Older Driver Crashes

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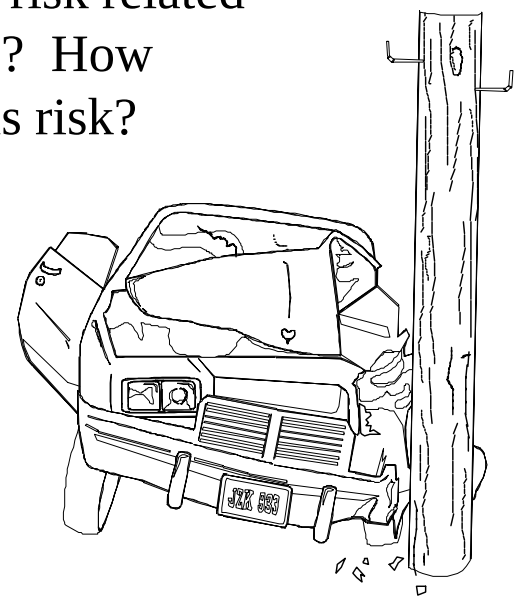
Populations in developed countries are getting older. Demographic data in the United States suggest a rapid growth in persons over age 65 years as the baby boom generation approaches retirement ages.

This phenomena may hold implications regarding injuries. Existing data show that falls and motor vehicle collisions are the two main factors contributing to injuries in the elderly. In this lecture, the issue of motor vehicle collisions is explored in more detail.

"Texas police say 92-year-old Viola Nelson Rizzo took a wrong turn on her way to exchange a pair of shoes and ended up on the tarmac of Houston Gulf Airport, where she crashed into a Piper plane taxiing toward the runway. No one was seriously hurt."

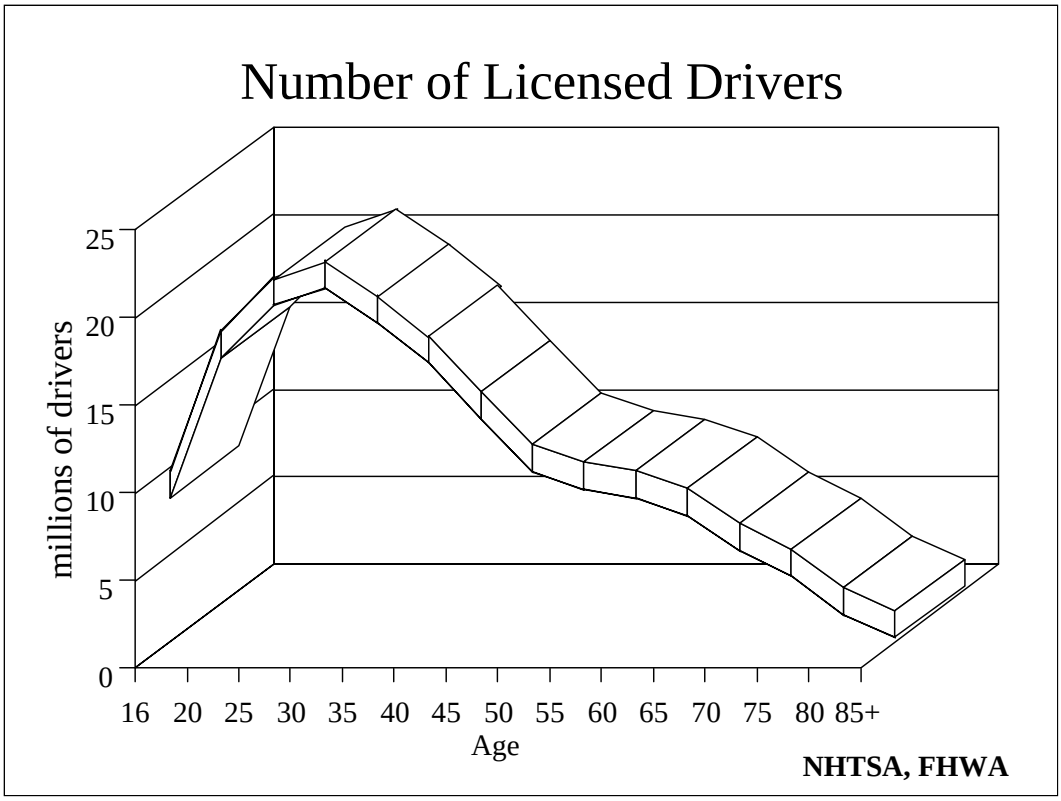
Several stories, such as the one above, exist which detail the quirky driving exploits of the older driver. Typically, the stereotypical driver is one who is driving too slow (or a Buick!).

What is the crash risk related to older drivers? How important is this risk?

