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ANALYSIS OF ACCIDENT RATES BY AGE, GENDER, AND TIME OF DAY BASED ON THE 1990 NATIONWIDE PERSONAL TRANSPORTATION SURVEY

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FINAL REPORT

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16. Abstract

Passenger-vehicle travel data from the 1990 Nationwide Personal Transportation Survey (NPTS) are combined with accident data from the 1990 Fatal Accident Reporting System (FARS) and the 1990 General Estimates System (GES) to produce accident involvement rates per vehicle-mile of travel. The same data sources are also used to generate rates per driver and per capita. Analyses are conducted according to the age and gender of the driver for fatal involvements, injury involvements, and all police-reported accidents. Elevated mileage-based rates of fatal involvements were observed for drivers 16-19 and 75 and over. The youngest drivers had 3.0 times the overall risk of fatal involvement per mile driven, while the oldest drivers experienced 3.8 times the overall risk. Considering accidents of all levels of severity, drivers 16-19 had the highest rate per mile in 1990, experiencing 3.3 times the risk of drivers of all ages. Drivers 75 and older recorded a rate 2.0 times the overall.

Gender-related differences were observed in the 1990 accident involvement rates. Per mile driven, men had about 1.5 times the risk of women of experiencing a fatal accident. However, the difference in the fatal rate between men and women was most extreme among the younger age groups, and by age 60, the rates for men and women were essentially identical. For non-fatal accidents, a different picture emerged. Per mile driven, women were found to have a 26% higher injury involvement rate and 16% higher rate in all police-reported accidents compared to men. Women had higher rates of non-fatal accidents than men the same age for every age group 25 and over.

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Executive Summary

Every seven or so years, the Nationwide Personal Transportation Survey (NTPS) is conducted to collect data on the type and amount of personal travel that occurs in the United States. The most recent NPTS was conducted in 1990 by Research Triangle Institute under the sponsorship of the Federal Highway Administration and four other agencies of the U.S. Department of Transportation. The random sample survey was carried out by means of telephone interviews. Respondents provided detailed information on all personal trips they made over a particular 24-hour period. This information included the purpose, time of day, mileage distance, and means of transportation for each trip. Weighting the raw data in the NPTS file yields national, annual estimates of personal travel.

This report uses the 1990 NPTS data to calculate accident involvement rates in passenger vehicles. The objective is to compare the risk of accident involvement among different groups of people, defined by age and gender. Risk is measured by calculating the number of collisions per some unit of exposure. NPTS supplies three measures of exposure that are used in this report. The primary measure is vehicle-miles of travel. A mileage-based rate is calculated for a group by dividing the number of involvements they experienced by the number of miles they drove. Mileage-based rates directly assess risk while driving. The two other measures of exposure used are number of licensed drivers and number of persons. Calculating rates per driver and per capita allow one to assess a group's contribution to the overall traffic accident problem. Groups that drive relatively few miles will have a relatively low accident rate per driver, and groups with a low percentage of licensed drivers will have a relatively low rate per capita, compared to other groups with the same risk per mile.

The accident data come from two sources. The Fatal Accident Reporting System (FARS) supplies data on all fatal accidents occurring on public roads in the U.S. The source for accidents of all levels of severity is the General Estimates System (GES), a probability-based sample of police-reported accidents in the U.S.

When accident rates are calculated per mile driven, elevated rates are observed among the youngest and oldest drivers. For example, drivers 16-19 had 3.0 times the overall risk of fatal involvement, and drivers 75 and over had 3.8 times the overall risk in 1990. Considering all police-reported accidents, teenage drivers had 3.3 times the overall risk, and the oldest drivers had 2.0 times the overall risk per mile.

When other measures of exposure are used, however, a different view of the elderly emerges. Because this group drives relatively few miles each year per person, their fatal involvement rate per licensed driver is only slightly above the overall rate. Furthermore, because a relatively low percentage of people over 74 have driver licenses at all, their per capita fatal involvement rate is lower than the overall rate. For non-fatal accidents, the per driver and per capita rates for this age group are even lower relative to younger people. Thus, people 75 and over experience a high risk of accident involvement when they drive, but they are involved in a relatively low number of accidents because their driving is limited relative to younger people.

Analyses are also conducted according to the gender of the driver. Per mile driven, men had about 1.5 times the risk of women of experiencing a fatal accident

in 1990. The difference in rates between men and women the same age was most pronounced among the younger age groups. By age 60, the fatal rates for men and women were essentially the same. In contrast, women were found to have a 26% higher injury involvement rate and a 16% higher rate in all police-reported accidents per mile driven compared to men. Women had higher rates of non-fatal accidents than men the same age for every age group 25 and over.

NPTS travel data contain the starting time and duration in minutes of every trip. By defining daytime as 6 AM to 9 PM and nighttime as 9 PM to 6 AM, trip mileage may be classified as occurring during the day or at night. By categorizing accidents in a similar manner, daytime and nighttime rates per mile driven can be calculated. In general, the risk of accident is higher at night than during the day. Per mile driven, the nighttime fatal involvement rate for drivers of all ages was 4.6 times the daytime rate. The difference varied with age of the driver, however. Among drivers 20-24, the nighttime fatal rate was 6.1 times the daytime rate, but among drivers 75 and over, the nighttime rate was only 1.1 times the daytime rate.

Comparisons are also made using the 1983 NPTS, the last year the survey was conducted. Comparing 1983 and 1990 rates provides an encouraging view of traffic safety trends in the 1980s. Passenger vehicle travel increased dramatically, rising 41% between the two years, but the rate of accidents per vehicle-mile travelled declined. The fatal involvement rate dropped 21%, the injury involvement rate fell 34%, and the rate of involvement in all police-reported accidents declined 23%. Lower accident rates were enjoyed by drivers of all ages and by men as well as women.

Contents

Tables

Figures

1 Introduction

In evaluating the contribution of different factors to traffic safety issues, two types of information are useful. One is prevalence and the other is risk. Prevalence is simply the proportion of accidents involving a particular factor, such as nighttime or an alcohol-involved driver. Countermeasures aimed at a factor associated with a large proportion of accidents have greater potential benefit than those aimed at something that occurs only rarely. Risk is the likelihood of experiencing a collision involving a particular factor per unit of exposure to that factor. The identification of high-risk factors is also useful when determining where to channel collision-reduction efforts.

There are different measures of exposure to accidents, each more suited to particular purposes. In this report, rates are calculated for groups of people according to three different measures of exposure: vehicle-miles of travel, number of licensed drivers, and number of people. The rate that most directly reflects risk is the mileage-based rate. It is calculated by dividing the number of accidents experienced by drivers in the group over the course of a year by the number of miles that group drove in the same year. The second type of rate is the licensed driver rate. This is calculated by dividing the number of driver involvements in a group by the number of licensed drivers in that group. The third type of rate is the per capita rate, calculated by dividing the number of driver involvements in a group by the total number of people in the group.

These three different rates yield different information. If one is interested in the risk of accident involvement once a person is behind the wheel of the car, the mileage-based rate should be used. Sometimes when comparing groups, however, one wants a measure of exposure that combines the risk per mile with the amount that people drive. Two groups of drivers may have the same involvement rate on a per-mile basis, but the group that drives fewer miles per person will have the lower rate per driver. In this sense, the licensed driver rate combines the risk per mile and the average number of miles per driver,

$$\frac{\text{risk}}{\text{mile}} \times \frac{\text{miles}}{\text{driver}} = \frac{\text{risk}}{\text{driver}} .$$

Similarly, the per capita rate includes non-drivers (unlicensed people) as well as licensed drivers, so the per capita rate combines the risk per mile, miles per driver, and licensed drivers per capita,

$$\frac{\text{risk}}{\text{mile}} \times \frac{\text{miles}}{\text{driver}} \times \frac{\text{drivers}}{\text{capita}} = \frac{\text{risk}}{\text{capita}} .$$

Of the three types of rates, the mileage-based rate most directly assesses risk because it reflects the likelihood of experiencing an accident when actually driving.[1] The licensed driver and per capita rates are more useful from a public health standpoint, where the contribution of a group to the overall problem is often of interest. For example, expressing risk per capita allows the comparison of disparate phenomena, such as traffic fatalities, homicides, and cancer deaths.

[1]Of course, the risk of accident involvement per mile is not constant. Risk varies from mile to mile with factors such as road class, light condition, rural/urban, and traffic density. Some of these differences will be discussed later in this report.

In this report, exposure data derived from the 1990 Nationwide Personal Transportation Survey (NPTS) are combined with data from two national accident files to produce rates of driver involvements in accidents. Three different levels of accident severity are considered, and rates are presented according to driver age and gender and time of day. While 1990 rates are the main emphasis, comparisons are made with rates from 1983, the previous NPTS data year.

1.1 Data Sources

The purpose of the NPTS is to provide comprehensive and nationally representative data on personal travel in the United States. The survey gathered information on all types of personal trips conducted for any purpose, using any mode of transportation except boat or ship. The 1990 NPTS was conducted by Research Triangle Institute (RTI) under the sponsorship of the Federal Highway Administration and four other agencies of the U.S. Department of Transportation. This marks the fourth appearance of the NPTS; earlier surveys were conducted in 1969, 1977, and 1983.

RTI contacted a random sample of households by telephone and collected information on all trips taken by household members during a designated 24-hour period, called the travel day (RTI, 1991). Household members over age 13 were interviewed directly, while older members reported travel information for children 5 to 13 years old. Respondents provided information such as the purpose, time of day, mileage distance, and means of transportation for each trip. All personal trips, including trips to and from work, were reported in the survey. Trips made as an essential part of work were excluded, but respondents estimated their average weekly work travel.

The NPTS survey was conducted from March 2, 1990 through March 24, 1991. The household response rate was 84%, and within survey households, trip information was collected for 87% of eligible respondents (household members 5 and older). Sample coverage included all 50 states and the District of Columbia. The sample was stratified according to geography, time of year, and day of week to ensure uniform data collection. The completed survey contains records for 22,317 households, 48,385 persons, and 149,546 travel day trips. Weight factors applied to the raw data in the NPTS file yield national, annual estimates of personal travel.

