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Abstract

This study compares the age and gender of at-fault drivers who were involved in fatal crashes and the corresponding driving errors that contributed to these crashes. This comparison provides insights that may help traffic engineers devise countermeasures to lessen the number of these unnecessary deaths. Data from the Fatality Analysis Reporting System (FARS) for the years 2001 through 2003 were used in this study. The analysis included passenger vehicles (automobiles, utility vehicles, minivans, and pickup trucks) involved in either single or two vehicle crashes. The driver responsible in each crash was identified through the driver error variable codes as listed in the FARS databases. Younger drivers (16 through 19 years of age) and the elderly (those 75 and older) were responsible for a disproportionate amount of fatality-related crashes. When combined these two groups accounted for only 6.4% of the total miles driven in 2001 but they were responsible for 83.1% of the fatal crashes attributed to driver-related errors. Driver operating error was listed as the contributing factor in 73% of fatal motor vehicle crashes when the driver was male and 83% of the crashes when the driver was female. The youngest drivers tended to be carrying the highest number of passengers when they were involved in fatal crashes. Failing to stay in the proper lane and driving too fast for road conditions were the two most frequent driver operating errors contributing to fatal crashes for both male and female drivers.

Keywords: Fatal Crash, Driver, Age, Gender, Driver Involvement Ratio, Vehicle

1. Introduction

Traditionally, motor vehicle crashes are reported in terms of the number of people killed or injured, and comparisons are usually made in terms of the age and gender of the people involved. This general reporting does not reveal two important facts of the crash: the physical profile of the person at fault and the type of driver's error that contributed to the crash. For example, assume a 26-year-old drunk driver loses control of his car, crosses a median and collides with an SUV driven by a 56-year-old man with two additional passengers — his 10-year-old child and 44-year-old old wife. If all people are killed in this crash, it will be reported that four people, aged 10, 26, 44, and 56, were killed in a motor vehicle crash; they will then contribute to the statistics of road fatalities in their respective age and gender categories. Although statistics reporting the number of deaths are important, from the traffic engineer's perspective, it is equally important to know the contributing factors to the crash. The driver responsible for the fatal crash and the driver error(s) and other causes need to be identified. Summarizing the deaths for which drivers are at-fault by age and gender and including the possible causes of the crash can be helpful in recognizing trends and hence in devising appropriate preventive measures.

There is considerable literature focused on how age and gender contribute to fatal motor vehicle crashes. Garber and Srinivasan (1991) used the 1986-88 crash data in Virginia to analyze the characteristics of crashes involving elderly drivers at intersections. They used the driver age in relation to crash location, driver gender, and type of collision to determine the involvement ratio (i.e., the number of crashes attributed to drivers). They found that the involvement ratio was significantly higher for elderly drivers (male and female) 65 years of age and older than it was for other age groups. The involvement ratio of female drivers 52 years old and older was higher than that of males in the same age group but females 42 years old and younger had a lower involvement ratio than males of the same age group.

Evans (1991) used the early 1980's FARS crash data and the 1983 National Personal Transportation Study (NPTS) travel data to analyze the driver fatalities per population, per licensed drivers, and per kilometers driven by age and gender of driver who was killed in a traffic crash. He reports that driver fatality risk per year plays a diminishing role for older drivers because of decreased driving and, as a result, threat to other road-users declines as well. This implies that the more you drive, the more time you spend on roads, which leads to an increased exposure to higher crash rates. In a later study, Evans (2000) used the 1994-96 FARS crash data and the 1995 NPTS travel data in analyzing driver fatality rates using the same methodology he used in Evans (1991). His conclusions were in agreement with his earlier study that licensing a younger driver poses substantially more risk to other road users than licensing an older driver.

Williams and Shabanova (2003) analyzed the death rates of drivers, their passengers, and occupants of other vehicles per licensed drivers and percent of deaths in crashes for which drivers were responsible by age and gender using the FARS 1996-2000 data. They found that young male drivers had the highest rate of fatal crash involvement and the highest rate of death for which they were considered being at-fault per licensed drivers and the majority of deaths due to youngest drivers' at-fault crashes were people other than themselves. Braver and Trempel (2004), using multiple databases including FARS, the General Estimates Systems (GES), 1995 NPTS and insurance claims for the 1993-97 period, analyzed the driver involvement rates by age at which drivers, their passengers, occupants of other vehicles and non-motorists were injured or killed in traffic crashes. They conclude that older drivers were not highly involved in crashes in which other road users were killed; specifically, drivers aged 75 and older had modest increase in risk involving two-vehicle crashes in which occupants of other vehicles receive non-fatal injuries. In other words, drivers younger than 30 years old pose the greatest risk to their passengers and other road users.

Abdel-Aty, et al. (1999) investigated the relationship between driver age and crash involvement in Florida for the period of 1993-1994 by using the conditional probabilities to explore the potential relationship between the driver age and other factors related to crash involvement such as location, manner of collision, roadway characteristics, speed, etc. They found that young and old age groups were usually over represented in different types of traffic crashes. Harb, et al. (2008) also used conditional logistic regression to perform freeway work zone crash analysis using data from Florida for the years 2002-2004 and concluded that for two-vehicle crashes, drivers younger than 25 years and older than 75 years had the highest risk of being at-fault in work zone crashes. Moreover, male drivers had significantly higher risk of being at-fault than females, but female drivers 75 years and older had higher risks than males of the same age group.

Two methodological types have been used when studying the contribution of drivers in traffic crashes. The first one analyzes the relative risks per given exposure measure such as population, licensed drivers, or driving exposures and the second one determines the relationship of various parameters contributing to the crash risks. The purpose of this study was to assess the contribution of age and gender to driving errors that cause fatal motor vehicle crashes. The scope of this study focused on passenger vehicle (i.e., cars, pickup trucks, vans, and utility vehicles) drivers. Exploring the role of the driver's age and gender in causing fatal motor vehicle crashes provides one way of understanding crash causes and allows for the implementation of specific preventive measures targeting particular groups of drivers.