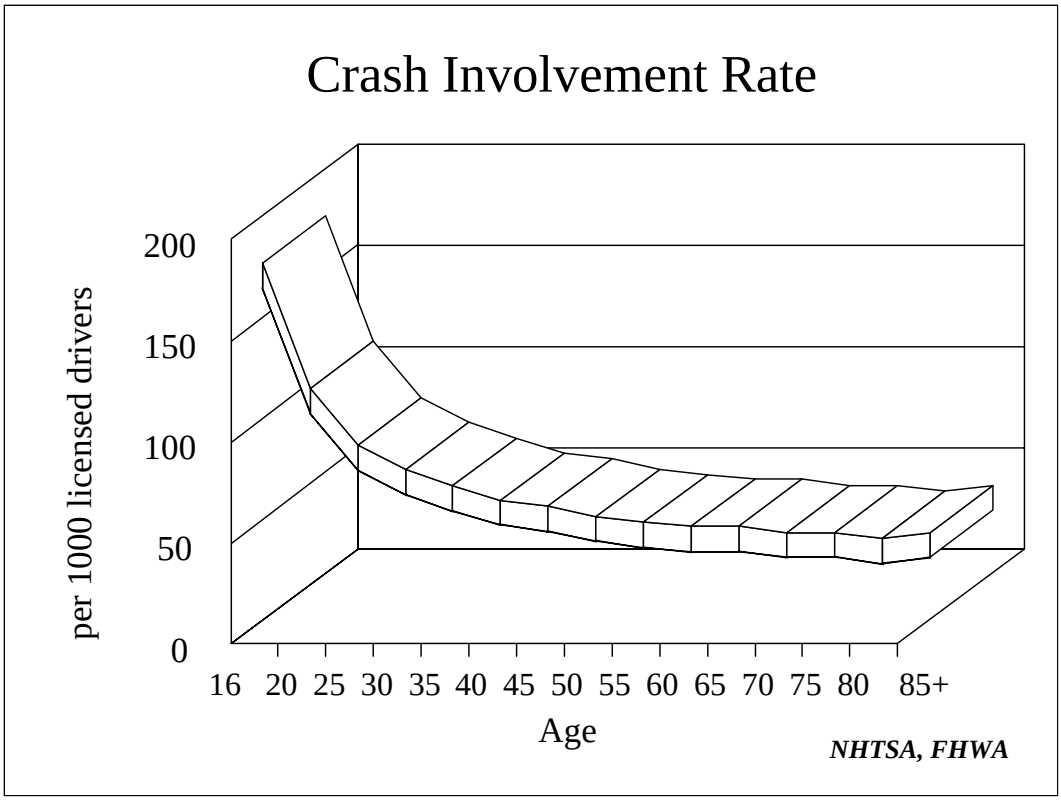


The question arises, though, as to if older drivers represent a problem on the road. How frequently do they crash? How does this risk compare to other age groups?

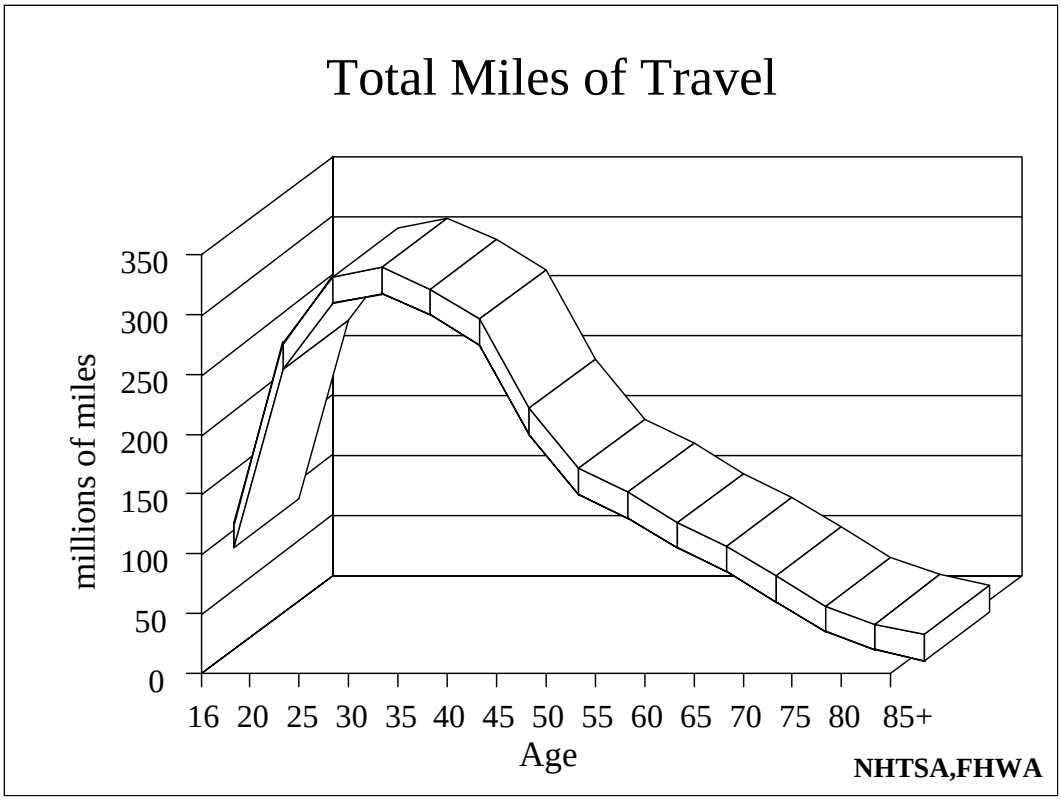
The concern with older drivers is not that they drive slow, but that advancing age is also usually accompanied with changes in motor and sensory abilities. Some individuals also face cognitive changes. Older individuals may also have diminished health, with co-morbid diseases. Do these factors affect driving ability? Are they related to crashes?



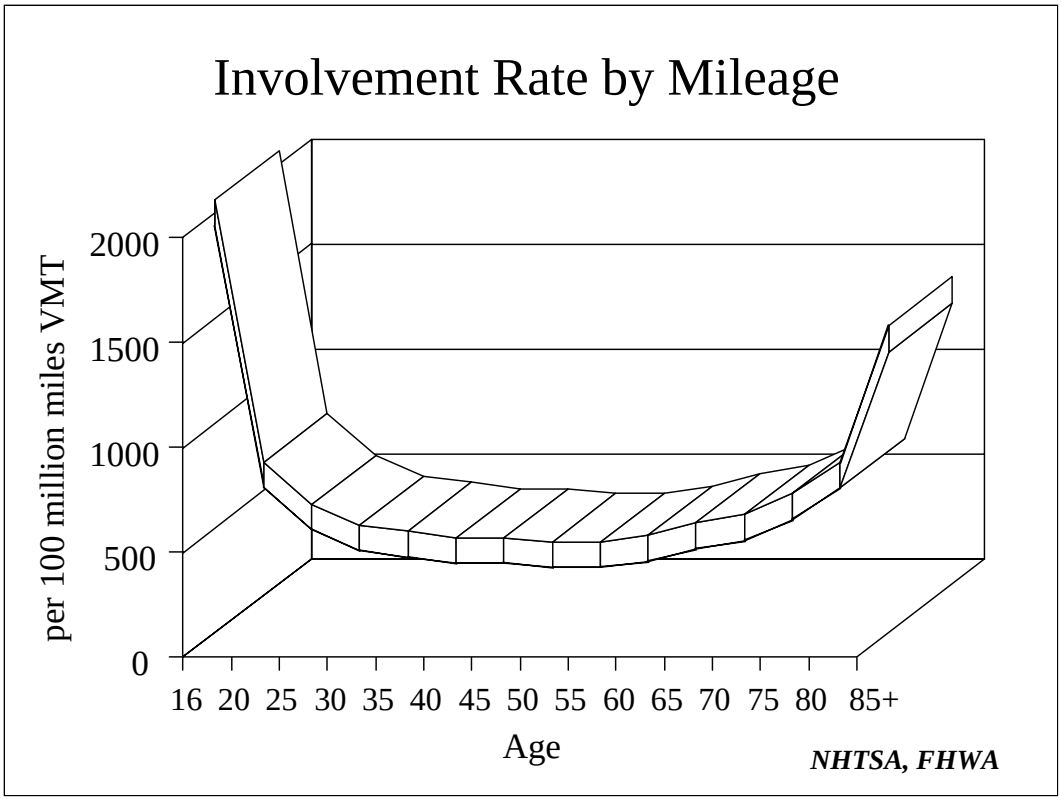
What do we know about the older driver population? In general, there are fewer numbers of older persons licensed to operate motor vehicles than younger persons.