The source of fatal accident data in this report is the 1990 Fatal Accident Reporting System (FARS). FARS is a census of motor-vehicle accidents involving at least one fatality and occurring on public roads in the United States. The states report data for FARS to the National Highway Traffic Safety Administration (NHTSA) in a standard format. NHTSA then constructs the FARS data file for each year.

Also developed by NHTSA, the General Estimates System (GES) is a probability-based sample of police-reported accidents of all levels of severity. The data for GES are coded from police reports. Each state has its own accident reporting system, and data elements vary from state to state. One purpose of GES is to provide a reasonably large, nationally representative set of accident data in a common format. This report uses GES for data on injury accidents and accidents of all severities.

1.2 Accident Rates

This report compares 1990 accident involvement rates for drivers by age and gender. The following section contains mileage-based rates by age group and by single year of age. Section 3 presents per driver and per capita rates by age and compares them to the mileage-based rates. Section 4 compares rates per mile for men and women, and Section 5 expands the analysis to daytime versus nighttime rates. Section 6 discusses some of the changes in travel and accident rates between 1983 and 1990. The report concludes with a discussion of the contribution of different groups of drivers to the overall problem of motor-vehicle accidents.

2 Mileage-Based Accident Rates

This section contains 1990 involvement rates based on miles driven. The procedure is to divide the number of 1990 involvements by drivers of a particular age by the total number of miles driven in 1990 by all persons the same age. The rates pertain only to travel and involvements in passenger vehicles (cars, vans, pickup trucks, utility vehicles). Involvements are categorized according to the maximum injury severity sustained by *any* person involved in the accident. FARS data supply the number of fatal involvements, that is, driver involvements in accidents where at least one person died. GES data are used for injury involvements (including fatal injuries) and involvements of all severities (including property-damage-only accidents).

Driver mileage data come from two parts of the NPTS dataset. Personal travel was derived from driver-reported trips in the NPTS travel day file. Travel made as an essential part of work was derived from an estimate in the person file of weekly miles driven as part of work. Personal and work travel were summed, and the appropriate weights were applied to arrive at annual travel estimates. Personal miles account for about 87% of the NPTS passenger vehicle travel.

2.1 Rates by Age Group

Overall there were 3.03 fatal involvements per 100 million vehicle-miles of travel (VMT) in 1990 (Table A-1). The youngest age group, drivers 16-19, had a rate of 9.21. The rate declined with each older age group to a low of 1.75 for the 40-44 group. The rate then rose with each age group, reaching a high of 11.53 for drivers 75 and older (Fig. 2-1). Based on miles driven, teenagers had 3.0 times the risk of being in a fatal accident compared to all drivers, and persons over 74 had 3.8 times the overall risk.

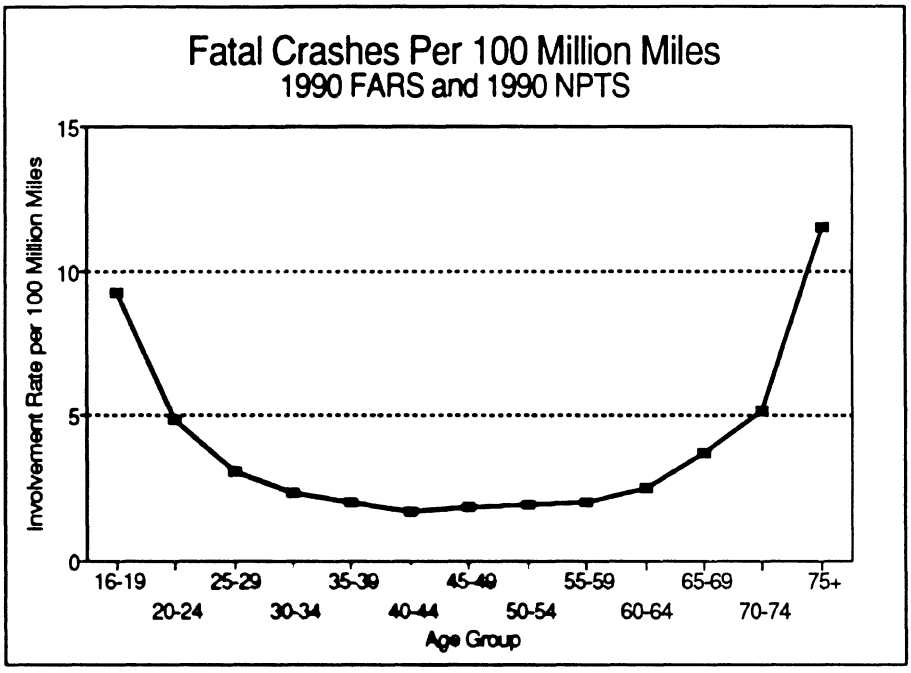

Figure 2-1

Similar rate curves are shown for injury involvements and all police-reported accidents in Figure 2-2. In 1990 there were 2.04 injury involvements per million VMT (Table A-2) and 6.08 involvements of all severities per million VMT (Table A-3). These rate curves share the general U-shape of the fatal curve, with one notable difference. While all three curves rise among the older age groups, the rate for the oldest group does not exceed the rate for the youngest group among all involvements or injury involvements, as it does among fatal involvements. For both injury and all accidents, teenagers had 3.3 times the risk of involvement compared to drivers overall, while drivers 75 and older had 2.0 times the risk of involvement. This pattern is likely related to the increased probability of fatality among the elderly given a crash of a particular severity (Evans, 1988; Pike, 1989).

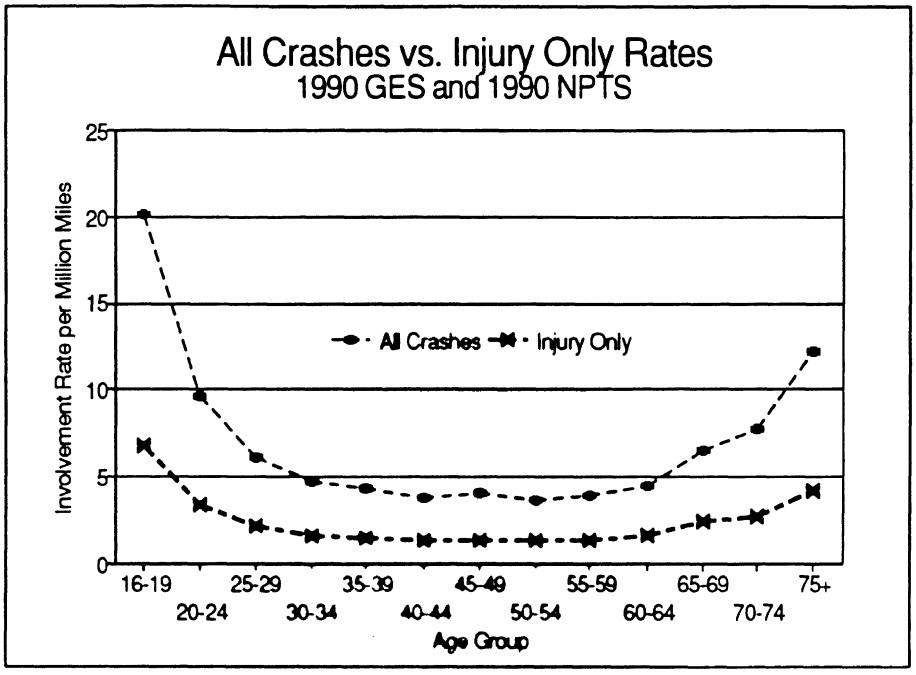

Figure 2-2

Figure 2-3 shows the rate curves for fatal, injury, and all involvements together. All the rates are plotted per million miles, with injury and all involvements plotted against the left y-axis and fatal involvements against the right. The graph reinforces the general shape shared by these curves, with elevations at either end of the age spectrum.

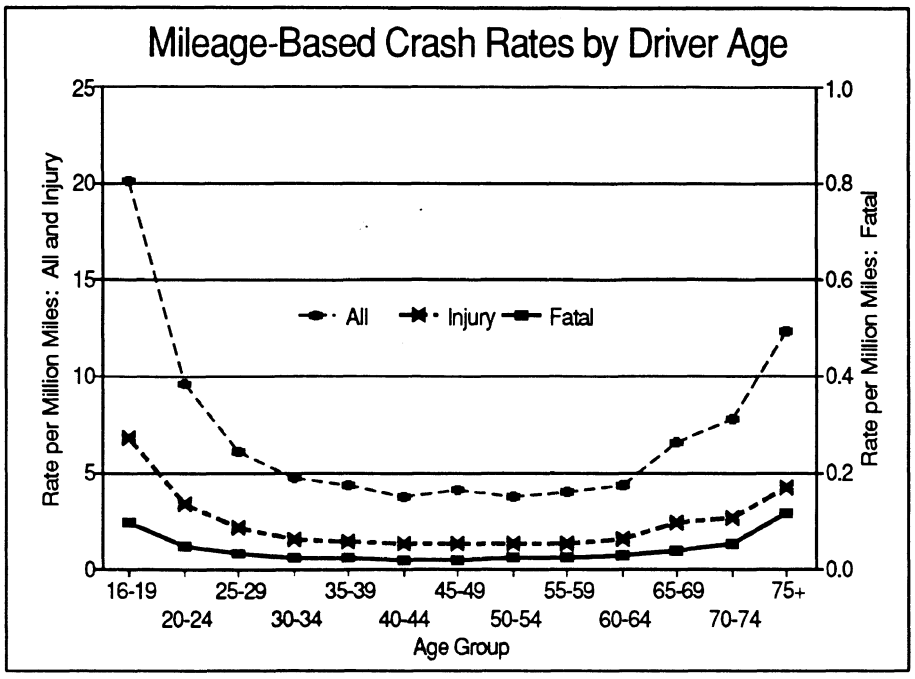

Figure 2-3

2.2 Rates by Single Year of Age

Figure 2-4 is a plot of fatal rates by single years of age, from age 16 to age 75. The two rightmost ticks on the x-axis represent ages 76-79 and age 80 and over. The ends of this curve are steeper than the curve in Figure 2-1, which indicates even higher rates among the very youngest and oldest drivers compared to their aggregate rates. For example, the rate for the 16-19 group was 9.2 involvements per 100 million VMT, but drivers age 16 had a rate of 16.7, close to twice the rate of the teenage group as a whole. The rate was 12.5 for drivers age 17, 7.9 for age 18, and 7.2 for age 19. At the other end of the age spectrum, the fatal rate rises from 5.4 for drivers age 75, to 9.5 for age 76-79, to 19.3 for drivers 80 and above.