2. Methods

2.1 Data

The Fatality Analysis Reporting System (FARS) data for the three-year period (2001-2003) is the primary source of information for this study (NHTSA 2007). These are computerized databases of all police-reported fatal traffic crashes in the United States occurring on public roads and resulting in a death within 30 days of the crash compiled by the National Highway Traffic Safety Administration (NHTSA) (Tessmer 2006). Data for crashes involving more than two vehicles were excluded simply because these types of crashes pose a greater difficulty of assigning relative contributions/responsibility in causing the crash (Williams and Shabanova 2003). Also excluded are crashes that involve large trucks, buses, motorcycles, pedestrians, motor vehicles not in transport, bicyclists, and other miscellaneous vehicles due to the scope of study and the fact that related driver factors are not coded for bicyclists and pedestrians in FARS datasets.

Information on licensed drivers by age and gender in the U.S. is annually reported by the Federal Highway Administration (FHWA) and was obtained from the Office of Highway Policy Information website (FHWA 2008). Information on average annual miles of travel (driving) by age and gender of drivers is conducted by FHWA about once every seven years. The most current available survey data is for 2001 and was provided by the National Household Travel Survey (NHTS) staff of the Office of Highway Policy Information.

2.2 Analysis

For each crash, the driver's probable responsibility was identified through the FARS variable "related factors-driver level" assigned to all drivers (Tessmer 2006). This variable is coded into five major categories depending on crash causes with codes 0-99 in the database. The driver-related operating error factors are recorded under the “miscellaneous factors” category with codes 17 to 60 inclusively. The FARS databases list 44 possible driver operation errors that can be used to record driver actions that may be judged to be the cause of the fatal crashes. Up to four different driver-related factors can be assigned in the FARS to each driver. If a driver was assigned multiple factors, all of the assigned factors were recorded when determining crash responsibility. Unlike in Williams and Shabanova (2003) who assumed all single vehicle drivers were responsible in their crashes irrespective of contributing factors coded in FARS database, in the current study all drivers’ responsibility (either in single-vehicle or two-vehicle crashes) was assigned based on coded related drivers’ factors only. Driving under the influence of alcohol or other drugs was not considered responsible unless the driver committed an operating error. In the FARS database, the five “related factors-driver level” categories are as follows: (1) Physical or mental conditions, e.g., drowsy, sleepy, emotional, drugs, road rage, etc.; (2) Driver errors (miscellaneous factors), e.g., running off road, following improperly, failure to yield right of way, failure to keep in proper lane, etc.; (3) External factors, e.g., vision obscured by rain, snow, fog, parked vehicle, etc; avoiding, swerving, or sliding due to severe crosswind, slippery surface, debris, etc.; (4) Other miscellaneous factors, e.g., carrying hazardous cargo improperly, other assault, etc.; and (5) Possible distraction inside vehicle, e.g., cellular phone, fax machine, on-board navigation system, etc.

The fatal crash and fatally injured victims (i.e., drivers, occupants of at-fault driver or occupants of another vehicle) were assigned according to the age of the driver who was judged responsible for the crash. Three methods were used to analyze the role of drivers of a given age and gender in causing fatal crashes that killed themselves, their occupants or occupants of other vehicles. The first method calculated the relative risk by dividing the number of fatal crashes attributed to driving errors in a given age group and gender by the number of licensed drivers in the same age group and gender. The disadvantage of this method is that it does not include the differences in driving between groups, i.e., the frequency with which the group drives and therefore exposes itself to the risk of driving (Massie et al. 1995). The second method used is a form of induced exposure called involvement ratio. The involvement ratio was computed by dividing the number of crashes attributed to drivers in a given age group and gender by the number of crashes not attributed to drivers in the same age group and gender (Garber and Srinivasan 1991). The third method used is a direct measure of driving exposure in which the role of driver's responsibility in fatal crashes in a given age group and gender was computed by dividing the average annual number of fatal crashes attributed to the driving errors in a given age group and gender by the annual average number of miles driven by the same age group and gender (Massie et al. 1995).

3. Results

In the period 2001-2003, there were a total of 73,220 fatal crashes involving either single-passenger vehicle crashes or two-passenger vehicle crashes that resulted in 84,175 deaths. Out of these, 39,364 were single-passenger vehicle crashes (42,633 deaths) and 33,856 were two-passenger vehicle crashes (41,542 deaths). Table 1 depicts the relative contribution of different related factor categories (by age and gender) to the number of fatal crashes involving single or two-passenger vehicles, which shows that the driver's error is the main contributor of fatal crashes. Driving errors contributed an average of 72.9% of all fatal crashes for which male drivers were judged responsible and 82.5% for female drivers with the other four factor categories sharing the remaining 13.8% and 17.5%, respectively. While the16-years old male's driving errors contribute by far the highest percentage (86.2%) in causing fatal crashes compared with other male age groups, for females it is the 85 and above-years old age group which has the highest percentage (87.1%).

3.1 Driving Errors

The major driver operating errors blamed for about 92.5% of the driver error-related fatal crashes are listed in Table 2. Figure 1 depicts the top five driver errors contributing to fatal crashes and shows how they vary in relationship to the age of the at-fault driver. While driving too fast for the conditions/excess of posted speed limits, failure to keep in proper lane, and running off road are the main contributing factors for young and middle aged drivers, for older drivers it is the failure to yield right of way that becomes the most dominant factor. For the youngest drivers (16 years old), the highest factor contributes only 15% of the total driver error-related fatal crashes, meaning that they have many driver errors due to inexperience with driving as compared to other age groups. Failure to obey traffic signs, traffic control devices, etc., is not listed in the top five causes and on average for all driver ages contributes to only about 5.4% of all driver-related fatal crashes, but for drivers 75 years old and above, this driving error is among their top three causes, contributing to 10-12% of their fatal crashes.

Table 3 lists the distribution of drivers responsible in single and two-vehicle fatal crashes by gender and age. Figure 2 depicting the same information shows that age and gender have marked effects on the likelihood of whether an at-fault driver is involved in a single-vehicle or a two-vehicle fatal crash. The likelihood of driving errors causing the single-vehicle fatal crashes generally decreases with age for both genders while it increases with age for the two-vehicle fatal crashes. In the 19-39 age range the fatal crash rates remain virtually unchanged for both genders and the likelihood of a female driver's error of causing a single or two-vehicle fatal crash is almost the same. Another point to note is that female drivers are generally more likely to cause two-vehicle fatal crashes than male drivers of the same age, but the role reverses for the single-vehicle fatal crashes.