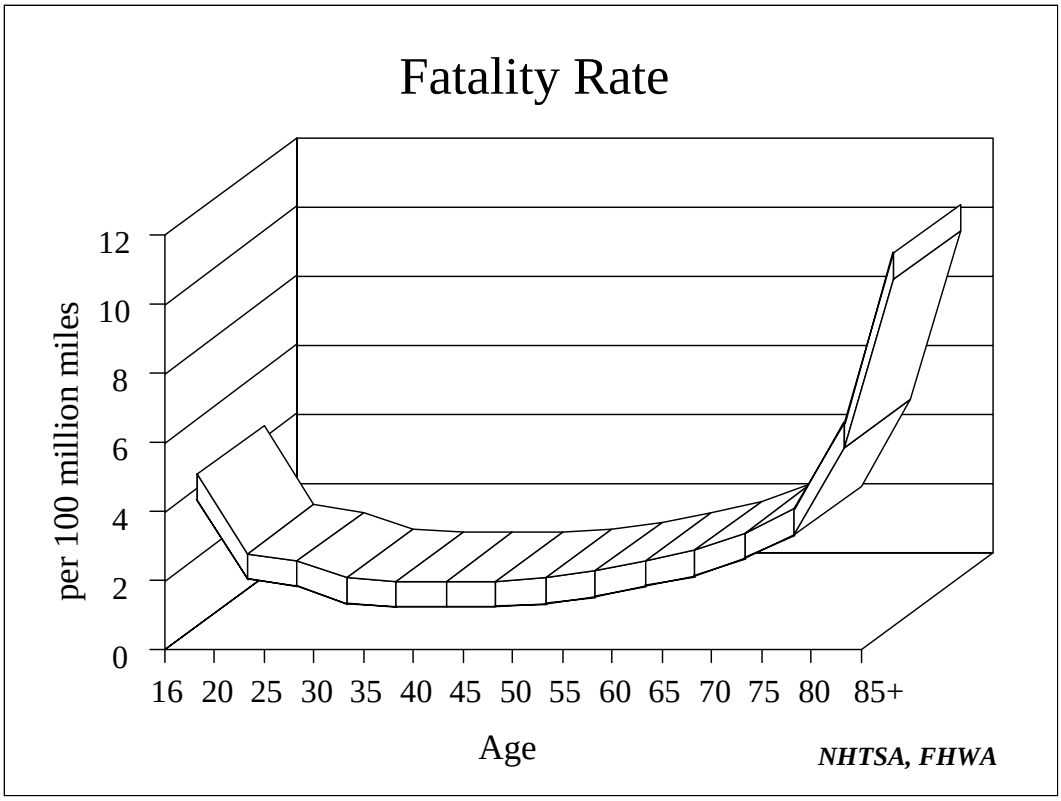
Looking at the number of crashes per 1000 licensed drivers by age suggests that the crash risk of older drivers is substantially less than that of younger drivers.



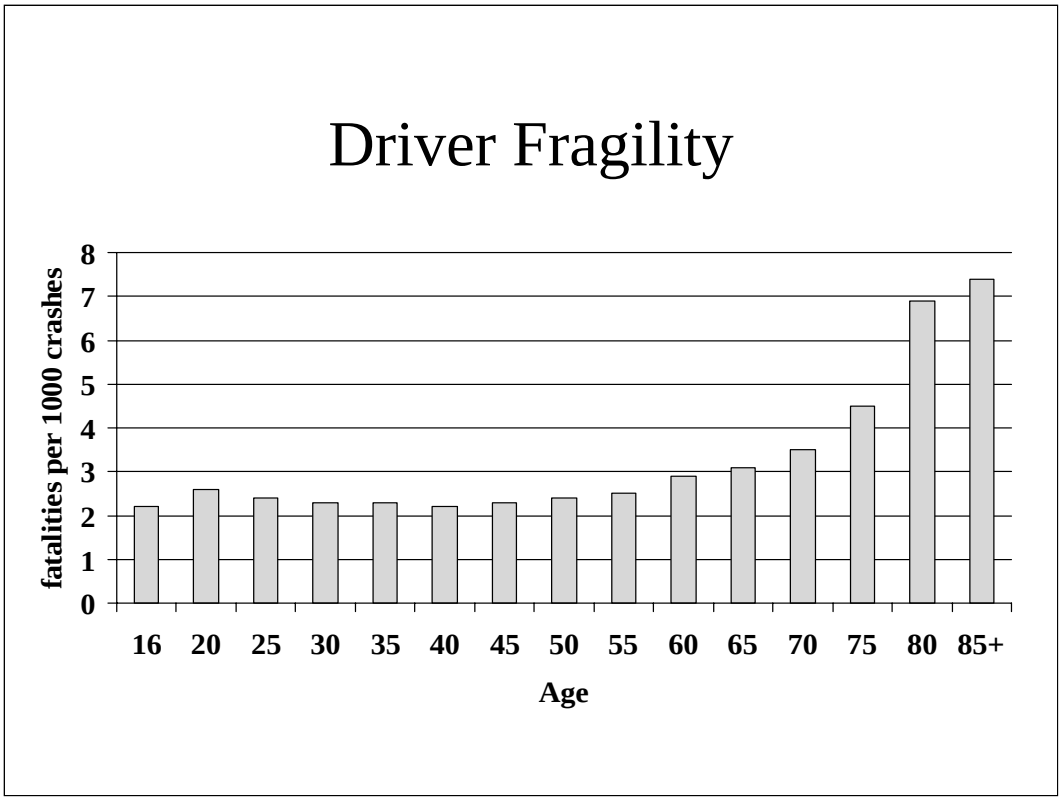
We also know (from surveys of personal transportation conducted by the FHWA) that older persons drive much less frequently than younger persons. Their exposure to road hazards, thus, is lower.



