Are older drivers actually at higher risk of involvement in collisions resulting in deaths or non-fatal injuries among their passengers and other road users?

E R Braver, R E Trempe

Objective: With more older drivers on the road, public concern has been expressed about their impact on traffic safety. This study revisited the question of driver age in relation to the risks of older drivers and others sharing the road with them, including pedestrians, passengers in the same vehicle, and occupants of other vehicles.

Methods: Using United States federal data on fatal and non-fatal crashes, injury rates per driver were calculated for different types of road users. In addition, using data supplied by nine insurers, insurance claims per insured vehicle year were examined by driver age. The reference drivers were aged 30–59.

Results: For fatal crashes, older drivers’ major impact on road users other than themselves was an increase in death rates among their passengers, who also tended to be elderly and thus more vulnerable to injuries.

Conclusions: These findings suggest that the oldest drivers, a group with low average annual mileage, do pose some increased risks to occupants of other vehicles, and pose the most serious risks to themselves and their passengers.
vehicles colliding with them in two-vehicle crashes, and non-
occupants in one-automobile crashes, including pedestrians,
bicyclists, and motorcyclists.

Drivers
Active drivers by driver age, with the exception of ages 30–34,
were estimated using the 1995 Nationwide Personal
Transportation Survey (NPTS). NPTS data from telephone
interviews of a national sample of United States residents
(97 881 persons in 1995) were used because standard federal
licensure data include drivers dying before scheduled license
renewals and license holders who no longer drive. Thus,
standard data overstate the number of older persons who
drive, which results in underestimates of crash rates. For ages
30–34, standard federal data were used because the NPTS
estimate for this age group was 11.5% higher—about the
same as the census estimate. Compared with federal
licensure statistics, NPTS estimated about 29% fewer drivers
aged 80 and older, which likely is more accurate than
standard data. For other age groups, the two databases
yielded similar estimates of drivers.

To estimate active drivers during 1993–97, NPTS 1995
driver estimates were multiplied by five. This procedure
appeared reasonable because licensed drivers among the
different age groups increased linearly during 1993–97; also,
the licensed driver counts for 1993–97 resembled the 1995
NPTS counts multiplied by five, except for ages 80+ and
30–34.

Deaths
The Fatality Analysis Reporting System (FARS), the informa-
tion source for motor vehicle related deaths during 1993–97,
is a census of fatal crashes in the United States occurring on
public roads in which a death takes place within 30 days of
the crash.

Non-fatal injuries
The General Estimates System (GES), the information
source for non-fatal motor vehicle injuries during 1993–97,
is a national sample of police reported crashes. The 55 000
annual crashes in the GES are weighted according to their
probability of selection so as to provide national crash
estimates. The GES translates police judgments of injury
severity to the Kabaco scale (K = killed, A = incapaciting
injury, B = visible but non-incapacitating injury, C =
complaint of pain, O = no injury). This study analyzed both
A and B injuries.

Insurance claims
Insurance databases provide a comprehensive picture of the
most common types of crashes because police are not notified
of many crashes reported to insurers, and police reported
crashes are more likely to involve severe injury. Also, data on
driver fault are more directly addressed than for involve-
ments in police reported crashes. Another advantage of using
insurance data was that the claims experience for ages 75–79,
80–84, and 85 and older could be computed separately rather
than combining them in a single age category because, unlike
FARS, GES, and NPTS, there were sufficient numbers of
insured drivers in these groups to permit stable claim rate
estimates.

Insurance claims by driver age—primarily non-fatal
crashes—were supplied by nine insurers for vehicles three
years old or newer: model years 1999–2001 during calendar
years 1998–2001. The actual ages of drivers in crashes
resulting in insurance claims were unknown; rather, the
ages of drivers listed for those vehicles in insurance records—
referred to as rated drivers—were analyzed. The rated driver
usually is the main driver for that vehicle, but some insurers
assign the highest risk driver in a household to its most
valuable vehicle. This may have led to some misclassification
of crashes by driver age, but likely had little effect on older
drivers, who usually share a household only with other older
people.