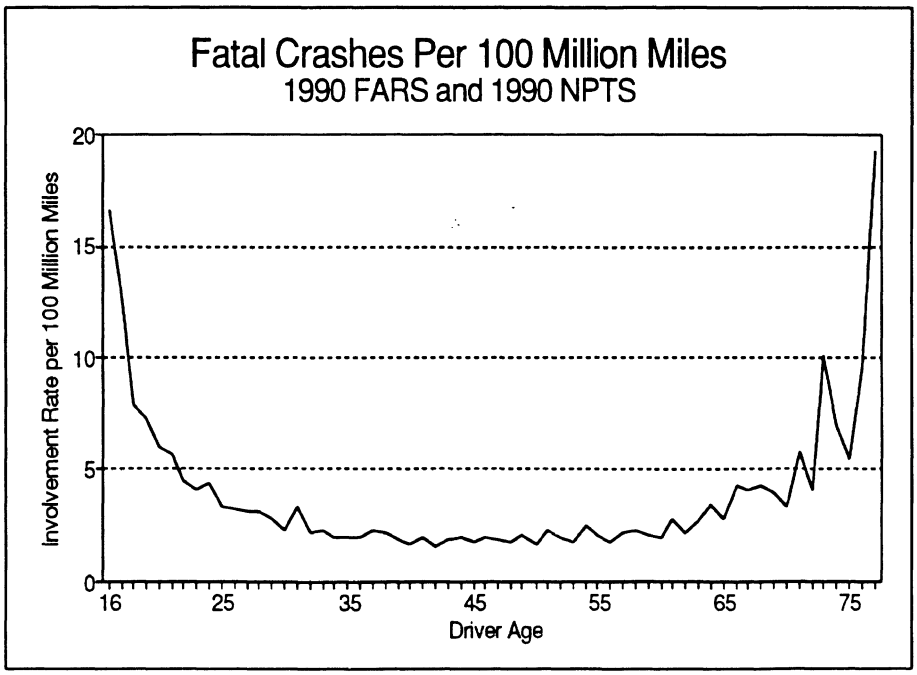

Figure 2-4

Injury rates show the same elevation among the youngest drivers, but not so much among the oldest (Fig. 2-5). The overall teenage rate was 6.7 involvements per million VMT. Drivers age 16 had a rate of 14.7, which is 2.2 times higher than for all teenagers. The rate was 10.2 for drivers age 17, 5.3 for age 18, and 4.7 for age 19. Drivers age 80 and over had a rate of 6.4, which is 3.1 times the rate for drivers of all ages. In contrast, the rate for drivers age 16 was 7.2 times the overall rate.

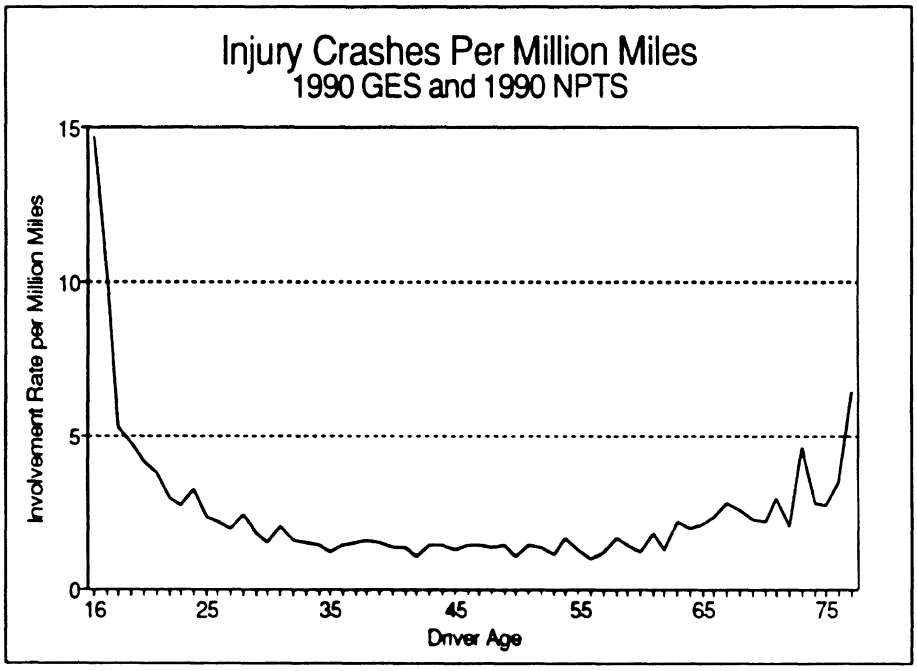

Figure 2-5

The rate curve for all police-reported crashes (Fig. 2-6) is very similar to the injury rate curve. The rate for all drivers was 6.1 involvements per million VMT. Drivers age 16 had a rate of 43.2, which is 7.1 times the overall rate. Drivers age 17 had 5.0 times the overall rate. The oldest drivers, age 80 and above, had a rate 2.9 times the overall.

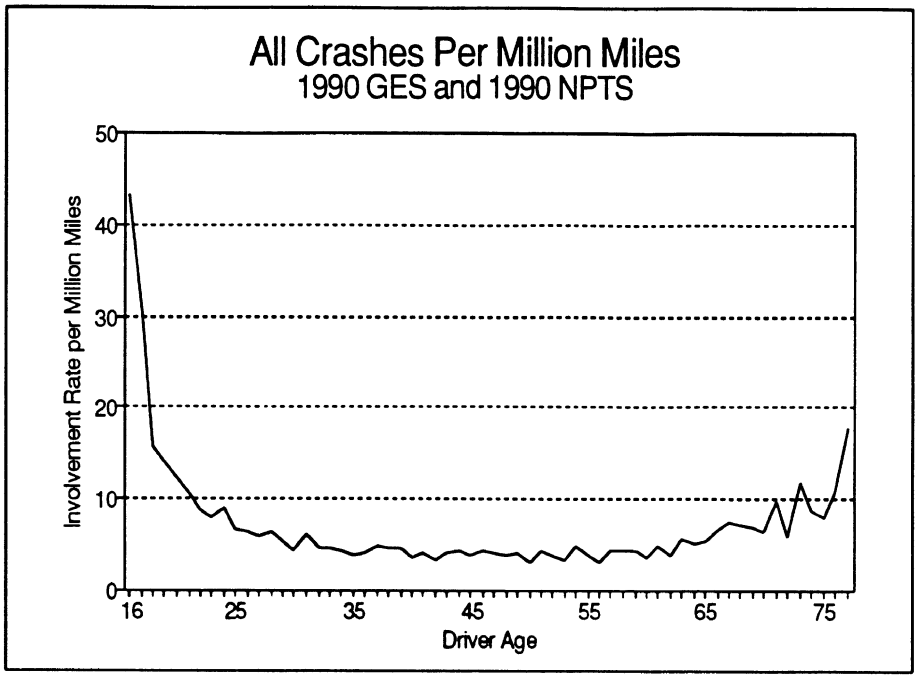

Figure 2-6

3 Comparison of Accident Rates by Mileage, Licensed Drivers, and Population

This section presents involvement rates per licensed driver and per capita. Both the estimated number of licensed drivers and the estimated number of persons were derived from the NPTS person file.[2] Each respondent to the survey was asked if they had a license, and this information was inflated to produce national estimates of the number of license holders. Similarly, the weighted number of respondents over age 15 in NPTS yields an estimate of the total national driving-age population. Rates were derived by dividing the number of passenger-vehicle involvements by drivers of an age group by the number of licensed drivers or the total number of people in that age group. Licensed driver and per capita rates by age are compared to the mileage-based rates for each of the three levels of accident severity.

3.1 Fatal Rates Per Licensed Driver and Per Capita

Figure 3-1 shows the number of fatal involvements per 100,000 licensed drivers. The curve is similar to the mileage-based fatal curve, except there is only a modest upturn in the rate for older drivers. Overall there were about 30 fatal involvements per 100,000 drivers in 1990 (Table A-4). Teenage drivers had the highest rate with 66.2. The rate then declined with each age group, reaching a low of 18.1 for drivers 55-59, before rising again, reaching a rate of 35.3 for drivers 75 and over. Teenage drivers had a risk of involvement that was 2.2 times the overall risk, while drivers 75 and above had a risk 1.2 times the overall.