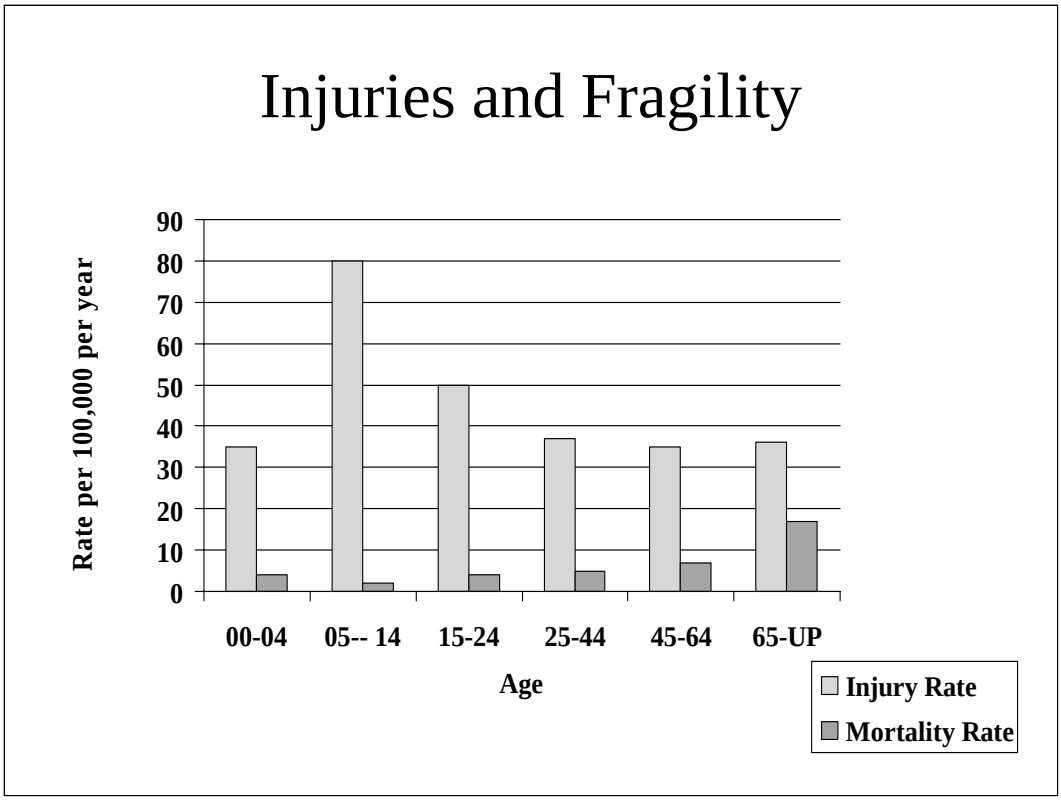
However, if you examine the number of crashes by the distance traveled then the crash risk of older drivers is much different. Second only to the youngest of drivers. (y axis : pers 100 million vehicle miles traveled). While the elderly tend to have less mileage driven than other ages, their crash rate is the second highest of all age groups.



Moreover, if you examine death rates from crashes by distance traveled, the risk level again changes. Older drivers in this scenario have the greatest risk. (y axis : per 100 million miles).



Many investigators have attributed this fatality observation to the greater susceptibility of the older person to injury. Thresholds to withstand energy transfer is different in older individuals than in younger individuals. With all other factors being equal, the older person has a higher chance of being injured in a crash than a younger person.

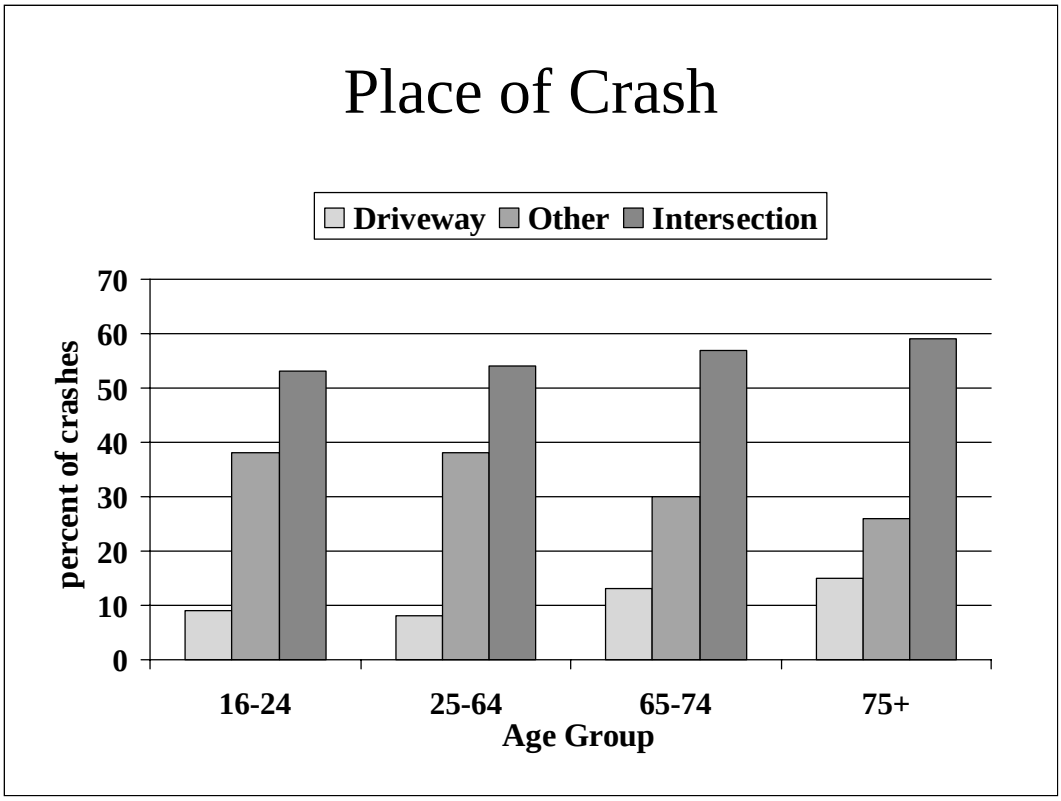


While the young have the highest injury rates, the old have the highest fatality rates from injury.