For injury claims, this study included only those made for
medical expenses under bodily injury liability policies. Bodily
injury liability claims are made by persons injured by a driver
deemed at fault and typically are occupants of other
passenger vehicles or non-occupants struck by the insured
vehicle. Bodily injury liability claims, which are the strongest
indicator of responsibility for other road users’ injuries, were
studied in all states and the District of Columbia.

Property damage liability claims, which cover property
damage to other vehicles caused by insured drivers, also were
analyzed in all 50 states and the District of Columbia.
Property damage liability claims, which are filed more often
than injury claims, are not necessarily associated with
injuries, but are another indicator of the crash patterns of
drivers in different age groups.

Analytic methods
The magnitude of the public health problem of motor vehicle
injuries by driver age is shown by absolute numbers of
vehicle related deaths and non-fatal injuries. Risks per driver
or per insured vehicle are another measure of impact on the
population exposed to vehicle travel.

Rate ratios (RR) and their 95% confidence intervals (CI)
were calculated to quantify differences among driver age
groups with regard to deaths per driver, persons with non-
fatal injuries (incapacitating and visible non-incapacitating)
per driver, and claims per insured vehicle year. Ages 30–59
were used as a reference group to facilitate comparisons
among younger, older, and middle range drivers. Analyses
were done using SAS, Microsoft Excel, and SUDAAN.

RESULTS
Deaths
Young drivers
Table 1 presents deaths during 1993–97 and NPTS estimates
of active drivers by driver age. The greatest numbers of deaths
arose from collisions involving teenage drivers and drivers
aged 20–29. Per driver younger than 30—especially those
under 25—raised RRs of death were observed among all road
user types compared with drivers aged 30–59. Deaths among
non-occupants and other vehicle occupants frequently
occurred in collisions with younger drivers. A striking finding
was a RR of 5.79 (95% CI 5.50 to 6.09) for passenger deaths in
vehicles of teenage drivers. Passenger deaths per driver also
were significantly raised among drivers in their 20s.

Older drivers
Among drivers 75 and older, significantly raised RRs were
observed only for driver deaths (RR 3.02; 95% CI 2.86 to 3.19)
and passenger deaths (RR 2.52; 95% CI 2.39 to 2.66) relative
to ages 30–59 (table 1; fig 1). Smaller elevations were
observed among drivers aged 70–74 (RR for driver deaths
1.33; RR for passenger deaths 1.31). The absolute number of
passenger deaths associated with the oldest drivers was far
lower than passenger deaths for young drivers.

Most passengers of older drivers were elderly. In both
police reported towaway and fatal crashes during 1993–97,
about 75% of passengers transported by drivers aged 75 and
older were 70 and older.

Among drivers aged 60–74, risks of death among occupants
of other passenger vehicles and non-occupants were sig-
nificantly lower compared with ages 30–59. When drivers
reached age 75, there was an upturn in fatality risk among
these types of road users, but their RRs relative to 30–59 year old drivers remained below 1.0.

Two thirds of the deaths in crashes involving drivers 75 and older were the drivers themselves. Drivers younger than 60 comprised fewer than 50% of motor vehicle deaths in their collisions.

### Non-fatal injuries

#### General Estimates System

Persons with non-fatal injuries described by police as incapacitating or visible but non-incapacitating were studied. RRs for the two injury severities were similar so they were combined (table 2; fig 2).

#### Young drivers

Younger drivers had much higher involvement rates in crashes resulting in non-fatal injuries to themselves than 30–59 year old drivers. As was true for fatalities, teenage drivers posed a greater risk of non-fatal injury to their passengers, non-occupants, and occupants in other vehicles than drivers in any other age group. The fatal and non-fatal injury rates per driver of passengers of teenage drivers both were more than five times as high as those of 30–59 year old drivers. For both fatal and non-fatal crashes, drivers in their 20s had lower risks than teenage drivers but their risks still were raised.