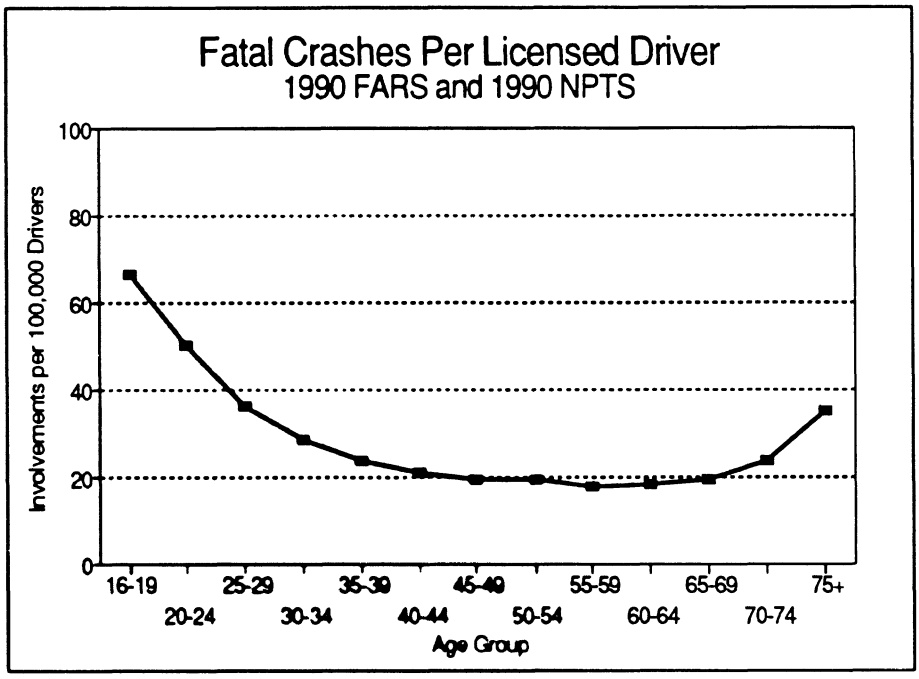

Figure 3-1

[2]Alternative sources of licensed driver and population data were considered. The Federal Highway Administration (FHWA) publishes state-reported numbers of licensed drivers each year in *Highway Statistics*. One difficulty with these data is that the states use different age group brackets in their reporting, which necessitates disaggregation of the data into common age groups. Another problem is

Fatal involvements per 100,000 population are plotted in Figure 3-2. This curve is less steep at the low end of the age range than the licensed driver curve. Teenagers experienced 45.6 involvements per 100,000 population, and the rate decreased only to 44.2 for persons 20-24 (Table A-5). Thereafter the rate decreased more swiftly, to a low of 16.3 for persons 55-64. The rate then increased slightly for the older age groups, up to 22.2 for persons over age 74. Teenagers had a rate 1.7 times the overall rate of 26.1 involvements. In contrast, the 75 and older group experienced a lower risk of fatal involvements than persons of all ages combined, with a rate 0.85 times the overall rate.

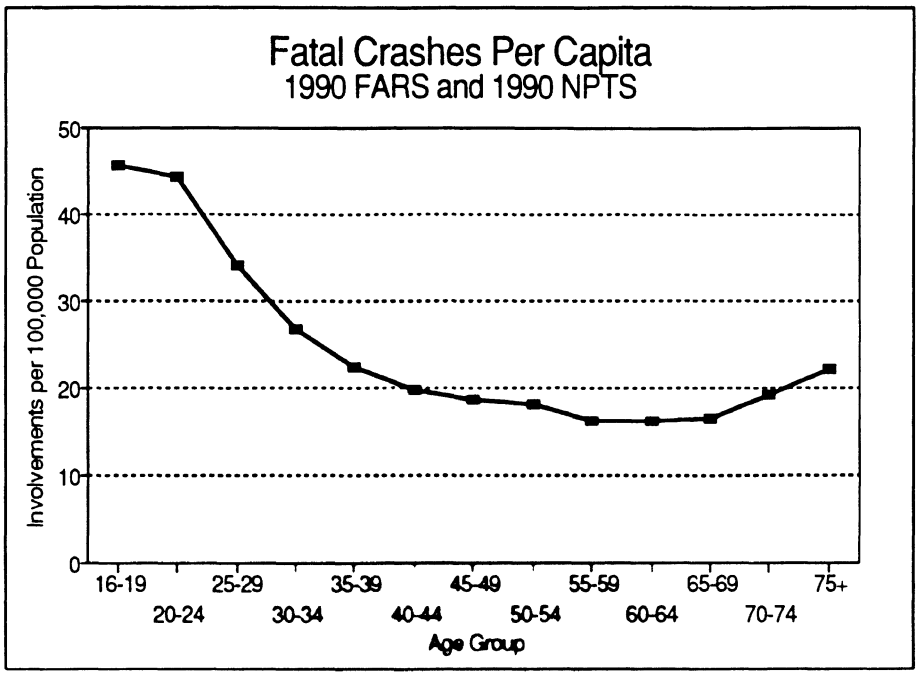

Figure 3-2

Figure 3-3 on the following page depicts three fatal rate curves, using mileage, population, and licensed drivers as the bases for exposure. This figure emphasizes that per capita and per licensed driver rates are highest among the youngest drivers, while the mileage rate is highest among the oldest drivers. The differences among the three curves reflect age-related differences in licensure rate and average annual mileage per driver.

The top curve in Figure 3-4 shows the percent of licensed drivers out of all people in each age group, based on NPTS estimates. Both the youngest and oldest age groups have low rates of licensure. About 69% of teenagers and 63% of people over age 74 are licensed, while the licensure rate approaches 95% for people in their

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that these data likely overestimate the number of licensed drivers due to people legally or otherwise holding a license in more than one state. This is not a concern with the NPTS licensing data. The obvious source of population estimates is the 1990 U.S. Census data. The NPTS weighting procedures adjusted the raw survey data to match the Census Bureau's March 1990 Current Population Survey, but this was done at the household level, not the person level. It happens that the weighted number of persons in NPTS is slightly lower than Census Bureau estimates. Likewise, the estimated number of licensed drivers in NPTS is slightly below the FHWA estimates. Because the mileage weights employed in NPTS are based on the person-level weights, use of NPTS mileage data together with outside sources of licensed driver and population data would result in inconsistencies, i.e., mileage estimates would be low relative to the driver and population data, thus mileage-based rates would be relatively high. Therefore, to ensure consistency and minimize data manipulation, NPTS was used as the source of all three types of exposure data

thirties and forties (Table A-6). A similar pattern holds for average annual mileage, plotted on the lower curve in Figure 3-4.[3] Teenagers average slightly over 7,000 miles a year per driver, and drivers 75 and older average just over 3,000 miles a year (Table A-7). Persons 25-44 put on 11,000-12,000 miles a year per driver.

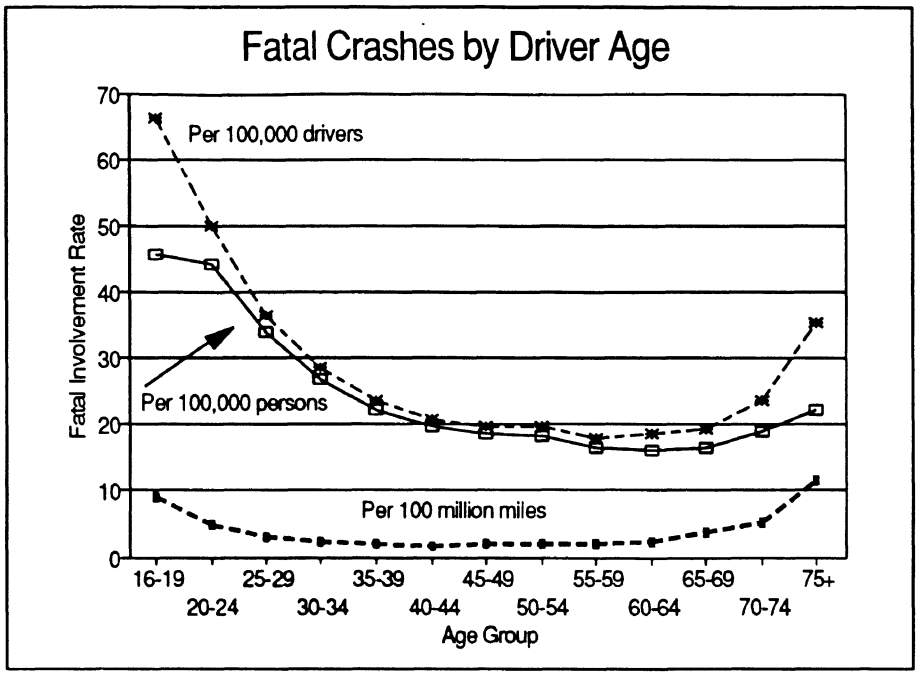

Figure 3-3

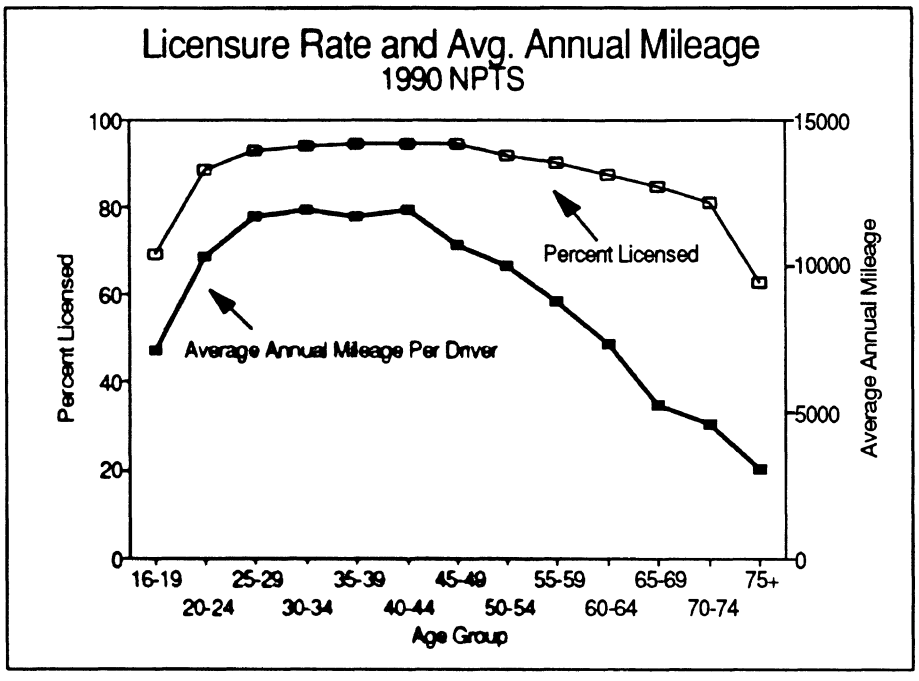

Figure 3-4

[3]Average annual mileage was calculated by dividing the total number of miles driven by *licensed* drivers by the number of licensed drivers. The total number of miles reported by licensed drivers is about 0.3% lower than the total miles for all drivers.