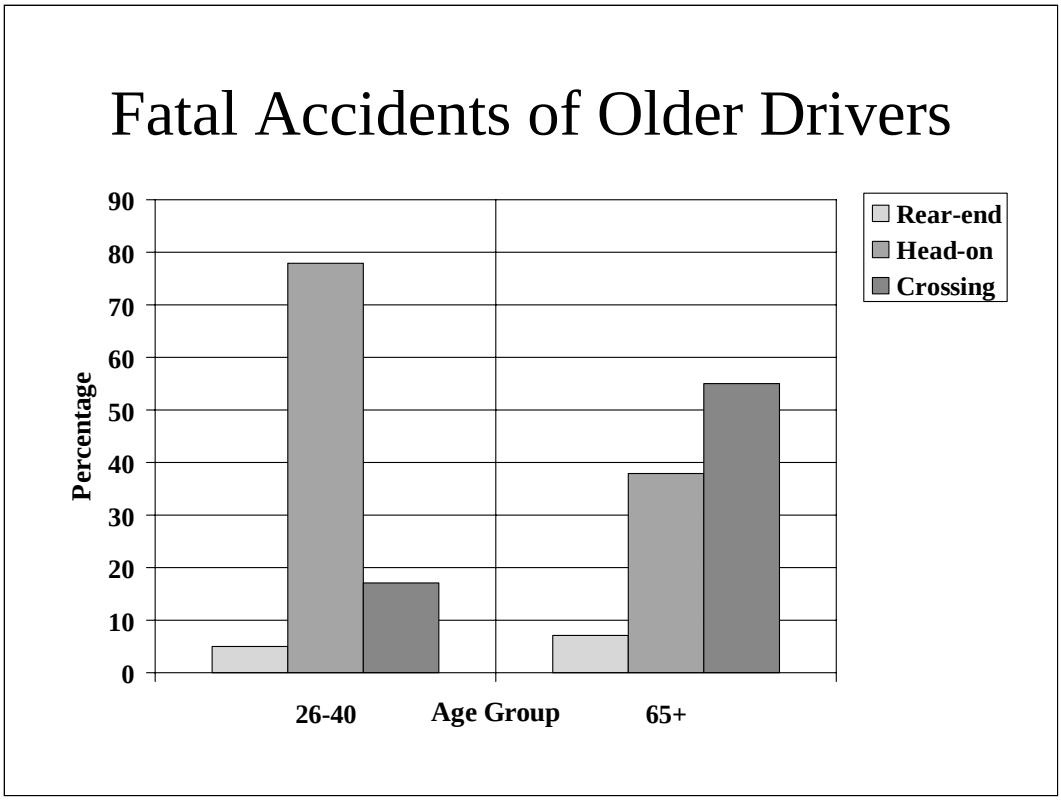
Caution

One must deal with choosing an appropriate endpoint upon which the level of risk is defined.

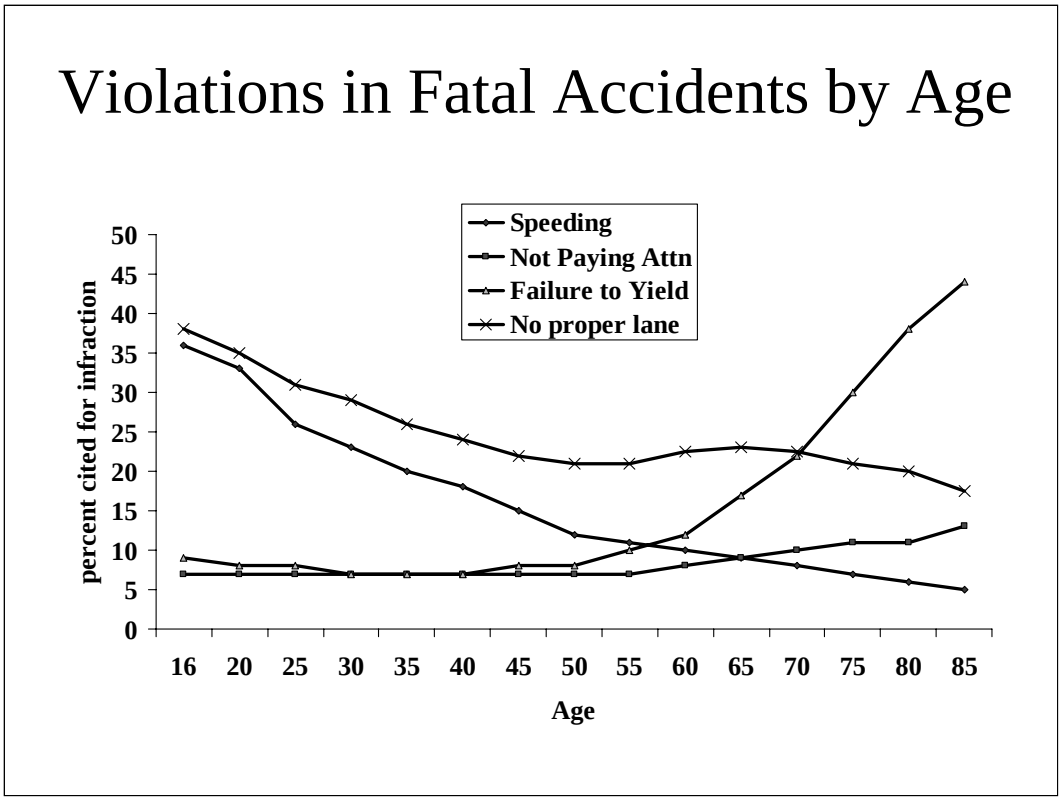
The data suggest that crashes are an important factor attributed to older drivers. When controlling for exposure (mileage driven), crash rates are very high in the elderly. It is important to point out, though, that the endpoint of interest and the population of interest (denominator) are meaningful to identifying and defining the risks associated with certain activities. Just as different endpoints may suggest different levels of risk of injury, different denominators may do the same.