3.2 Driver Responsibility

This section presents the results of the analyses of the role of the driver in causing fatal crashes. The first method used in evaluating drivers' responsibility in fatal crashes examined the number of fatal crashes caused by driver operating errors per 100,000 licensed drivers by age group and gender. Figure 3 reveals the high contribution of teenage drivers to fatal crashes for which they were probably responsible as compared to other drivers of all other ages for both genders. The responsibility per licensed drivers for elderly (75+ years old) is very comparable to that of the 20-29 age group, with the middle age (30-70) drivers posting the lowest responsibility for both males and females. Additionally, the male teenage drivers' responsibility rates per licensed drivers are much higher than those of their female counterparts.

The results of the involvement ratio of drivers in fatal crashes as another method of assessing the driver responsibility are depicted in Table 4 and displayed in Figure 4 for better clarity. The 16-year-old drivers had the highest fatal involvement ratio, which shows that they were about five times more likely to be deemed responsible for fatal crashes than being judged victims of the collisions. Male drivers aged 16 to 59 were more likely to be culpable in their fatal crashes than females of the same age, but the trend reverses thereafter. However, at age 16 both male and female drivers seem to have similar responsibility rates. The youngest and the oldest drivers have the highest responsibility in their fatal crashes with the 40-59 and 50-69 ages having the lowest responsibility for female and male drivers, respectively.

The drivers' likely responsibility in fatal crashes per billion miles driven by age and gender, which utilizes a direct measure of driving exposure shown in Figure 5 was the third method used. The oldest drivers (age 85 and above) were disproportionately culpable in fatal crashes per miles they drove compared to other age groups. Figure 5 shows that male drivers' involvement in fatal crashes for which they were likely responsible per miles driven is higher than that of female drivers up to about 40 years of age, after which beyond this age there is no noticeable difference between genders. This also reveals that the safest drivers in terms of miles driven are middle-age drivers. The data analysis showed that while teenage drivers (16-19 years old) drove about 3.8% of all miles driven in 2001, they contributed 47.5% of all the fatal crashes that were attributed to driver operating errors. Likewise, the older drivers (75+ years old) contributed 35.6% of the fatal crashes blamed on drivers' operation errors while driving just 2.6% of the total miles driven by U.S. drivers in 2001. On the other hand, the middle-age drivers (20-74) drove 93.6% of the total miles driven in 2001 but were responsible for only 16.9% of the total driver error-related fatal crashes.

3.3 Additional Characteristics Observed from Fatal Crash Data

The relationship between the types of crashes likely due to driver's operating errors and where they occur on a roadway are depicted in Figure 6. Figure 6(A) confirms the results of Figure 2; single vehicle crashes (not collision with vehicle in transport) for which a driver is likely responsible decreases with driver age with a dramatic decrease starting at age 50. For the two-vehicle fatal crashes, the angle type is more prominent and increases dramatically starting at age

50. Figure 6(B) reveals that for drivers 50 years old and above, most of the angle crashes they are likely responsible for occur within the intersection areas.

Figure 7(A) divides up the number of deaths in fatal crashes for which drivers were likely responsible in terms of the drivers themselves, their passengers, and occupants of other vehicles as assigned to the age and gender of the at-fault driver. Teenage drivers, especially those 16-18, were more likely to be responsible for deaths of people other than themselves. The majority of the deaths to other people were sustained by their passengers; in particular, 35-37% of all the deaths for which 16-18 years old teenage driver were likely responsible occurred to their passengers. Above 19 years old, drivers were more responsible in their own deaths than others' and the percentage increases with age. This is also reflected in Figure 7(B), which shows the vehicle occupancy for passenger vehicles involved in fatal crashes for which drivers were likely responsible. The 16-year-old drivers had the highest average vehicle occupancy of 2.2 people, which decreased with the driver's age; the lowest vehicle occupancy of 1.3 people per vehicle occurred with the 85+ years old drivers' age group.

4. Discussion

4.1 Specific Findings in this Study

Specific findings from this study include:

- Driving errors contribute more to fatal crashes involving female drivers than their male counterparts. However, external factors contribute more to male's fatal crashes than their female counterparts, especially for older drivers (60 years old and above), where they contribute as high as 20.4-24.2% of their fatal crashes.

- Drivers' responsibility in terms of causing fatal crashes per 100,000 licensed drivers decreases rapidly until about 25-29 years of age, then continues decreasing gradually until ages 50 to 69 then increases gradually for female drivers but more steadily for male drivers. Per licensed drivers, males happen to cause more fatal crashes than females at all ages. The relatively safest age groups for both genders are 30-74 inclusive. Male drivers, 16-25 years old pose the highest danger per licensed drivers. The danger posed by the 75-84 age-group drivers is comparable to that posed by the 25-29 age-group.
- Teenage (16-19) and elderly (80+) drivers have the highest involvement ratios in their fatal crashes; while the involvement ratio decreases rapidly with increasing age for younger drivers (16-39 years old), the involvement ratio increases with increasing age for older drivers (70 and above years old). The involvement ratio method reveals that the relatively safe age ranges for male and female are 30-74 and 25-69, respectively. In terms of involvement ratio, while the responsibility in causing fatal crashes for males aged 75-79 is comparable to that of 25-29 male drivers, the 85 and above years old female's responsibility is comparable with that of 19 years old male drivers.
- The oldest drivers (85+) have the highest responsibility in the fatal crashes they get involved in per miles driven. While at a young age, males have higher responsibility than females up to age 40, but there is no gender difference beyond this age. The relatively safe drivers are between ages 30 and 69. In terms of causing fatal crashes per miles driven, the older drivers aged 70-74 are comparable with that of 25-29 male drivers. It can be noted that yet the 75-79 aged drivers are safer per miles they drive

than the 20-24 years old male drivers and they are comparable with the 19 years old female drivers.

4.2 Study Contribution and Relation to Other Research Results

The reporting of fatal crashes and deaths by relating them to the drivers responsible gives a better perspective of the motor vehicle safety problem. While this study focused on the comparison of drivers in terms of the number of fatal crashes they caused, most similar studies focused on the number of fatalities (e.g., Karpf and Williams, 1983; Williams and Karpf, 1984; Evans, 1991; Evans, 2000; Williams and Shabanova, 2003; Li et al., 2003). The focus on the number of fatal crashes instead of the number of deaths make sense because each crash is equivalent to one event causing death while the number of deaths in a crash depends on the number of people in the vehicles involved, the situation that is beyond the control of the at-fault driver.

