Similarly, 17.1% of the drinking drivers and 7.1% of the nondrinking drivers had their driver's license suspended or revoked during the 3 years before the fatal crash (prevalence ratio, 2.4).

For all child passenger deaths (including those not related to drinking drivers) from 1985 through 1996, child passenger restraint use decreased as both the child's age and the blood alcohol concentration of the child's driver increased (FIGURE 2). Of the 3246 child passengers with known restraint information who died while being transported by a drinking driver, just 584 (18.0%) were restrained in the fatal crash. For comparison, of the 14 772 children with known restraint information who

died while being transported by a non-drinking driver, 4508 (30.5%) were restrained. Of the 3063 cases for which restraint use was known for both the drinking driver and the child passenger who died, both used a restraint in 345 cases (11.3%). In 398 fatal crashes (13.0%), the drinking driver was restrained, but the child who died was not.

### Nonfatal Injuries

An estimated 2 322 000 child passengers were nonfatally injured from 1988 through 1996. Of these injuries, 149 000 (6.4%) involved a drinking driver. Of these 149 000 injured child passengers, 58 000 (38.9%) were being transported by a drinking driver at the time of the crash. Of the child passengers injured while riding with a drinking driver, 33.2% were restrained; of all children injured while riding with a nondrinking driver (whether in alcohol-related crashes or not), 66.0% were restrained.

### COMMENT

In the United States, the majority of the drinking driver-related child passenger deaths involve a child riding unrestrained in the same vehicle as a drinking driver. Typically, the drinking driver transporting the child is old enough to be the child's parent or caregiver. This is different than what might be assumed from the popular media reports of children who are killed when the vehicle in which they are riding is hit by a drinking driver.<sup>10,11</sup>

Our findings are generally consistent with an analysis of traffic injuries and deaths among children in North Carolina that found that of the 51 child passengers killed in alcohol-related crashes from 1979 through 1982,<sup>12</sup> 36 (70.6%) were riding with drinking drivers.

We found that among drivers involved in a crash in which their child passenger died, drinking drivers were over 6 times more likely than nondrinking drivers to have prior convictions for driving while impaired. This finding underscores the serious risk that persons arrested for alcohol-impaired driving pose to others and to themselves. Drivers who have been arrested for driving while impaired are known to be at substantially increased risk

**Table 2.** Characteristics of Drinking and Nondrinking Drivers Involved in Crashes in Which a Child Passenger in Their Vehicle Died, United States, 1985-1996\*

Driver Characteristic	Drinking Drivers, No. (%) (n = 3152)	Nondrinking Drivers, No. (%)† (n = 14 316)	Prevalence Ratio
Male	2070 (65.7)	6895 (48.2)	1.4
Age 25-34 y	1342 (42.6)	4840 (33.8)	1.3
Driving record			
Conviction for driving while intoxicated	250 (7.9)	172 (1.2)	6.6
License suspension or revocation	539 (17.1)	1011 (7.1)	2.4
Previous crash	463 (14.7)	1719 (12.0)	1.2
Speeding conviction	704 (22.3)	2589 (18.2)	1.2

\*Data from the Fatality Analysis Reporting System of the National Highway Traffic Safety Administration.<sup>6</sup> Driver characteristic data were missing for a number of drinking and nondrinking drivers, respectively, as follows: sex (7, 17), age (13, 34), conviction for driving while intoxicated (119, 438), license suspension or revocation (118, 438), previous crash (139, 517), and speeding conviction (119, 438).

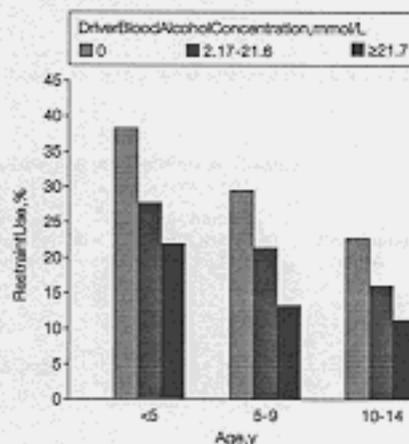
†Drivers with a blood alcohol concentration of less than 2.17 mmol/L (10 mg/dL) at the time of fatal crash.

of future death in an alcohol-related motor vehicle crash compared with drivers who have not been arrested for this offense.<sup>13</sup> In addition, studies have shown that over half of the drivers arrested for driving while impaired are alcoholics.<sup>14</sup> Taken together, these findings emphasize the importance of aggressively intervening with persons convicted of driving while impaired, including evaluating and treating them for alcohol problems, to prevent future deaths in alcohol-related crashes.