Thus, age-related differences in average annual mileage and licensure rate account for the differences in fatal rates based on different measures of exposure. For example, on a per-mile basis the rate for the oldest drivers (75 and older) is 1.25 times the rate for the youngest drivers (16-19). However, per licensed driver, the oldest drivers have a rate 0.53 times that of the youngest drivers. This is a reflection of their different average annual mileages, 3,055 for the oldest compared to 7,079 for the youngest. The oldest drivers travel only 0.43 times as many miles per year as teenagers, per driver. This is the quotient produced by dividing the two ratios above (0.53/1.25=0.43).

Similarly, differences in licensure rate account for the difference between rates per licensed driver and rates per capita. Per capita, the oldest drivers have a rate 0.49 times that of teenagers, compared to 0.53 times the teenage rate per licensed driver. This quotient is 0.91, which equals the quotient of the licensure rate of the oldest drivers (62.7%) divided by that of the youngest drivers (68.9%).

3.2 Injury and All Rates Per Licensed Driver and Per Capita

Turning now to injury accidents, involvements per licensed driver are shown in Figure 3-5. This curve differs from the fatal curve in that there is virtually no upturn in the older age groups. Drivers 16-19 experienced 4,852 injury involvements per 100,000 drivers, but the rate declines steeply with each older age group, reaching a low of 1,126 for drivers 55-59 and increasing only slightly after that (Table A-8). Teenage drivers had 2.4 times the risk of involvement of all drivers.

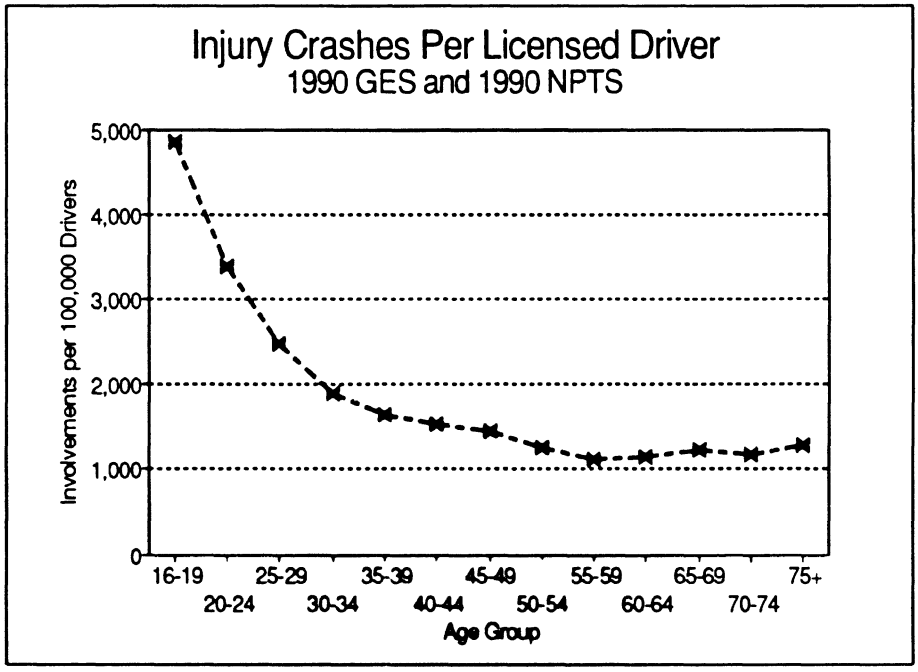

Figure 3-5

Figure 3-6 depicts injury involvements per capita. The involvement rate declines less steeply with each age group than is the case per licensed driver, but the rate continues to decline in the older age categories. Persons 75 and older had the lowest involvement rate of all, with 801 per 100,000 population (Table A-9). Teenagers had a rate of 3,344, which is 4.2 times the rate of the oldest persons.

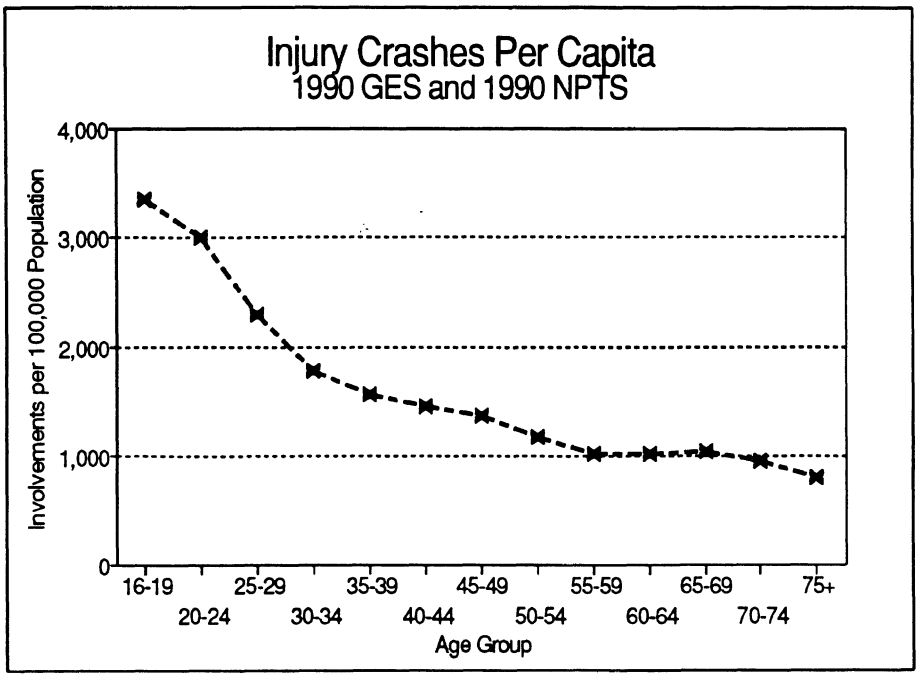

Figure 3-6

Figure 3-7 summarizes the different injury involvement rates per mile, per driver, and per capita. The youngest drivers have the highest involvement rate no matter which of the three measures of exposure is used. However, the mileage curve is essentially U-shaped, reflecting elevated risk at either end of the age spectrum. In contrast, the per driver and per capita curves generally slope down from left to right, indicating greatest risk for young people.

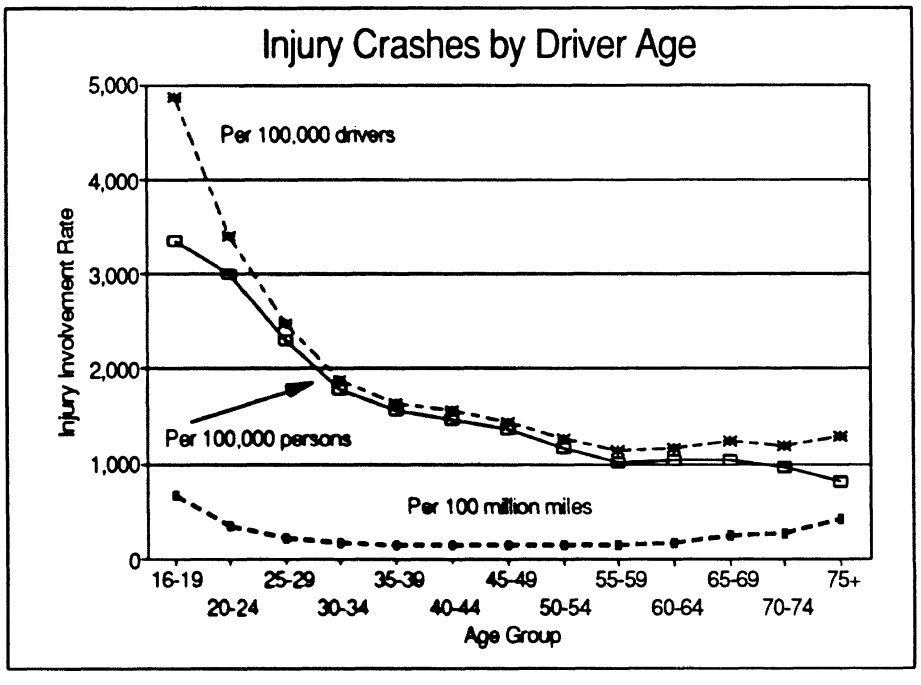

Figure 3-7

Per driver involvements for accidents of all levels of severity (Figure 3-8) show an age pattern similar to injury involvements. Involvements per 100,000 drivers are highest among teenagers with 14,468 (Table A-10). The rate quickly drops with each older age group and essentially stabilizes by age 50. The 60-64 group has the lowest rate of all age groups considered, with 3,252 involvements.

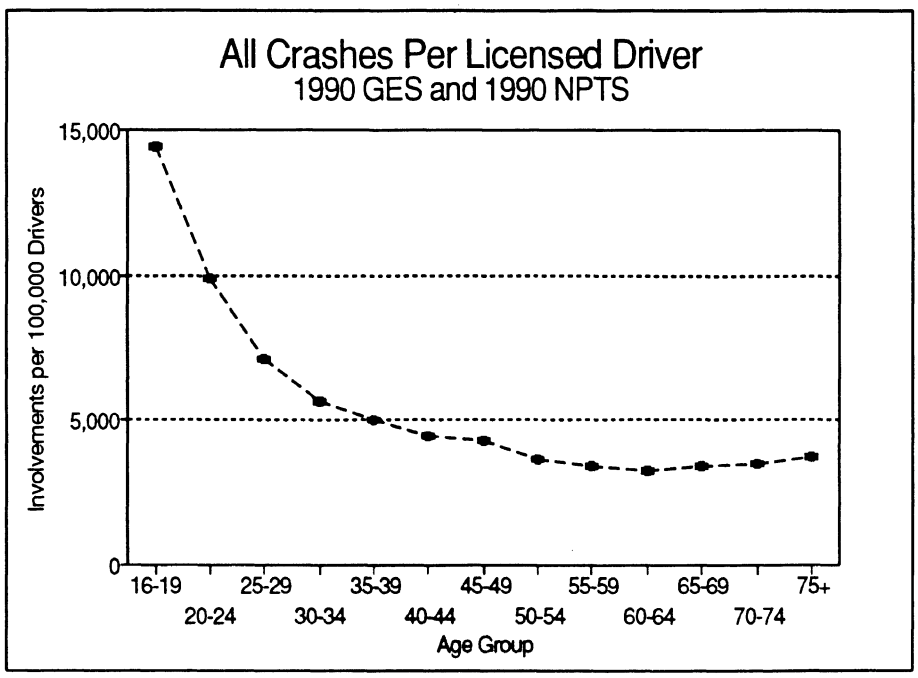

Figure 3-8

The per capita rate curve for accidents of all severities (Figure 3-9) is similar to the injury per capita curve. Involvement rates show a fairly steady decline from 9,971 per 100,000 people for the 16-19 group to 2,350 for the 75 and older group (Table A-11). The risk of involvement per capita for teenagers is 4.2 times the risk for the oldest group.