#### Older drivers

The pattern for non-fatal injuries was for drivers aged 60–74 to have RRs for injuries well below 1.0 compared with ages 30–59, but for drivers 75 and older to have modest upturns in risk that were not as high as those of 30–59 year old drivers. For both fatal and non-fatal crashes, drivers in their 20s had lower risks than teenage drivers but their risks still were raised.

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**Figure 1** Deaths per 100 000 drivers by driver age and person type, 1993–97 FARS and 1995 NPTS.

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**Table 1** Deaths, rate ratios (RR) for deaths per driver, 1993–97 FARS and 1995 NPTS.

<table>
<thead>
<tr>
<th>Driver age groups</th>
<th>No of passenger vehicle drivers</th>
<th>Drivers of passenger vehicles</th>
<th>Passengers in same vehicle as driver</th>
<th>Occupants in other passenger vehicles: two-vehicle crashes</th>
<th>Non-occupants: one-auto crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>16–19</td>
<td>49089550</td>
<td>3312</td>
<td>2.70</td>
<td>2.57 (2.34, 2.81)</td>
<td>117860950</td>
</tr>
<tr>
<td>20–24</td>
<td>70882300</td>
<td>4335</td>
<td>2.20</td>
<td>2.20 (2.02, 2.40)</td>
<td>142230600</td>
</tr>
<tr>
<td>25–29</td>
<td>88576550</td>
<td>5828</td>
<td>1.43</td>
<td>1.37 (1.26, 1.49)</td>
<td>112810800</td>
</tr>
<tr>
<td>30–34</td>
<td>101418615</td>
<td>7062</td>
<td>1.43</td>
<td>1.37 (1.26, 1.49)</td>
<td>93510600</td>
</tr>
<tr>
<td>35–39</td>
<td>95654450</td>
<td>6837</td>
<td>1.43</td>
<td>1.37 (1.26, 1.49)</td>
<td>593510600</td>
</tr>
<tr>
<td>40–44</td>
<td>95654450</td>
<td>6837</td>
<td>1.43</td>
<td>1.37 (1.26, 1.49)</td>
<td>593510600</td>
</tr>
<tr>
<td>45–49</td>
<td>95654450</td>
<td>6837</td>
<td>1.43</td>
<td>1.37 (1.26, 1.49)</td>
<td>593510600</td>
</tr>
<tr>
<td>50–54</td>
<td>83390550</td>
<td>6598</td>
<td>1.43</td>
<td>1.37 (1.26, 1.49)</td>
<td>593510600</td>
</tr>
<tr>
<td>55–59</td>
<td>63691900</td>
<td>5691</td>
<td>1.43</td>
<td>1.37 (1.26, 1.49)</td>
<td>593510600</td>
</tr>
<tr>
<td>60–64</td>
<td>44153350</td>
<td>4354</td>
<td>1.43</td>
<td>1.37 (1.26, 1.49)</td>
<td>593510600</td>
</tr>
<tr>
<td>65–69</td>
<td>38507600</td>
<td>3738</td>
<td>1.43</td>
<td>1.37 (1.26, 1.49)</td>
<td>593510600</td>
</tr>
<tr>
<td>70–74</td>
<td>32640400</td>
<td>3102</td>
<td>1.43</td>
<td>1.37 (1.26, 1.49)</td>
<td>593510600</td>
</tr>
</tbody>
</table>

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FARS (1993–97), weighted. RRs were calculated by five to estimate numbers of active drivers during 1993–97 for all age groups except ages 30–34, for whom 1995 Federal Highway Administration licensure data were used.

Non-occupants include pedestrians, bicyclists, and motorcyclists.

Reference group is ages 30–59 combined.

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Compared with ages 60–74, the increase was statistically significant.

Insurance claims
Table 3 shows distributions of bodily injury liability claims (primarily non-fatal injuries), property damage liability claims, and insured vehicle-years by driver age, together with RRs and confidence intervals. Figure 3 depicts claims per 1000 insured vehicle-years.