Our ability to characterize alcohol involvement in child passenger deaths was somewhat limited by the lack of complete alcohol testing on drivers involved in fatal crashes. However, the discriminant analysis used in the Fatality Analysis Reporting System to estimate the distribution of blood alcohol concentrations when test results are unavailable consistently estimates blood alcohol distributions within 3 percentage points of the actual distribution.<sup>7</sup> Moreover, restricting this analysis to drivers with known test results did not change the findings of our study.

Our study probably underestimates the actual number of child passenger deaths involving drinking drivers and overestimates restraint use. For the cases in which a child's driver survived, driver alcohol use was probably underreported because alcohol testing is more complete among fatalities.<sup>15</sup> Therefore, the proportion of drinking driver-related child passenger deaths in which a child was in the same vehicle with a

**Figure 2.** Restraint Use Among Child Passenger Fatalities by Child's Age and Blood Alcohol Concentration of Child's Driver, United States, 1985-1996 (N = 18 018)



Does not include 1599 children for whom restraint use was unknown and 151 children for whom driver information was unknown.

drinking driver may be even greater than we report. In addition, the Fatality Analysis Reporting System data we analyzed contains information only on crashes that occur on public roadways; therefore, the system, and consequently our study, do not include data for fatal crashes that occur on private roads or off-road areas. Finally, our estimate of restraint use is based on police crash reports, which have a bias toward overreporting.<sup>16</sup>

The data on nonfatal injuries from the General Estimates System were also subject to limitations. Up to one half of motor vehicle crashes in the United States

are never reported to police; presumably, most of these involve property damage only.<sup>6</sup> However, some crashes that result in injuries, such as single-vehicle crashes involving a drinking driver, are likely to be underreported to police. Furthermore, among crashes that are reported, alcohol involvement is underreported by police.<sup>15</sup> Therefore, our data on nonfatal injuries probably underestimate both the total number of child passenger injuries and the number that are alcohol related. As for fatalities, restraint use information for nonfatal injuries is from police crash reports, which tend to overestimate restraint use.<sup>16</sup>

We recommend a combination of aggressive interventions to prevent alcohol-impaired driving. Effective general policies include administrative license suspension<sup>17</sup> and mandatory substance abuse assessment and treatment for driving-under-the-influence offenders,<sup>18,19</sup> lowering the legal blood alcohol limit to 17.4 mmol/L (80 mg/dL) or lower for adults,<sup>20,21</sup> and zero tolerance for alcohol use by drivers younger than 21 years.<sup>22</sup> However, while these interventions have been shown to be effective in reducing alcohol-impaired driving in the general driving population, it is pos-

sible they are somewhat less effective in preventing this behavior among drinking drivers who transport children.

Strategies to specifically deter individuals from drinking and driving with children in the vehicle might include lower legal blood alcohol limits for drivers transporting children and child endangerment laws. There are 2 types of child endangerment laws. Currently, 27 states have statutes that create special sanctions for cases of driving under the influence in which the convicted driver was transporting a child at the time of the offense. Two additional states have applied child abuse or neglect statutes in such situations.<sup>23</sup> These strategies should be evaluated for their effectiveness in reducing drinking driver-related deaths and injuries. If effective, other states should consider adopting such laws. In addition, we encourage families to adopt a personal policy of zero alcohol tolerance when transporting children to decrease their risk of a fatal crash and serve as positive role models for their children. Furthermore, we recommend that health care providers in various settings (eg, outpatient clinics and emergency departments) screen adult patients for alcohol problems and provide them with brief interventions, refer them for special-

ized treatment, or both depending on the severity of the drinking problem.<sup>24,25</sup> Health providers treating adults can also include information on the risk to child passengers when counseling their patients about the risk of driving while impaired. We also encourage health providers treating children to include advice against drinking and driving in discussions of caregiver behaviors that affect a child's injury risk (eg, proper car seat use).<sup>27</sup> Finally, to increase restraint use among child passengers, we recommend stricter enforcement of child safety seat laws (which currently exist in all 50 states) and the passage of primary seat belt laws that cover all children in all seating positions in the vehicle. Through these legal, medical, and educational interventions, we can further reduce the unacceptable risks of child passenger injury and death associated with alcohol-impaired drivers.

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