The methods used in previous studies to determine risk exposure include crashes/fatalities per population (e.g., Evans, 1991 & 2000; Karpf and Williams, 1983); per licensed drivers (e.g., Evans, 1991 & 2000; Karpf and Williams, 1983; Williams and Karpf, 1984; William and Shabanova, 2003); per miles driven (e.g., Evans, 1991 & 2000, Massie et al., 1995). Only Garber and Srinivasan (1991) used the involvement ratio but their data was only from the state of Virginia and analyzed crashes that occurred at intersections only. Most researchers tend to use several methods of calculating the risk exposure due to each method having its limitations. A better method of comparing the relative driver risk is by use of miles driven, which reflects the direct exposure, but this data is not always available on a yearly basis. The induced exposure methods, such as the involvement ratio, offer a better alternative where miles of travel data is not available. Therefore, the current study used three of the risk exposure methods that are considered better and used them together to draw conclusions. The contribution of this study relies in the use of fatal crashes that were attributed by driving errors including a uniform method of determining the at-fault drivers involved in both the single and two-vehicle crashes by age and gender and the use of the methods that reflect better driving exposure in the determination of relative risk rates.

4.3 Some General Results Compared with Other Previous Findings

Driver experience may be one of the reasons why driver operating errors are more likely to contribute to fatal crashes involving female drivers than male drivers as males tend to drive many more miles per year than females. Storie (1977) and Massie, et al. (1995) suggest that annual mileage represents one's level of experience because the more experienced drivers are more proficient in driving tasks and therefore more likely to avoid crashes. It is noteworthy to mention that in 2001 males accounted for 62% of the total miles driven in the U.S. and females accounted for only 38% while the percentage of licensed drivers in the country is split almost evenly at 50.1% to 49.9%, respectively. The same reasoning may apply for the youngest aged drivers who exhibited many more different driver errors contributing to their fatal crashes when compared with other ages. Inexperience has been associated with elevated driving risks of the youngest drivers (Williams et al., 1995). Driving too fast for the conditions/excess of posted speed limits, failure to keep in proper lane, and running off the road together contribute highly to at-fault drivers in their fatal crashes from age 17 through 60. All of these factors can easily be tied to speeding because they all contribute to the driver's losing control of the vehicle. But, failure to yield the right of way becomes a single leading cause of fatal crashes at older ages (similar findings in an earlier study (Garber and Srinivasan 1991)), particularly at age 75 and over in the current study. This may be due to deteriorating reflex reactions and visual perception, as one earlier study also suggested that an older driver may notice the oncoming vehicle but fail to estimate correctly the time needed to make and complete the intended maneuver safely (Hakamies-Blomqvist 1993).

The comparisons of relative responsibility in causing fatal crashes by involvement ratio and per miles driven are the better methods because they incorporate the driver exposure to crash propensity. Both of these methods have agreed that the 16-19 and 75+ year olds have an elevated risk of causing fatal crashes. Although older drivers have been defined as persons aged 65 years and older (Garber and Srinivasan, 1991; Braver and Trempel, 2004), the evidence-based results from the current study show that the 65-74 aged drivers are relatively safer than drivers in their 20's and even compare well with drivers in their 30's. Therefore, it is suggested that the older drivers with elevated crash risk should be defined as 75 years old and above. A number of countermeasures can be suggested based on the results of this study. Teenage drivers (16-19 years old) who on average carry more than two people in their vehicles and have been found to be highly culpable in causing deaths to others require special attention. The first countermeasure is to restrict them from carrying teenage passengers except when the driver is supervised by a parent or other experienced driver. Another countermeasure is a night-time driving restriction, i.e., the teenager being restricted from driving between 10pm to 6am. Again, the restriction can be waived if the driver is accompanied by a parent or driving to or from work. Generally speaking, these countermeasures are similar to some of the restrictions in graduated driver licensing (GDL) laws currently implemented by some states, so it is suggested that they be extended throughout the nation. A number of studies have shown that these restrictions under

GDL laws where they have been implemented have been effective in reducing crash rates among teenage drivers (Williams 2007; Mayhew 2007)

For the elderly drivers (75 years old and above), the best countermeasures are those that will help them in improving their visual and reaction times, especially at locations such as intersections where they easily become victims of failing to yield the right of way to others. These may include improving roadway delineation, providing advanced warning signs, increasing size and letter heights of roadway signs, and reducing intersection skew angles. Also, educational and training opportunities should be provided to address the specific concerns and limitations of older drivers. Under the education component, older drivers should be informed and educated to be aware of their increasing fragility on top of their deteriorating driving capabilities.

Speeding has also been identified to be a major cause of fatal crashes at all ages but especially for drivers younger than 60 years old. It is noteworthy to mention that the top three driver errors for the 16-59 age range are partly speed related. The main countermeasure for this perennial problem is increased reinforcement and more visible police patrol. The limitation to this study may be due to possible bias and subjectivity on the side of the police officers' judgments when assigning the causes of crashes and who most likely to be responsible

5. Conclusions

Driving errors are more likely to be responsible in female drivers' fatal crashes than those of male drivers of the same age. Generally, in terms of involvement ratio, young males are more likely than young females to be responsible in their fatal crashes, a trend that continues up to around age 60 where older females become more responsible than males of the same age.

However, when comparing the responsibility in fatal crashes per miles driven, young male drivers exhibit higher risks than their female counterparts but there is no noticeable difference between the genders beyond 40 years of age. Therefore, teenage (16-19 years old) and elderly (75 years old and above) drivers pose a higher risk to other road users than other drivers. The safest drivers in terms of having the lowest potential of being responsible in causing fatal crashes are those in the middle ranges, i.e., aged 30-69.

Countermeasures required for younger and elderly drivers are varied due to the differing causes of their fatal crashes and types of driving errors. Younger drivers need to be restricted in terms of unsupervised passenger carrying and night-time driving. The aim is *not* restricting them from driving, because they need to increase their driving experience; this differs from other suggestions that aim to delay teenage driving. For elderly drivers, the best countermeasures are those that will help them improve their visual recognition and reaction times, especially at intersections. These include improved advanced warning signs, increased size and letter heights of roadway signs, reduced intersection skew angles, and better lighting. Additionally, educational and training materials that will inform older drivers about their deteriorating driving capabilities and how to compensate for them should be readily available.