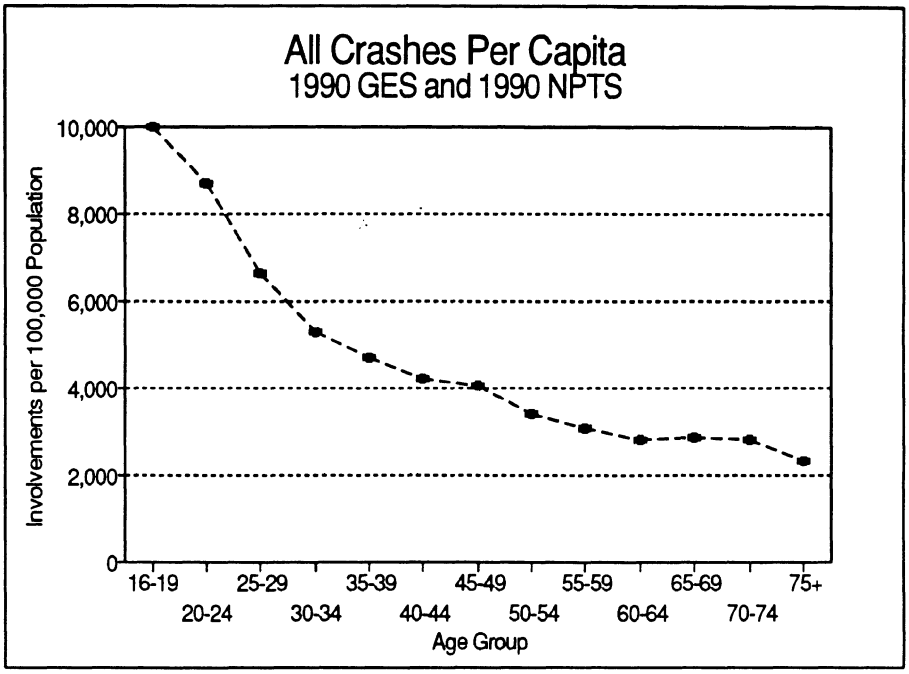

Figure 3-9

Involvement rates in all police-reported accidents per mile, per driver, and per capita are shown in Figure 3-10. Risk of involvement per mile is higher for the youngest drivers and, to a lesser extent, the oldest drivers. Risk per driver and per capita is highest for younger drivers.

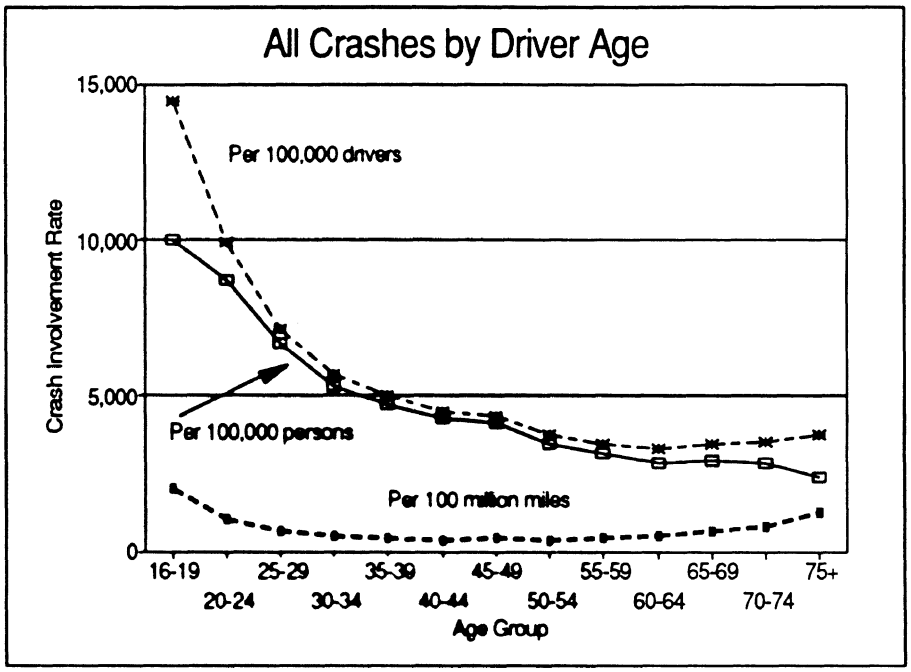

Figure 3-10

The comparison of involvement rates based on three types of exposure illustrates that risk assessment differs depending on the measure of exposure used. People 75 and older are a prime example. On a per-mile basis, they are involved in more fatal accidents than are people of any other age group. Because they drive relatively few miles each year, however, their fatal involvement rate per licensed driver is only slightly above the overall rate. Furthermore, because a relatively low percentage of people that age have driver licenses at all, the per capita fatal involvement rate for people 75 and over is lower than for people of all ages combined. These differences will be discussed further in Section 7.

4 Mileage-Based Rates for Men and Women

In this section, driver involvement rates will be presented per mile driven, and the differences in rates between males and females will be explored. In 1990, men experienced 3.46 fatal involvements per 100 million miles, while women experienced 2.24. Women had higher rates of involvement than men in less severe accidents, however. Women had a rate of 2.32 injury involvements per million miles, while the male rate was 1.85. For all police-reported accidents, the rate for women was 6.54 involvements per million miles and the rate for men was 5.63.

Figure 4-1 represents these differences by depicting relative risk for men and women of being involved in an accident of each of the three levels of severity. In this case, relative risk is calculated by dividing each gender's share of involvements by its share of travel (see Table 4-1). A relative risk of 1.0 indicates no difference in risk of involvement between the group and the overall population. Relative risk values over 1.0 indicate overinvolvement, and values less than 1.0 indicate underinvolvement. For fatal involvements, men had a relative risk of 1.15 and women a relative risk of 0.74. Dividing these two numbers, or, equivalently, dividing the absolute fatal rates listed above, we see than men have 1.55 times the risk of women of being involved in a fatal accident. For injury involvements, however, men are underinvolved, with a relative risk of 0.91, while women have a relative risk of 1.15. Similarly, for all police-reported accidents, men have a relative risk value of 0.94, compared to 1.10 for women. Per mile driven, women have 1.26 times the risk of men of being involved in an injury accident and 1.16 times the risk of men of being in any police-reported accident.

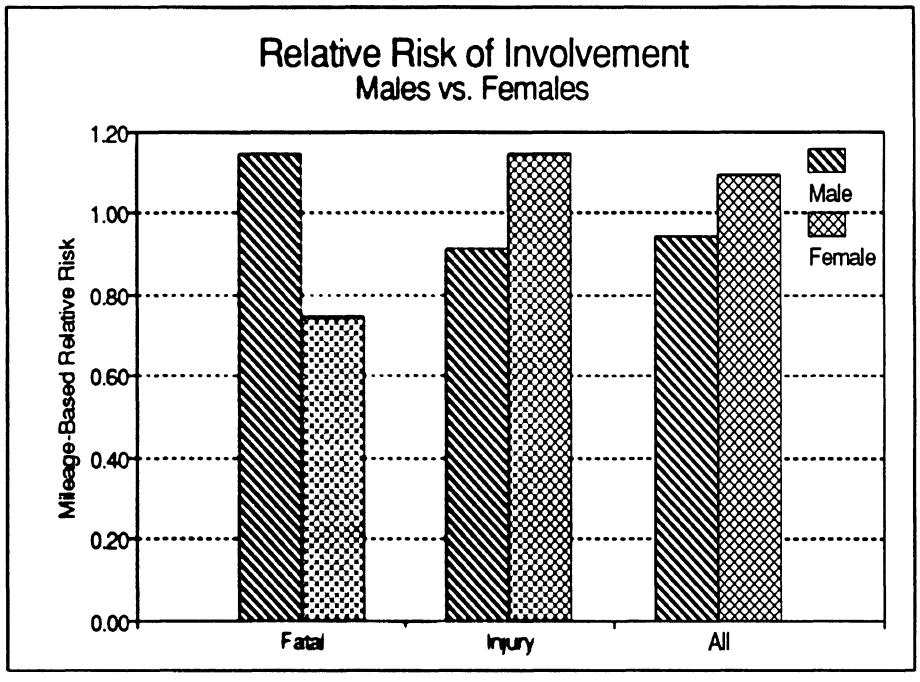

Figure 4-1

4.1 Rates by Age and Gender

Figure 4-2 compares fatal involvement rates for men and women by age group. The male curve is a classic U-shape, with the highest rates belonging to the youngest and oldest age groups. The rate per hundred million miles for those two groups is about the same, with 11.7 for teenagers and 11.3 for the 75 and older group (Table A-12). The female curve shows elevated rates for the younger age groups, but the highest rate by far among women is for the 75 and older group. That group has a rate of 12.2 fatal involvements per 100 million miles, which is 2.1 times the 5.9 rate achieved by teenage females. These differences in the rate curves indicate that the differential risk of fatal involvement between men and women is strongly age dependent. Between age 16 and age 39, men had anywhere from 1.6 to 2.5 times the risk of fatal involvement as did women. Between ages 40 and 59, men had 1.2 to 1.3 times the risk. At age 60 and over there was essentially no difference in the rates for men and women. Men 60 and above had a rate of 4.49, and women had a rate of 4.45.