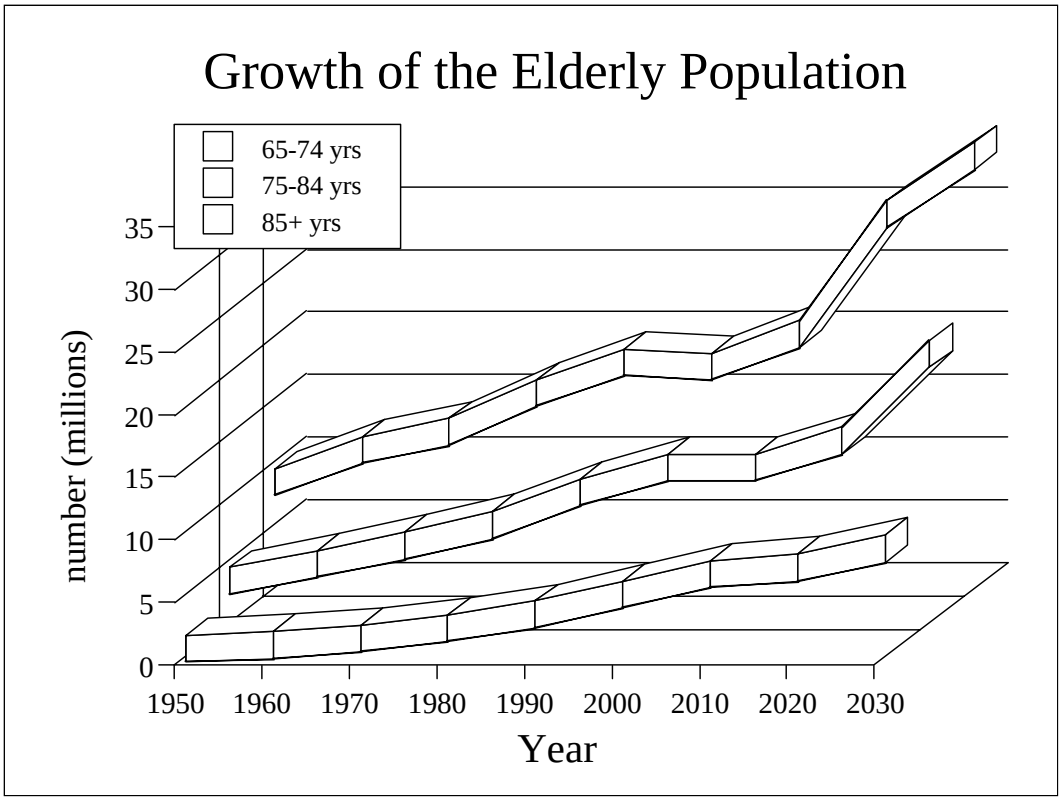
Other characteristics of crashes have been noted amongst older drivers. Crash studies, for example, note that the elderly are more involved in crashes at intersections than the young. Many of these crashes involve the older driver making a left turn. Discussions on the reasons why often lead to diminished sensory perception and slower reaction times.



Related to the tendency for intersection crashes is the observation that older drivers have fewer head-on collisions (percentage wise) than younger drivers.



Mistakes by the driver contributing to the crash scenario also differ by age. Younger drivers have higher rates of speeding violations and improper lane violations. Older drivers, on the other hand, have markedly higher "failure to yield" violations and those related to inattention.



Why is all of this a big deal? Again, the population in the U.S. is aging. By 2030, there will be over 35 million persons between ages 65-74 years. Further the number of drivers over age 85 will increase as well. These data, combined with the crash data, suggest a safety concern on our roads.

Car Trouble

Older Drivers Pose Growing Risk on Roads as their Numbers Rise

They Crash More Than Many, Yet Taking Away Wheels Leads to Isolation, Anger

Wall Street Journal, October 29, 1993

What actions should we take? This question is a focus of debate for several injury professionals. The NHTSA has included older drivers as a programmatic interest, and is actively leading research in this area. There do not appear to be easy solutions. One, while crash risks are higher, older persons vote. Changing laws that affect the elderly may also affect one's term in office. Further, public transport in the U.S. is poor. Nearly all of the population depends upon the private automobile to meet their transportation needs.

With no standard method to pinpoint dangerous elderly drivers and get them off the roads, perhaps the best that many states can do is to simply encourage people to anonymously report bad drivers. Yet many people are loathe to do so. Maureen Aber of Verona, Pa., says she still feels guilty about a woman she turned in a few years ago.

The woman, who was in her early 80s, drove poorly and often left her car parked halfway in the street. Ms. Aber pointed out the problem, but the woman always said she was too tired to park again.

Slide 1 0f 2

Taking older drivers off the road has other personal consequences as well. This is illustrated here in the next two slides.

Worried that the woman might kill someone, Ms. Aber called the police.

Soon after, state officials retested the woman and revoked her license. Without her wheels, the woman was forced to move into a nursing home, where she subsequently died. “She was crushed” over losing her license,” Ms. Aber recalls, “I did feel responsible.”

Relation between Social Activities and Driving Habits in Women

	Percentage Participating Transportation Mode		
Social Activity	***Drives Self***	***Others Drive***	***Other Mode***
% seeing children monthly	78.5	85.3*	64.3**
% with >3 close friends	61.1	54.0*	52.7
% who leave house weekly	99.0	93.6***	96.5
% club members	80.9	63.6***	56.7***
number of meetings per month	2.7	1.9***	2.5

Values are adjusted for age and overall health status using analysis of covariance:*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Huntley et al. (1986).

There are data, for example, that link driving to social health. Individuals who drive themselves are more active in social events. At face value, this represents a major quality of life indicator.

"Officials Try to Balance Public Safety Against the Rights of Older Drivers"

New York Times, May 4, 1992

Crash Risk Social Opportunities

The debate is over finding the proper balance between the crash risks identified in the older driver and the diminished social opportunities that may arise if driving privileges are removed. We are having a difficult time in finding this balance at the present time.

Experts say that denying licenses solely on the basis of advanced age would be unfair, unwise, and unnecessary.

Much of the discussion on this issue regards the licensing of older drivers. Some policy-makers see interventions based upon the licensure of the elderly as a path to pursue. What, though, is the most appropriate method? Rules that apply to all individuals determined by age? Or rules that only apply to those most at risk for crash?