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Table 1 Average Percent Contribution to Passenger Vehicle Fatal Crashes by Different Causing Factors, 2001-2003

Age group	Percent contribution by different causing factors* by age and gender									
	Male					Female				
	1	*2*	*3*	*4*	*5*	*1*	*2*	*3*	*4*	*5*
16	7.4	86.2	16.6	3.0	0.5	8.0	85.0	3.9	2.6	0.6
17	6.9	73.2	12.9	2.8	0.5	8.1	84.9	4.3	1.8	0.9
18	9.3	74.3	11.2	3.0	0.6	9.4	83.5	4.2	2.1	0.8
19	9.1	75.5	9.8	3.8	0.5	9.6	82.6	4.8	2.2	0.9
20-24	9.5	75.9	9.8	4.0	0.7	11.0	80.5	4.6	2.8	1.1
25-29	9.7	74.4	11.1	4.3	0.6	11.0	80.6	5.1	2.2	1.0
30-39	9.4	72.2	14.4	3.3	0.6	10.8	81.5	4.3	2.6	0.8
40-49	10.0	71.7	15.3	2.4	0.6	10.6	82.1	4.7	2.0	0.6
50-59	9.8	71.1	17.3	1.4	0.5	10.2	82.6	5.4	1.1	0.7
60-69	10.5	67.7	20.4	0.8	0.6	11.0	83.3	4.0	0.9	0.8
70-74	9.3	66.4	23.0	0.9	0.5	12.3	83.7	3.1	0.4	0.5
75-79	9.7	65.0	24.1	0.6	0.6	10.1	86.3	2.8	0.7	0.1
80-84	9.6	65.0	24.2	0.7	0.5	10.9	85.6	2.7	0.1	0.7
85+	7.5	68.2	23.3	0.7	0.3	9.8	87.1	2.3	0.4	0.4
Mean	9.4	72.9	14.2	2.9	0.6	10.4	82.5	4.4	1.9	0.8

*Note: 1-Physical/mental conditions
2-Driver errors
3-External factors
4-Other miscellaneous factors
5-Possible distraction (inside vehicle)

Table 2 Major Driving Errors that Contributed to Driver Error-related Passenger Vehicle Fatal Crashes, 2001-2003

Rank	Driver's Error Description	Percent
1	Driving too fast for the conditions/excess of posted speed limit	22.4
2	Failure to keep in proper lane	19.6
3	Running off road	17.4
4	Failure to yield the right of way	8.9
5	Operating the vehicle in erratic, reckless, careless or negligent manner	6.3
6	Over correcting	5.8
7	Failure to obey traffic sign, traffic control devices, etc.	5.4
8	Making improper turn	3.2
9	Driving on wrong side of road	1.9
10	Operating without required equipment	1.6

Table 3 Drivers Responsible in Single-vehicle and Two-vehicle Fatal Crashes, 2001-2003

Age group	Male drivers responsible			Female drivers responsible		
	One-vehicle N (%)	Two-vehicles N (%)	Total	One-vehicle N (%)	Two-vehicles N (%)	Total
16	814 (60.5)	532 (39.5)	1346	440 (53.8)	378 (46.2)	818
17	1066 (56.9)	809 (43.1)	1875	471 (53.3)	413 (46.7)	884
18	1482 (59.6)	1005 (40.4)	2487	430 (46.4)	497 (53.6)	927
19	1510 (59.9)	1009 (40.1)	2519	400 (50.6)	390 (49.4)	790
20-24	6183 (61.8)	3822 (38.2)	10005	1437 (51.4)	1359 (48.6)	2796
25-29	3408 (58.6)	2407 (41.4)	5815	897 (50.7)	872 (49.3)	1769
30-39	4998 (57.3)	3731 (42.7)	8729	1769 (50.6)	1725 (49.4)	3494
40-49	4267 (57.4)	3167 (42.6)	7434	1453 (47.7)	1592 (52.3)	3045
50-59	2521 (54.5)	2104 (45.5)	4625	910 (44.4)	1140 (55.6)	2050
60-69	1334 (47.1)	1497 (52.9)	2831	541 (38.4)	869 (61.6)	1410
70-74	542 (38.6)	862 (61.4)	1404	235 (30.5)	535 (69.5)	770
75-79	522 (33.0)	1058 (67.0)	1580	231 26.4)	643 (73.6)	874
80-84	342 (26.2)	961 (73.8)	1303	156 (22.2)	547 (77.8)	703
85+	226 (21.1)	843 (78.9)	1069	101 (19.4)	420 (80.6)	521

Table 4 Driver Involvement Ratio in Single- and Two-Passenger Vehicle Fatal Crashes for Which Drivers were Likely Responsible, 2001-2003

Age group	Drivers responsible		All drivers in crash		Involvement ratio	
	Male	Female	Male	Female	Male	Female
16	1346	818	1611	972	5.1	5.3
17	1875	884	2291	1146	4.5	3.4
18	2487	927	3004	1216	4.8	3.2
19	2519	790	3085	1111	4.5	2.5
20-24	10005	2796	12703	4045	3.7	2.2
25-29	5815	1769	8137	2798	2.5	1.7
30-39	8729	3494	13198	5747	2.0	1.6
40-49	7434	3045	11735	5250	1.7	1.4
50-59	4625	2050	7804	3483	1.5	1.4
60-69	2831	1410	4802	2232	1.4	1.7
70-74	1404	770	2127	1104	1.9	2.3
75-79	1580	874	2210	1148	2.5	3.2
80-84	1303	703	1680	874	3.5	4.1
85+	1069	521	1364	629	3.6	4.8