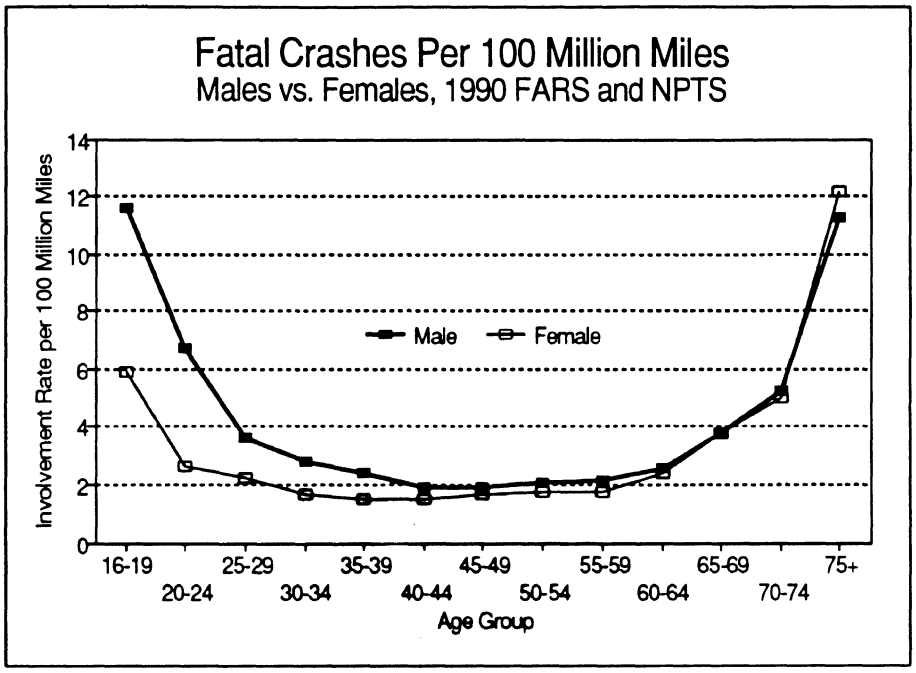

Figure 4-2

Turning now to involvements in injury accidents, we see that the rates for males and females in the 16-19 group were about equal, the rate in the 20-24 group was higher for men, and women had the higher rate in every remaining age group (Fig. 4-3). At age 25 and above, the injury involvement rate in each female age group was 1.2 to 1.8 times the corresponding male rate (Table A-13). For both males and females, the highest injury involvement rates per mile were recorded by the teenage groups.

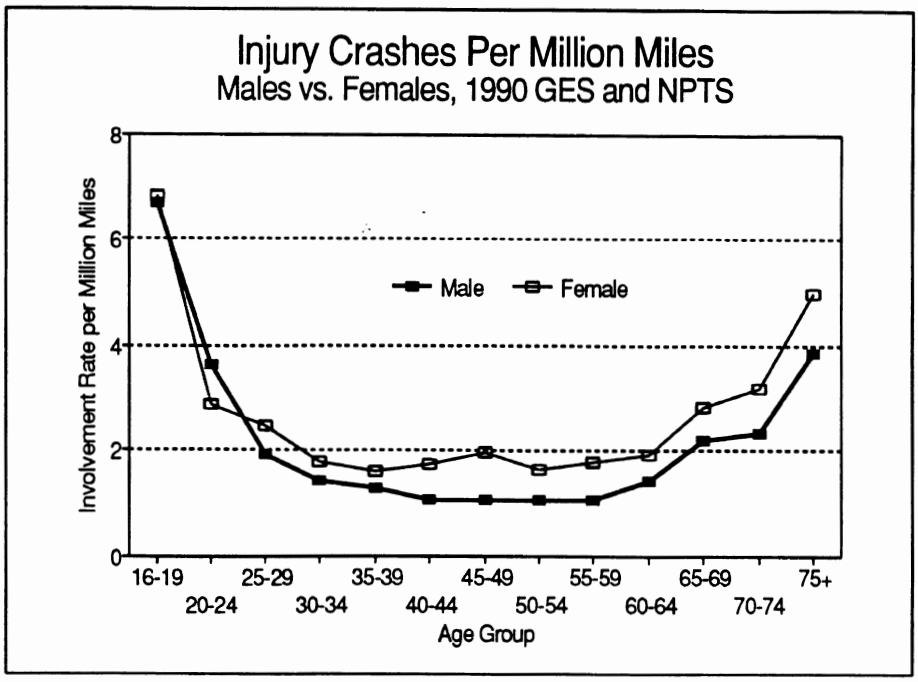

Figure 4-3

The rate curves for involvement in all police-reported accidents (Fig. 4-4) are similar to the injury involvement curves. Males had higher rates below the age of 25, while the rate for women was 1.2 to 1.7 times the corresponding male rate in all age groups 25 and over (Table A-14). Teenagers had the highest rates among both males and females. Among men, the teenage rate was 1.9 times the rate of the 75 and older age group. Among women, the teenage rate was only 1.2 times the 75 and older rate.

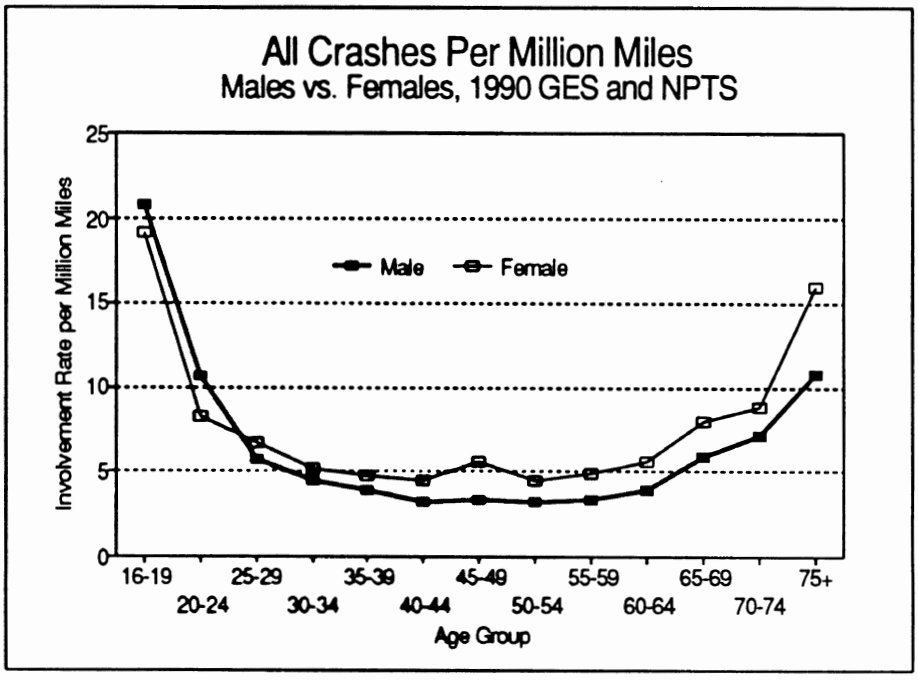

Figure 4-4

4.2 Travel and Licensure by Age and Gender

We have seen that, on a per-mile basis, men have higher rates of fatal involvements than women, while women have higher rates of injury and all involvements. This is illustrated in Table 4-1, which shows the distribution of driver mileage and accident involvements between men and women (unknown cases have been excluded). Men accounted for 63% of the miles driven in 1990, compared to just 37% for women. Male drivers were over-represented in fatal accidents based on their share of the mileage, since they accounted for 72.5% of the involvements. Similarly, women were over-represented in injury involvements and all police-reported involvements.

Table 4-1
Mileage and Accident Distributions by Gender
1990 FARS, 1990 GES, and 1990 NPTS

Travel or Accident Category	Male	Female
Driver Mileage	63.00%	37.00%
Fatal Involvements	72.46	27.54
Injury Involvements	57.56	42.44
All Involvements	59.44	40.56

Travel distributions by age for men and women are plotted in Figure 4-5. In every age group, women drove fewer miles than men, but the magnitude of the difference varied with age. Table A-15 lists the total number of miles driven by men and women and also lists female mileage as a percentage of male mileage for each age group. From age 16 to 24, women logged 79.4% of the mileage of men. This percentage generally decreased with age. Between age 25 and 44, women drove only 60.4% of the miles that men drove, and this declined to just 47.2% for drivers 45 and over. For both men and women, total mileage rose with each age group to peak in the 30-34 group with 146 billion miles for men and 92 billion miles for women. Total mileage decreased with each age group thereafter for both men and women.