Young drivers
Teenage drivers had the highest bodily injury liability frequencies per insured vehicle-year (RR 3.32; 95% CI 3.26 to 3.38). Drivers aged 20–24 had twice the bodily injury liability claim rate as drivers aged 30–59 (RR 2.0; 95% CI 1.97 to 2.03) and drivers 25–29 had a smaller elevation in bodily injury liability claim rates. Property damage liability claim rates per insured vehicle-year also were raised among drivers younger than 30, with risks more than doubling among drivers aged 16–19 (RR 2.13; 95% CI 2.11 to 2.15).

Older drivers
As with crashes leading to fatal and non-fatal injuries, older drivers in their 60s had significantly lower bodily injury liability claim frequencies per insured vehicle-year compared with ages 30–59, with RRs of about 0.80. At age 70, bodily injury liability claim rates and RRs started to increase, with higher rates for each successive five year age group. The bodily injury liability claim rate was 1.8 times as high for drivers 85 and older as for drivers 30–59 (95% CI 1.71 to 1.89), albeit lower than that for teenage drivers. Property damage liability claims per insured vehicle-year among the oldest drivers (aged 85+) were as high as among teenage drivers (RR 2.09 for drivers 85+; 95% CI 2.05 to 2.13).

DISCUSSION
Public concern exists about potential hazards from the aging driver population. Older people suffered the most serious consequences of crashes involving older drivers, consistent with other research. Significant increases in fatalities per driver did not begin until ages 70–74, and the most likely victims were the older drivers followed by their passengers, who also were older and thus more fragile. Throughout the...
Older drivers and other road users

Table 3  Insurance claims,* rate ratios (RR) for claims per insured vehicle-year, and 95% confidence intervals (CI) by driver age and type of claim, model years 1999–2001.

<table>
<thead>
<tr>
<th>Driver age groups†</th>
<th>Insured vehicle-years</th>
<th>Claims</th>
<th>RR</th>
<th>95% CI</th>
<th>Insured vehicle-years</th>
<th>Claims</th>
<th>RR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>16–19</td>
<td>602994</td>
<td>15358</td>
<td>3.22</td>
<td>3.26 to 3.38</td>
<td>744666</td>
<td>54886</td>
<td>2.13</td>
<td>2.11 to 2.15</td>
</tr>
<tr>
<td>20–24</td>
<td>1917585</td>
<td>29428</td>
<td>2.00</td>
<td>1.97 to 2.03</td>
<td>2403555</td>
<td>135489</td>
<td>1.64</td>
<td>1.63 to 1.65</td>
</tr>
<tr>
<td>25–29</td>
<td>2606488</td>
<td>25346</td>
<td>1.27</td>
<td>1.25 to 1.29</td>
<td>3338590</td>
<td>135356</td>
<td>1.18</td>
<td>1.17 to 1.19</td>
</tr>
<tr>
<td>30–39†</td>
<td>16716602</td>
<td>128185</td>
<td>1.02</td>
<td></td>
<td>2164388</td>
<td>745969</td>
<td>1.07</td>
<td></td>
</tr>
<tr>
<td>40–44</td>
<td>1479610</td>
<td>9084</td>
<td>0.80</td>
<td>0.78 to 0.82</td>
<td>1845684</td>
<td>56425</td>
<td>0.89</td>
<td>0.88 to 0.90</td>
</tr>
<tr>
<td>45–49</td>
<td>1146822</td>
<td>7205</td>
<td>0.82</td>
<td>0.80 to 0.84</td>
<td>1416686</td>
<td>44898</td>
<td>0.91</td>
<td>0.91 to 0.93</td>
</tr>
<tr>
<td>50–54</td>
<td>911061</td>
<td>6788</td>
<td>0.97</td>
<td>0.95 to 0.99</td>
<td>1103764</td>
<td>40290</td>
<td>1.06</td>
<td>1.05 to 1.07</td>
</tr>
<tr>
<td>55–64</td>
<td>684005</td>
<td>5938</td>
<td>1.20</td>
<td>1.17 to 1.23</td>
<td>751288</td>
<td>34080</td>
<td>1.30</td>
<td>1.29 to 1.31</td>
</tr>
<tr>
<td>60–69</td>
<td>317667</td>
<td>3519</td>
<td>1.44</td>
<td>1.39 to 1.49</td>
<td>362798</td>
<td>20483</td>
<td>1.64</td>
<td>1.62 to 1.66</td>
</tr>
<tr>
<td>70–74</td>
<td>109891</td>
<td>1515</td>
<td>1.80</td>
<td>1.71 to 1.89</td>
<td>124304</td>
<td>8964</td>
<td>2.05</td>
<td>2.02 to 2.13</td>
</tr>
</tbody>
</table>