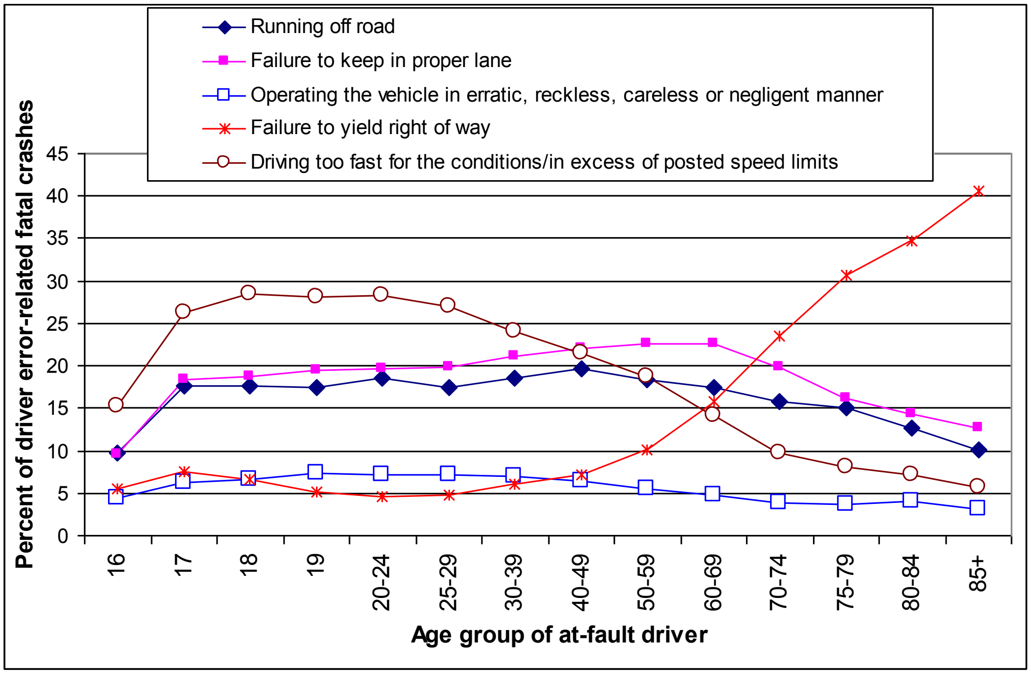

Figure 1 The Top Five Driver Errors Responsible for Passenger Vehicle Fatal Crashes, 2001-2003

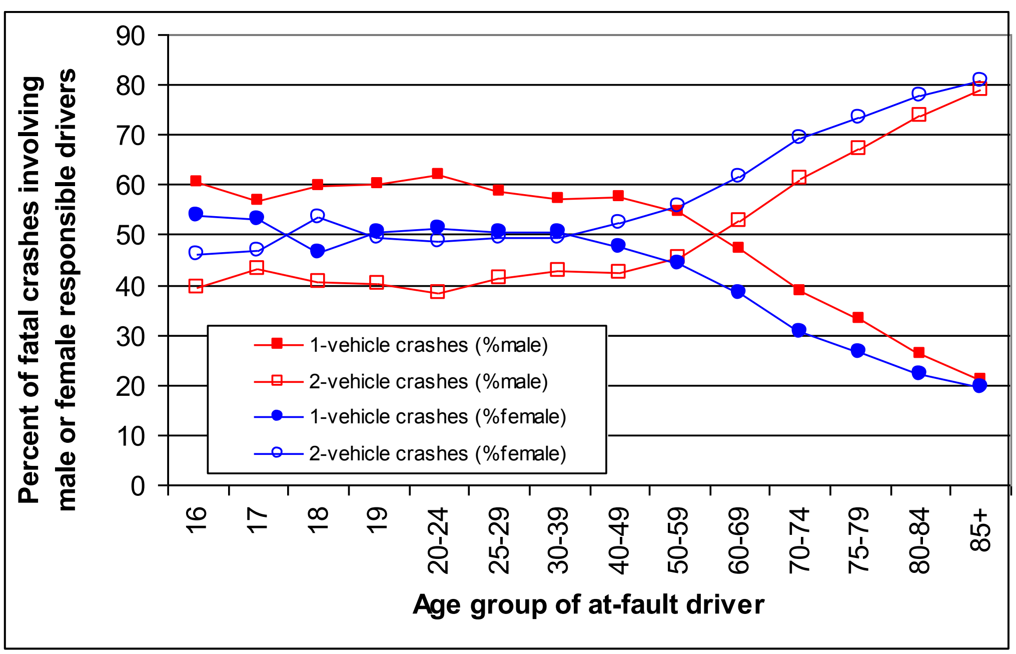

Figure 2 Driver Age and Gender Responsibility in Causing Single- and Two-Passenger Vehicle Fatal Crashes, 2001-2003

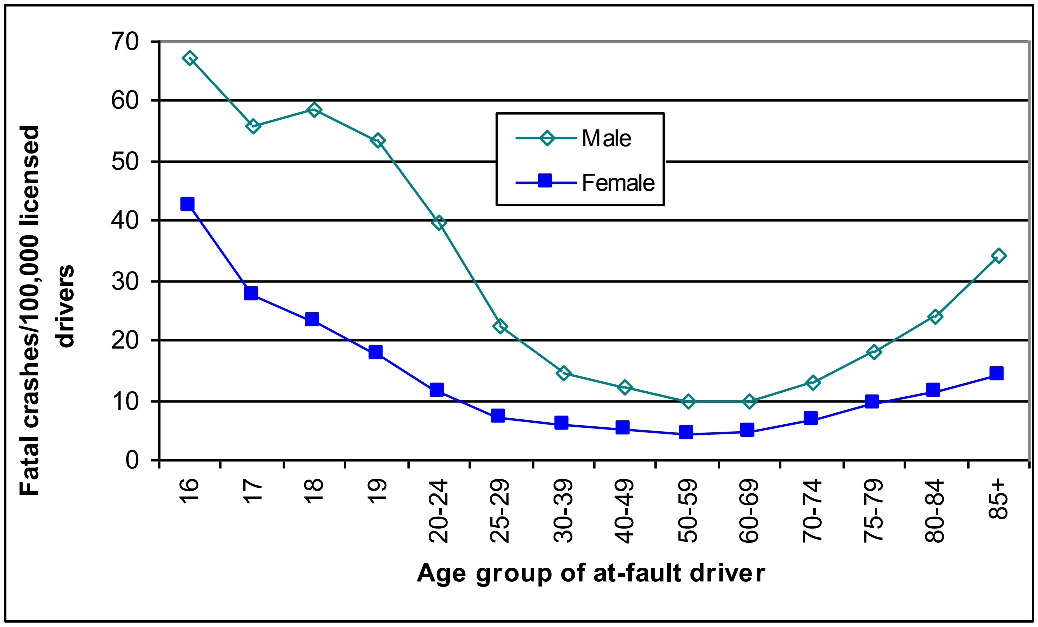

Figure 3 Fatal Crashes per 100,000 Licensed Drivers for Single or Two Passenger Vehicle Crashes for Which Drivers were Likely Responsible, 2001-2003