Licensing Older Drivers in the USA

Source: IIHS
(June 2001)

☐ No age provisions ☐ More frequent license renewals ☐ Require testing (road or vision)

At present, licensing procedures for older drivers do not vary widely from those for younger drivers. Most states have no special renewal procedures at all. Ten states require more frequent renewal in older drivers than younger drivers. Only 5 states require additional vision or road testing. Some states, such as California will not allow mailed in renewals of licenses in older drivers, and this could lead to a vision test being done on the applicant. These states are indicated by the slanted lines. Tennessee has conveniently dispensed with the need for renewal altogether once you reach age 65 years.

Issues for Appropriate Licensing

- Does licensing reduce crash involvement?
- Can high risk drivers be identified by licensing agencies?
- Are screening tests an administrative nightmare?
- What is an acceptable risk for motor vehicle crashes?
- How many drivers would be affected?
- What are the social costs to the driver of being denied a license?

NHTSA has identified the following research questions that require further information before licensing-based interventions can be effective. There are several fundamental questions that remain without answers. These include identifying high risk drivers, the effectiveness of licensing in reducing crashes, and the costs involved.

"legislatures and public agencies are frequently under pressure to restrict drivers with medical characteristics presumed to be a hazard to driving"

Haddon, Baker 1981

One area that has received a great deal of attention amongst older drivers is the role of medical conditions in driving. Investigators have commonly thought that medical factors play a role in collisions for some individuals. This view has existed for several years. The hypothesis is that medical conditions may impair a persons' driving ability by (a) leading to alterations in judgement, (b) leading to a loss of consciousness while driving, or (c) affecting sensory perceptions.

Relative risk of motor vehicle collision injury by selected cardiovascular conditions

	Percent Prevalence Cases (n=234)	Controls (n=446)	Odds Ratio (95% CI)
Coronary heart disease			
Myocardial infarction	7.3	6.1	1.2 (0.6-2.3)
Angina pectoris	19.7	14.1	1.5 (0.9-2.2)
Coronary-artery bypass	2.6	1.6	1.6 (0.6-5.0)
Any of above conditions	21.4	15.5	1.4 (1.0-2.2)

Koepsell 1994

The literature, though, is rather inconclusive on this subject. For every study that shows a link between crashes and a medical condition, there is generally another study that shows no association. Overall, most evidence seems to suggest that there is a link to lower visual abilities. After that, it gets problematic.

The next three slides illustrate the data from a case-control study by Koepsell, et.al. It is one of the better studies in the area. Shown here are the data relating to cardiovascular disease and crashes. No associations were observed.

Relative risk of motor vehicle collision injury by selected neurological conditions

	Percent Prevalence Cases (n=234)	Controls (n=446)	Odds Ratio (95% CI)
Cerebrovascular disease			
Stroke	1.7	2.2	0.8 (0.2-2.5)
Transient Ischemia	3.0	1.8	1.6 (0.5-4.8)
Either of above	4.7	3.8	1.2 (0.5-2.6)
Head Injury	0.9	0.2	4.0 (0.4-44.0)
Dementia	1.3	0.4	2.8 (0.4-17.0)

Koepsell 1994

No strong findings were evident either for various neurological conditions. The number of persons with head injuries and dementia, though, were quite small in the study. These conditions might be related if examined in a study with a larger sample.

Relative risk of motor vehicle collision injury by selected medical conditions

Condition	Percent Prevalence Cases (n=234)	Controls (n=446)	Odds Ratio* Est.	(95% CI)
Fall in previous year	12.4	9.2	1.4	(0.9-2.4)
Alcohol abuse	3.4	5.6	2.1	(0.8-6.0)
COPD	9.8	9.9	0.9	(0.5-1.6)
Osteoarthritis	53.8	52.0	1.1	(0.8-1.5)
Rheumatoid arthritis	2.1	1.3	1.6	(0.5-5.3)
Cancer	18.4	17.9	1.0	(0.6-1.5)
Diabetes mellitus	11.1	4.5	2.6	(1.4-4.7)

Koepsell 1994

The only condition that Koepsell, et. al. Found to be statistically linked to crashes was diabetes. Subsequent reports by other investigators, though, have noted no link with diabetes.

Research Issues

- Which population
- Exposures
- Definition of Crashes
- Recall bias
- Reporting bias

So, this research area remains wide-open for more studies. Future studies will need to consider several methodological items in their design. For example, they should be population-based. They should consider the amount of driving by the person (exposure). The outcome variable (crash) should be well defined and the limitations of its measurement acknowledged.

Reasons for Stopping Driving in the Elderly

Advancing Age

Low Income

Medical Impairment

- cataracts
- neurologic disease

Activity Limitation

Increasing Number of Factors from above

Marottoli, 1993

As as example, the measurement of exposure is very important in older drivers. Studies have found that many individuals maintain drivers licenses, but do not drive. Their exposure, then, is nil. Many older persons voluntarily stop driving. A study by Marotolli found several reasons related to this decision. These include getting older, becoming functionally limited, and certain medical conditions.

Reasons for Stopping Driving in the Elderly

Advancing Age

Female Gender

Medical Impairment

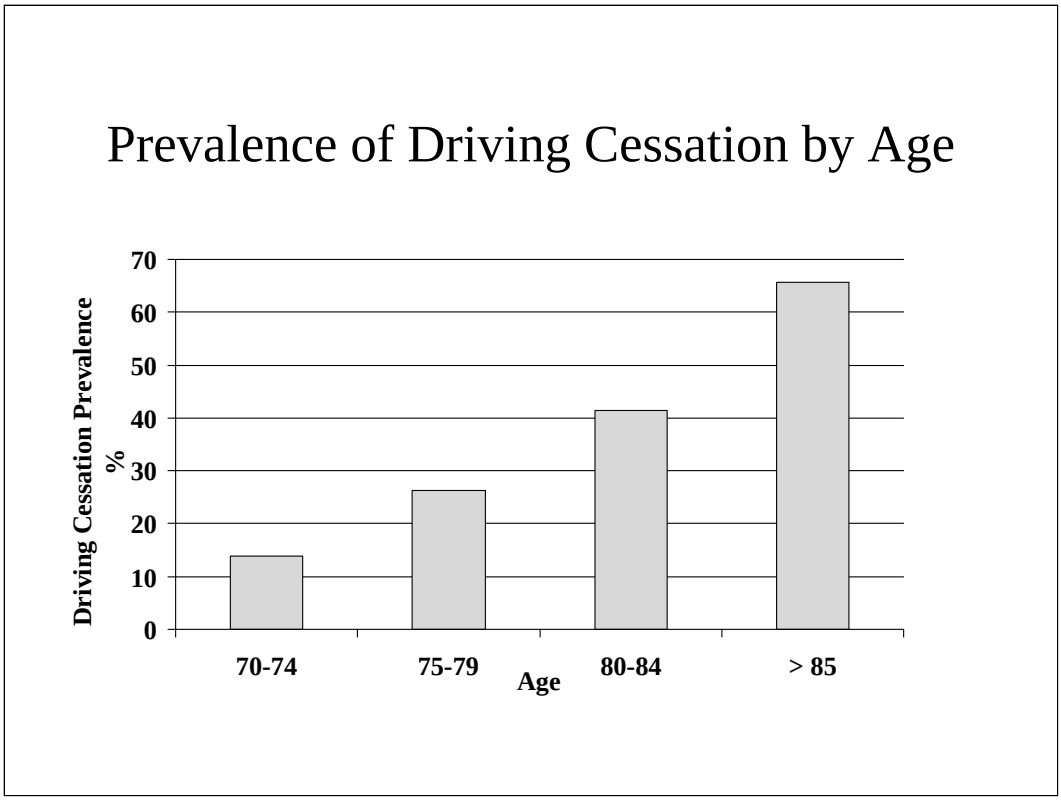
poor vision	stroke
syncope	Parkinson's disease