†Rated drivers.
‡Reference group.

older ages, there were low rates of crashes fatal to other road users, including other vehicle occupants, after declining greatly from high levels per driver among teenagers and 20–29 year olds.

Analyses of non-fatal injuries and insurance claims showed that other road users did experience some of the injury burden and property losses associated with older drivers. This study differed from past studies, which observed increased risk to other road users per mile, but generally not increased risks per driver.20–22 Although older drivers did not pose an excess risk of non-fatal injury to passengers of their vehicles or to non-occupants, risks to occupants of other passenger vehicles (and to the drivers themselves) did increase when drivers reached age 75. The effect of older drivers’ crashes on other road users was most evident for teenage drivers. Relative to ages 30–59, bodily injury liability claims, property damage liability claims, and non-fatal injuries, but not fatal injuries, to occupants of other passenger vehicles is unknown. The travel patterns of older drivers, who travel less at night and more on roads with speed limits below 55 mph, may reduce fatality risk.31

One important point when interpreting the current study is that injuries described as incapacitating or visible non-incapacitating by police typically are minor.32 A limitation of insurance databases is that they are confined to newer vehicles (1–3 years old), which might have higher annual mileage and healthier older drivers with more resources than is typical. Another limitation is that confounding factors such as travel speeds and alcohol impairment could not be studied.

Screening to identify older drivers at very high risk of crashing might protect both older drivers and other road users, but consensus has not been reached on feasible and

 risks declined among drivers in their 20s, but were significantly greater compared with 30–59 year olds.

Why older drivers were associated with an increased risk of bodily injury liability claims, property damage liability claims, and non-fatal injuries, but not fatal injuries, to occupants of other passenger vehicles is unknown. The travel patterns of older drivers, who travel less at night and more on roads with speed limits below 55 mph, may reduce fatality risk.31

One important point when interpreting the current study is that injuries described as incapacitating or visible non-incapacitating by police typically are minor.32 A limitation of insurance databases is that they are confined to newer vehicles (1–3 years old), which might have higher annual mileage and healthier older drivers with more resources than is typical. Another limitation is that confounding factors such as travel speeds and alcohol impairment could not be studied.

Screening to identify older drivers at very high risk of crashing might protect both older drivers and other road users, but consensus has not been reached on feasible and

Figure 3  Claims per 1000 insured vehicle-years by rated driver age and type of claim, model years 1999–2001.

Key points

- With the exception of deaths among their passengers, many of whom were older than 70 and thus more fragile, older drivers were not overinvolved in crashes in which other road users were killed.
- Drivers aged 75+ appeared at modestly increased risk of involvement in two-vehicle collisions in which occupants of other vehicles received non-fatal injuries.
- Drivers aged 85+ had an 80% increase in bodily injury liability claims per insured vehicle-year relative to 30–59 year-old drivers.
- Drivers in their teens and 20s posed the greatest risk to their passengers and other road users.
- Older drivers experienced the most serious consequences of their collisions: two thirds of the deaths in crashes involving drivers 75 and older were the drivers themselves.
valid methods to detect unsafe drivers and avoid falsely characterizing safe drivers as hazardous.\textsuperscript{17} Research on driver screening should continue, because screening might provide useful information to drivers and physicians when considering whether modifications in driving might be appropriate for individuals. Efforts to enhance the protection afforded to older vehicle occupants, such as improving restraint systems and vehicles, should be vigorously pursued because older people are more susceptible to injury and will continue to travel in vehicles whether or not they are driving.\textsuperscript{17,18}

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