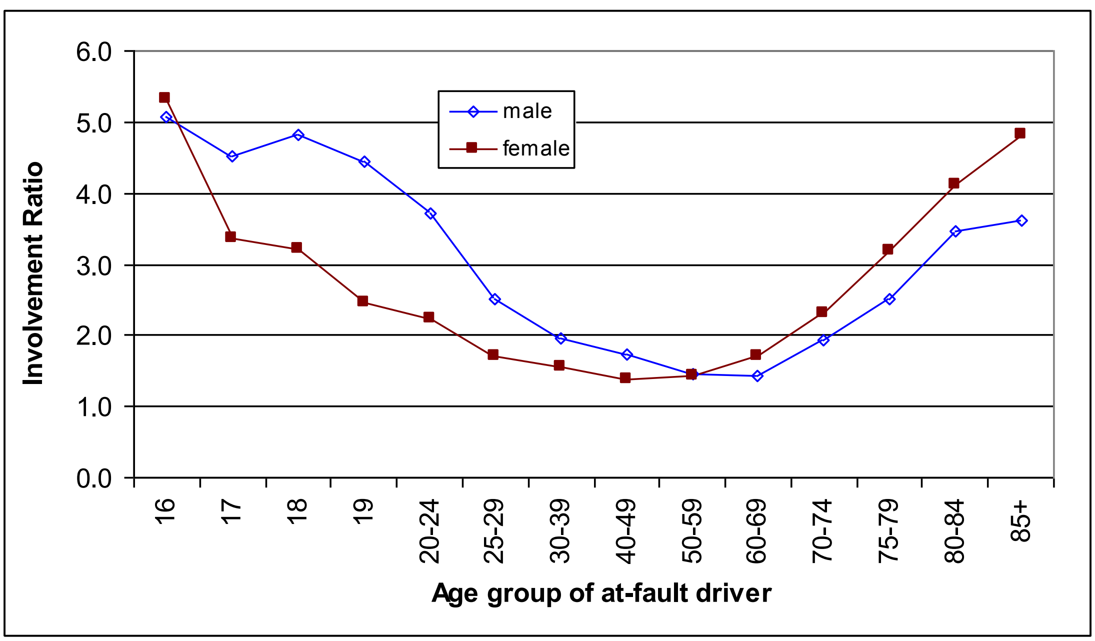

Figure 4 Driver Involvement Ratio in Single and Two-Passenger Vehicle Crashes for Which Drivers were Likely Responsible, 2001-2003

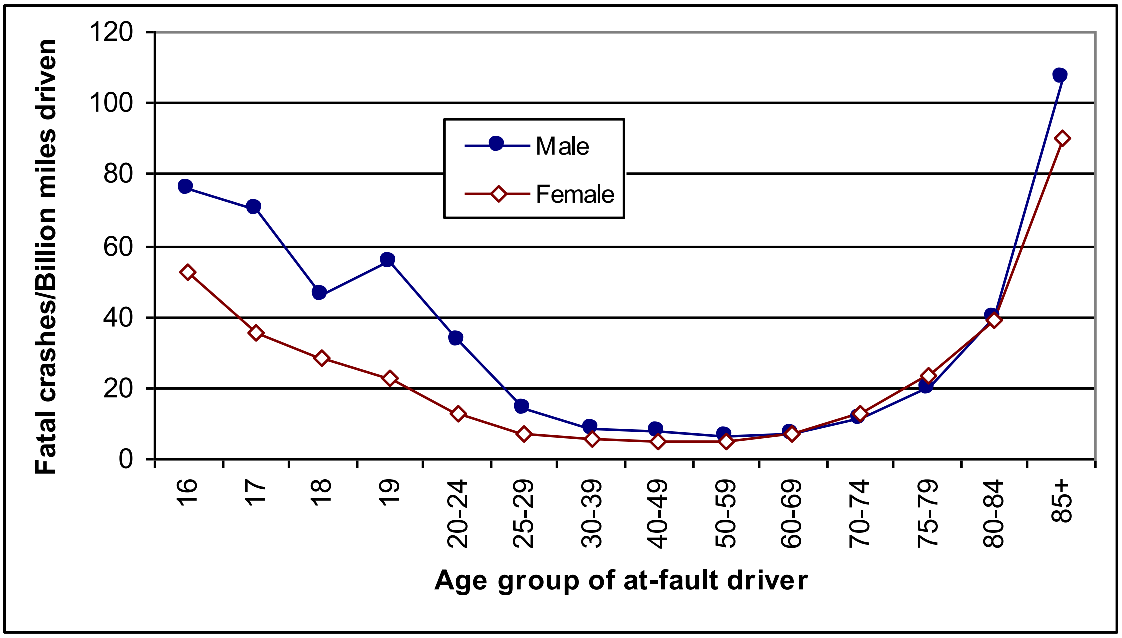

Figure 5 Single and Two-Passenger Vehicle Fatal Crashes per Billion Miles of Travel for Which Drivers were Likely Responsible, 2001-2003

