Younger Drivers and Sport Utility Vehicles
John Kindelberger and Ana María Eigen*

In the years 1992 through 2001, 986 sport utility vehicle (SUV) drivers of ages 16 through 19 years were fatally injured in U.S. rollover crashes – 128 in the year 2001, the most recent year for which complete data exist in the Fatality Analysis Reporting System (FARS). In these same years, 1,345 SUV drivers of ages 20-24 sustained fatal injuries in rollovers; of these, 326 occurred in the year 2001. Serious injuries were sustained in SUV rollovers by an estimated 16,000 drivers of ages 16-24 in the years 1992-2001, as estimated by the National Automotive Sampling System’s General Estimates System (GES).

To address the concerns raised, this note addresses the following topics:
- Younger drivers in SUV crashes
- Relative risk of rollover among differing age groups
- Rollovers in aging SUVs
- Groups at high risk

For this note, drivers of ages 16 through 24 are classified as younger drivers.

**Background**

Based on weighted estimates extracted from the GES, about 114 million drivers at least 16 years old were involved in police-reported crashes over the period 1992 through 2001. About 2.5 million of these crashed vehicles experienced a rollover, of which an estimated 1.6 million resulted in fatal or non-fatal injuries to either drivers or passengers. About 20 percent of these vehicles were SUVs. Among all rollovers, about 40 percent occurred with a younger driver at the wheel, and about 36 percent of these younger drivers were in SUVs.

As SUVs have grown in popularity, numbers of crashes involving SUVs have grown as well. Younger drivers have traditionally been involved in about 25 percent of SUV crashes (Table 1).

**Definitions and Constraints**

The GES is a nationally representative weighted sample of police reported motor vehicle crashes of all types, from minor to fatal. This note’s analyses were conducted on GES cases from 1992 through 2001 involving drivers 16 years old in passenger cars, SUVs and non-SUV light trucks. SUV status was assigned to GES classified compact utility vehicles, large utility vehicles, and utility station wagons. For this note “non-SUV” light trucks include vans, minivans, and pickups. Excluded are buses, motorcycles, snowmobiles, motor homes, construction equipment, all-terrain vehicles, farm equipment, large limousines, or medium to heavy trucks. The GES body type variable categories have not changed since 1992, so the years analyzed do not differ in that respect.

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*Source: R.L. Polk Co.
The data were segmented for analysis into the following variables:
- Driver age: Younger (16-24)/ older (25+)
- Vehicle type: SUV/non-SUV
- Vehicle crash type: Rollover/ non-rollover
- Vehicle age in years: Derived from model year (MY) and crash date
- Vehicle age category: Less than 5 years/5 years or more
- Model year category: 1997 or earlier/1998 or later

Driver gender was used as it appears in the GES. The question of chassis was not addressed and SUVs were examined in total because of the body type limitations in the GES.

To test the significance of relative risks and odds ratios under the GES sample design, the SUDAAN (SUrvey DAta ANalysis Software for Statistical Analysis of Correlated Data) software package was utilized.

Analyses

Rollover Injuries

In the GES data, given that a police-reported crash has occurred where a passenger car or light truck has rolled over, the likelihood of at least one occupant in the rollover vehicle suffering injury at any level\(^2\) is about 63 percent. This proportion was not found to differ significantly across age groups. The analogous risk for incapacitating or fatal injury\(^2\), again across driver age groups, is about 18 percent. Since injury probabilities were found to be similar across groups once a rollover has occurred, the rollover analyses of this note are conducted with the event of interest being any rollover — regardless of resulting injury level - to take advantage of the larger sample size.

SUV Rollovers

In the weighted GES data from 1992 through 2001, given that a vehicle is involved in a police-reported crash, the estimated incidence of rollover (injury or not) for SUVs was a statistically significant 5.19 percent. This rate translates to an estimated 359,000 SUV rollovers in the 10-year period. (Statistical significance in this note refers to a 95 percent confidence level.)

The comparable rate for non-SUVs was 2.00 percent. Thus, in the universe of GES-eligible police-reported crashes, the estimated risk of rollover for SUV drivers relative to that of non-SUV drivers is 5.19/2.00=2.59, or more than two and one half times as high. This number is called the “relative risk” and is statistically significant in this result. All age groups were more likely to roll over in an SUV than in a non-SUV, as summarized in Table 2.

Table 2

Rollover Percentages and Relative Risks

By Vehicle Type and Driver Age Group
Among Police Reported Crashes 1992-2001

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Driver Age Group</th>
<th>Relative Risk of Rollover, Younger vs. Older Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUV</td>
<td>16-24</td>
<td>5.19</td>
</tr>
<tr>
<td></td>
<td>25 and up</td>
<td>3.14</td>
</tr>
<tr>
<td>Non-SUV</td>
<td>16-24</td>
<td>4.42</td>
</tr>
<tr>
<td></td>
<td>25 and up</td>
<td>1.55</td>
</tr>
</tbody>
</table>


Note that the relative risk does not depend on the relative proportions of SUV to non-SUV in the crash population, but rather on the proportions of rollovers in crashes within each vehicle type.