Activity Limitation

Increasing Number of Medical Conditions

Campbell, 1993

Another report by Campbell also found advancing age to be related to voluntarily stopping driving. Different medical conditions were associated in this study.



A study of older women drivers in the Mon Valley, Pennsylvania found that persons over age 85 years were the individuals most likely to make the decision to stop driving.

Prevalence of Driving Cessation by Number of Significant Medical Conditions

Number of significant medical conditions	Driving cessation prevalence %	Odds Ratios (95 % CI)
0	21.3	1
1	24.4	1.54(1.14-2.09)
2	33.7	2.48(1.69-3.64)
3	59.0	5.96(3.31-10.74)
4-5	66.7	9.67(2.78-33.68)

In this group, driving cessation was strongly linked to health status. The likelihood of stopping driving increased strongly with co-morbidity.

Future Research - National Agenda

Establish Crash Risk for Various Medical Conditions

Document mobility consequences of driving cessation

Improve vehicle crashworthiness for older population

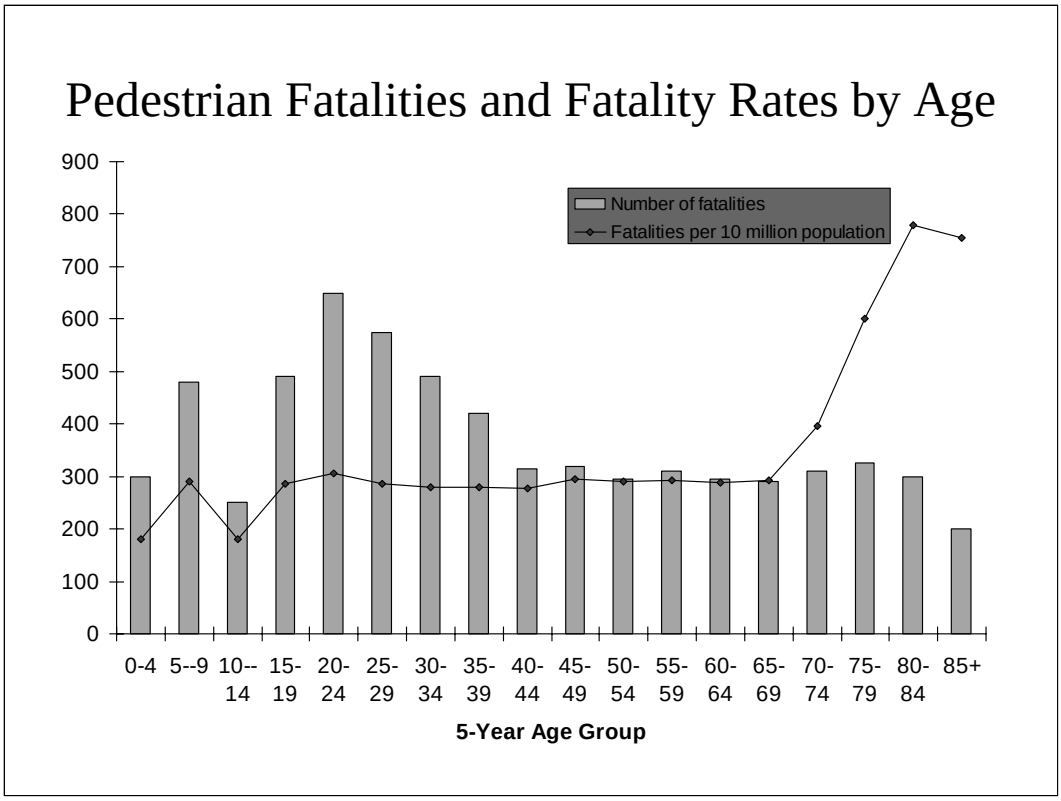
Identify causes of crashes at intersections

Examine physician role in licensing

Examine voluntary reporting of "high risk" drivers

Examine how older drivers compensate for limitations

Much remains for research on older drivers. This slide outlines the national agenda of the NHTSA on this issue.


Pedestrian Fatalities and Fatality Rates by Age
900
800
700
600
500
400
300
200
100
0
Number of fatalities
Fatalities per 10 million population
0-4
5--9
10--14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80-84
85+
5-Year Age Group

Extra slide

Collisions and Vision/Mental Status

	% with condition	Crash Rate	Adjusted Relative Risk
All Drivers		28	
Vision Status			
Hx of cataracts	29.0	25	0.9 (0.6, 1.2)
Hx of glaucoma	4.7	38	1.5 (0.9, 2.7)
Mental Status			
> 80th % depressive score	18.1	38	1.5 (1.1, 2.1)
> 2 errors on Questions	6.9	18	0.6 (0.3, 1.2)
20 Word Memory Test			
<5 words (1st recall)	35.6	34	1.2 (0.9, 1.7)
< 3 words (2nd recall)	35.2	35	1.4 (1.1, 1.9)

*Cox proportional hazards model for time (in months) until first crash adjusted for age and sex

Extra slide