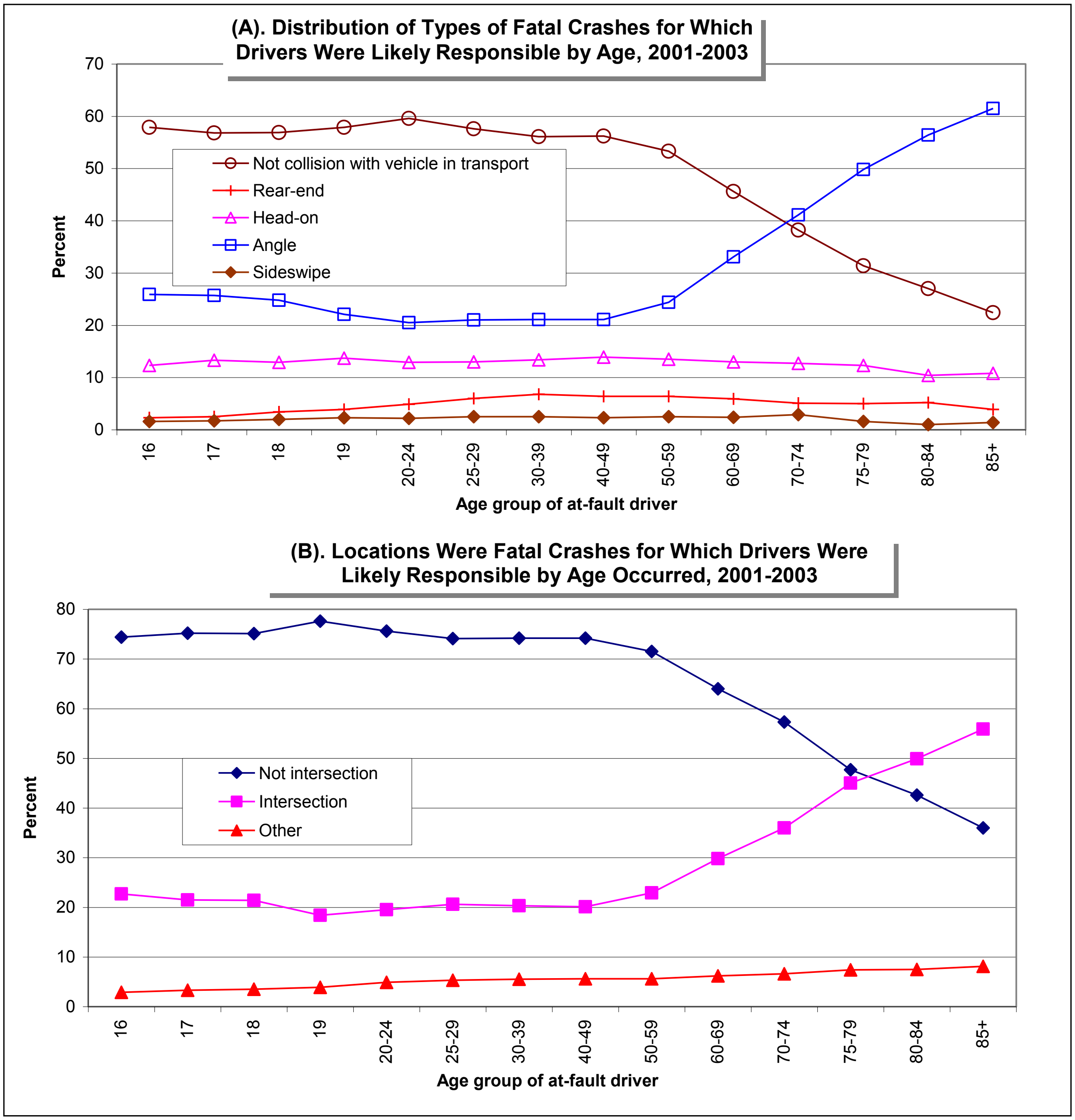

Figure 6 Types of Fatal Crashes Due to Driving Errors by Age of Driver Likely Responsible, 2001-2003

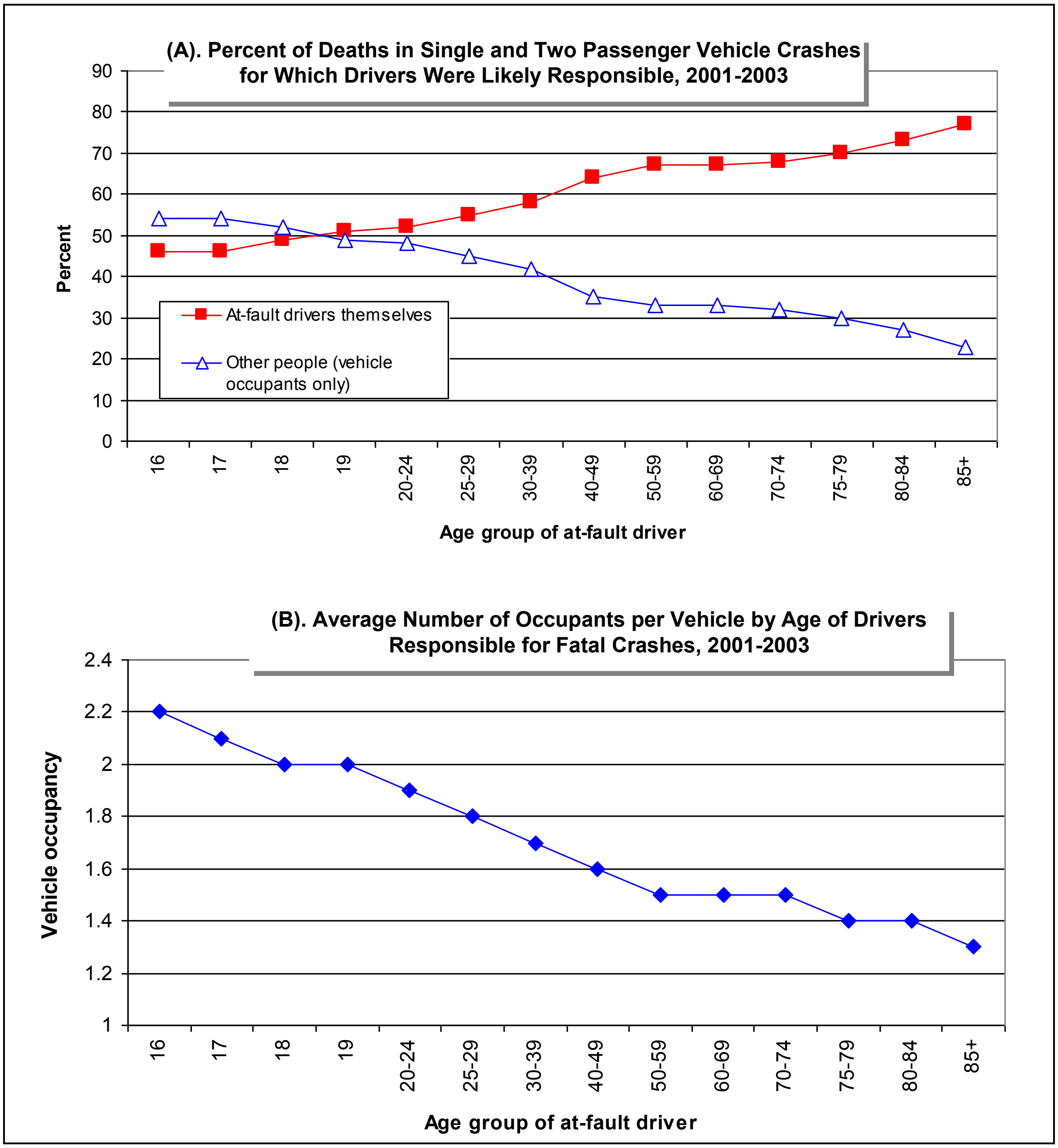

Figure 7 Drivers Responsibility in Deaths of Vehicle Occupants and Average Occupants per Vehicle of Responsible Drivers, 2001-2003