**Driver Age**

The highest individual rollover risk in Table 2 is that of drivers of ages 16-24 in SUVs, who experienced rollovers in 7.43 percent of their crashes. The comparable percentage of older drivers was 4.4 percent, so the relative risk is 7.4/4.4 = 1.68, denoting a 68 percent higher risk for younger drivers. The difference is not limited to SUVs among passenger cars and non-SUV light trucks, the GES data indicate that younger drivers are twice as likely to roll over in a crash than older drivers (Table 3).

Table 3

Rollover Percentages and Relative Risks

By Vehicle Type and Driver Age Group
Among Police Reported Crashes 1992-2001

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Driver Age Group</th>
<th>Relative Risk of Rollover, Younger vs. Older Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUV</td>
<td>16-24</td>
<td>7.43</td>
</tr>
<tr>
<td></td>
<td>25 and up</td>
<td>4.42</td>
</tr>
<tr>
<td>Non-SUV</td>
<td>16-24</td>
<td>3.14</td>
</tr>
<tr>
<td></td>
<td>25 and up</td>
<td>1.55</td>
</tr>
</tbody>
</table>


**Gender**

About 65 percent of younger drivers and 58 percent of older drivers in SUV crashes were male. Among younger SUV drivers, male drivers were found to be 23 percent more likely to roll over in a crash than female drivers. The gender difference for older drivers was not statistically significant (Table 4).

Table 4

Rollover Percentages and Relative Risks

By Driver Age Group and Driver Gender
Among Police Reported Crashes 1992-2001

<table>
<thead>
<tr>
<th>Driver Age Group</th>
<th>Driver Gender</th>
<th>Relative Risk of Rollover, Male vs. Female Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-24</td>
<td>Male</td>
<td>7.94</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>6.46</td>
</tr>
<tr>
<td>25 and up</td>
<td>Male</td>
<td>4.66</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>4.10</td>
</tr>
</tbody>
</table>


The gender difference is also seen in non-SUVs, where males across age groups were about 50 percent more likely to rollover in a crash.

**Rollovers in Aging SUVs**

To examine the possible consequence of older used SUVs becoming affordable for a new batch of (possibly...
were included to allow a vehicle age-in-years effect to be seen in the recent past. The apparent vehicle age effect raises issues that are inherent to handling vehicles. For example, within a GES qualified case, braking failures may exist with evidence remaining at the crash site, however, no recording mechanism exists to capture these data. Further, the state of tire repair may be masked by the events of the crash as in the case of tread separation. Engine or transmission malfunction, although speculative, also impair driving operations.

Although the model year variable was not significant in the GES analysis, further research may be called for as
data accumulate. SUVs have undergone design changes over the period of this study, including but not limited to: suspension, steering, and changing tire requirements. The first generation of SUVs operated like their heavier truck counterparts. Steering inputs require great precision and penalty exists for exaggerated movements. SUVs do not benefit from the recovery characteristics inherent to passenger cars. In concert with the suspension changes are variation in the tires used for the SUV. In earlier SUVs, light truck tires enhanced the handling discrepancies with the passenger car. In the second generation of SUVs, however, passenger car tires have become more pervasive.

When considering the effect of young drivers versus older drivers, it may be noted that inexperience likely acts to increase the risk of rollover crashes, but the effect of older vehicles complicates this issue. It may be useful to examine younger drivers operating older vehicles with regard to inexperience with SUV handling and mechanical difficulties. The disaggregating of these two conditions becomes very complicated with existing data. Within the data sets, it is possible to identify the model year of the vehicle and calculate the years it has been in service at the date of the crash, but the vehicle condition prior to the crash due to waning maintenance may be unknown and no clear method exists for uniform tracking.

**Limitations**

The risk and odds estimates in this analysis used only data from the GES, a weighted sample of all US police-reported crashes. This study was restricted to more general characteristics and does not address behavior-based variables such as alcohol, speeding, and safety belt usage. Further research is needed to explore the relationship between behavior-based variables and SUV rollover crashes among younger drivers.

**Conclusions**

Analysis of GES data for the years 1992 through 2001 produced certain significant findings regarding drivers in SUV rollovers:

- As a group, drivers of ages 16-24 in crashes have been significantly more likely to roll over than drivers over age 24.
- Among younger drivers of SUVs that crashed, males have been more likely to roll over than females. The gender difference for older SUV drivers was negligible.
- In both younger and older drivers, older SUVs in crashes have been more likely to roll over than newer SUVs.
- Effects on rollover of driver age, driver gender, and vehicle age are not limited to SUVs, but the higher risk of rollover in an SUV crash adds to the overall risk where the other variables are involved.

NHTSA plans to continue research into the subject of this note. Potential areas of further inquiry include behavior-based variables in different age groups and vehicle types, the aging effect in various vehicle types, and application of exposure data from appropriate databases. NHTSA will continue to provide information on younger drivers, SUVs, rollovers and similar issues as data become available and new research is conducted.

For additional copies of this research note, please call 1-800-934-8517 or fax your request to 202-366-3189. For questions regarding the data reported in this research, contact John Kindelberger (202-366-3365) or Ana María Eigen (202-366-2903). This research note and other general information on highway traffic safety may be accessed by internet users at: http://www-nrd.nhtsa.dot.gov/departments/nrd-30/nhsa/AvailInf.html