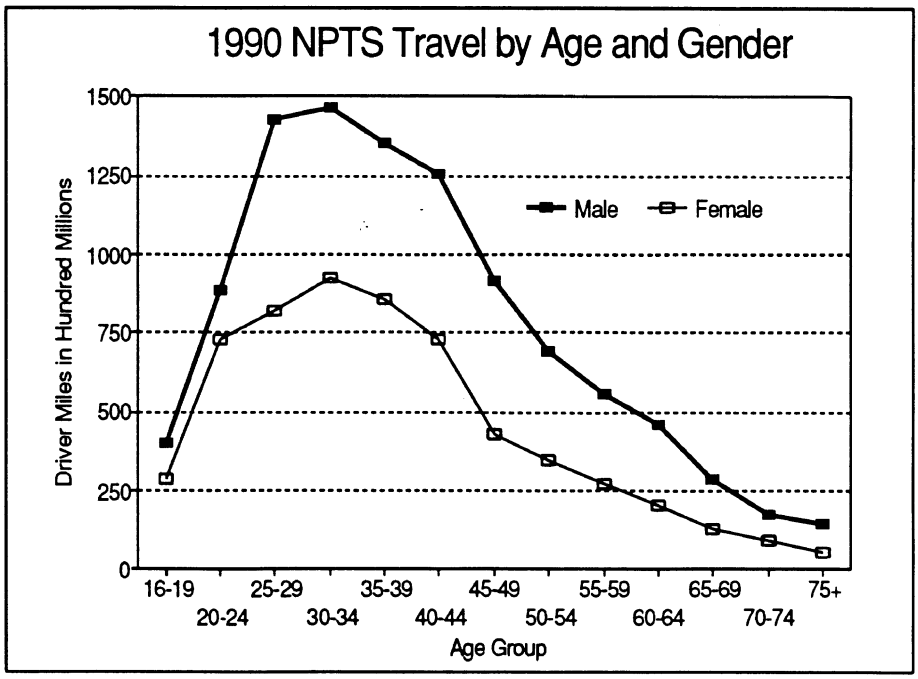

Figure 4-5

The licensure rate, or the percentage of an age group licensed to drive, is graphed in Figure 4-6 for men and women. Overall, 92.1% of men and 84.5% of women held licenses (Table A-16). The licensure rates for men and women quickly rise from low teenage rates and remain at high levels before tapering off in the older age groups. This decrease in the licensure rate is seen in women beginning at about age 50, while the male licensure rate is over 90% until the 75 and over group. Calculating the female licensure rate as a percentage of the male licensure rate yields 98% for persons 16-24 and 97% for persons 25-44. For persons 45 and over, however, the female licensure rate is just 84% that of the male rate.

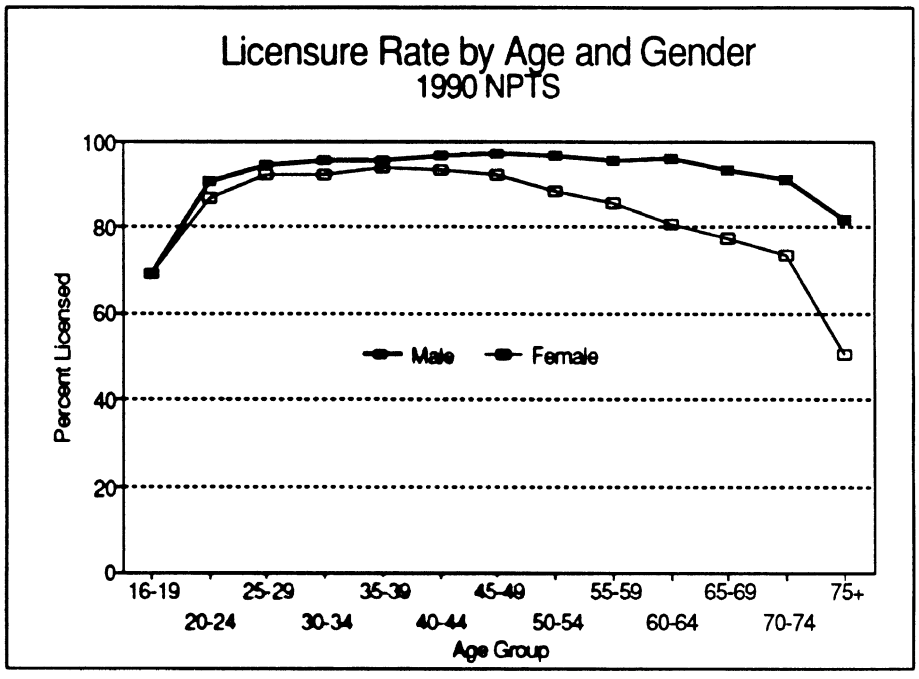

Figure 4-6

Average annual mileage per license holder is depicted in Figure 4-7 for men and women.[4] For all ages combined, men averaged 12,508 miles per year compared to 7,116 for women (Table A-16). The peak average annual mileage for men was achieved by those age 25 to 49. Average annual mileage for these age groups ranged from 14,478 to 15,260 miles per year. For women the peak number of miles was driven by age groups from 20 to 44. Average annual mileage ranged from 8,470 to 8,986 miles per year for women that age. Average annual mileage for women as a percentage of that for men once again shows a decrease with age. The percentage is 73.5% for drivers 16 to 24, 58.6% for drivers 25-44, and just 47.2% for those 45 and over.

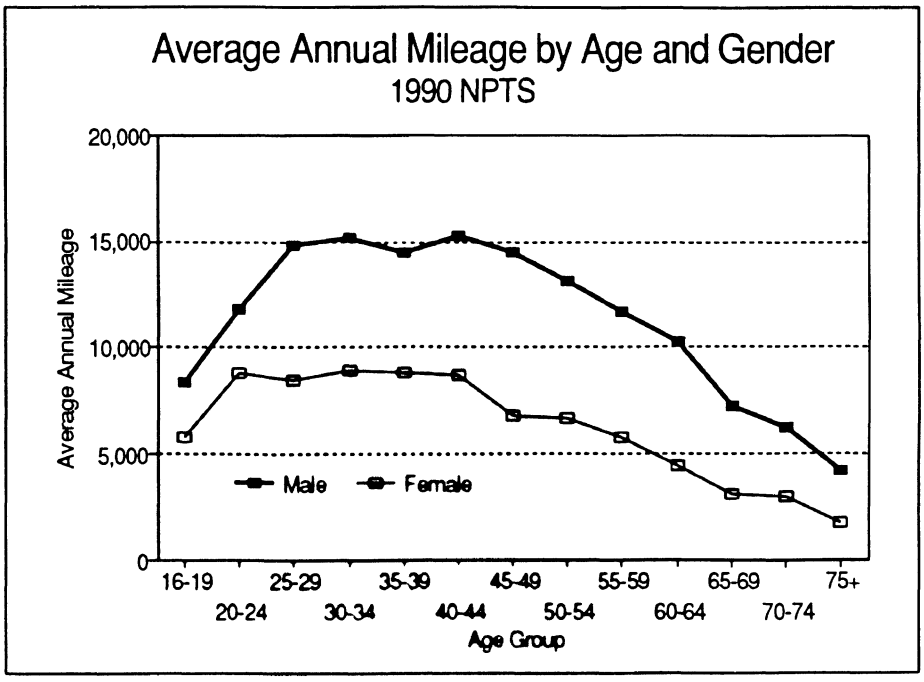

Figure 4-7

We have seen that men have more exposure to accident involvement than do women. A higher share of men are licensed to drive, and, both as a group and on an individual level, men drive more miles each year than women. These differences in the amount of driving by men and women grow with increasing age. Compared to men, fewer older women are licensed to drive and those with licenses drive much less than do men the same age. Because of these differences in exposure, men are involved in more accidents at all levels of severity each year than women. However, women over age 25 have a higher risk of being involved in a non-fatal accident *per mile of driving* than men.

4.3 Discussion of Accident Rates for Men and Women

The accident involvement rates presented in this section suggest an interesting set of relations among driver age, driver gender, accident severity, and risk of accident involvement. Men, especially young men, were shown to have a higher fatal involvement rate than women, while women over age 25 were shown to have a higher rate of involvement in non-fatal accidents than men. It has frequently

[4]Again, only miles driven by *licensed* drivers were used in the calculation of average annual mileage.

been suggested that men, especially young men, are more apt to engage in risky driving behaviors than women. Compared to female drivers, male drivers tend to speed or drive too fast for conditions more often, go through yellow lights more frequently, accept shorter gaps when entering the traffic stream or turning left before oncoming traffic, drive more aggressively, wear restraints less often, and drive under the influence of alcohol more often (Finn and Bragg, 1986; Polus et al., 1988; Storie, 1977; Veevers, 1982). These generalizations apply more strongly to young male drivers, for example those under age 25. Young male drivers have more confidence in their own driving abilities than do older drivers, and young men do not perceive specific driving situations to be as risky as older drivers perceive them (Finn and Bragg, 1986; Matthews and Moran, 1986).

It therefore seems plausible that men's higher fatal involvement rate compared to women is at least partly attributable to men's increased propensity to drive in a risky manner. This result of risky driving is not observed in the non-fatal accident rate. Fatal accidents are a rare event. Only 0.5% of all police-reported involvements in 1990 were fatal involvements. Compared to non-fatal accidents, fatal accidents are more likely to take place at night, in rural areas, involve alcohol, and result from a single-vehicle or head-on collision. It is possible that young males can usually rely on their quicker reaction times (AAA, 1966; Sivak et al., 1981; Welford, 1977) to avoid accidents, but when faced with the additional demands brought on by reduced visibility due to darkness and/or an impaired condition they have less success in avoiding an accident.

The results from GES and NPTS showing women to have a 26% higher injury involvement rate and 16% higher involvement rate in all police-reported accidents compared to men are somewhat more surprising than the higher fatal involvement rate for men. Although rates per mile provide an overall measure of the risk of crash involvement by gender, they do not take into account other risk factors, such as those associated with the driving environment. For example, women may conduct a greater share of their travel in urban areas, where the risk of accident involvement per mile may be greater than in rural areas. The NPTS data do not support a breakdown of mileage into rural and urban travel, so accident rates in these two areas cannot be calculated. The distribution of the accidents themselves can be examined in terms of the GES land use variable, however. Table 4-2 presents these distributions for both injury involvements and all involvements by gender. The leftmost column of the table indicates the size of the population area where the accident occurred. The land use involvement distributions are almost identical between men and women, but the data suggest that men have a slightly higher percentage of urban involvements and women a slightly higher percentage of rural involvements. Given that women have a higher involvement rate than men in non-fatal accidents and that the distribution of involvements by land use is virtually the same between men and women, gender-related differences in rural/urban travel (defined in the same manner as the GES variable) cannot explain women's higher involvement rate.

Table 4–2
Distribution of Involvements by Land Use and Gender
1990 GES

Land Use	Injury Involvements				All Involvements			
	Male		Female		Male		Female	
	Freq.	Col. Pct.	Freq.	Col. Pct.	Freq.	Col. Pct.	Freq.	Col. Pct.
< 25,000	898,830	48.29%	684,972	49.91%	2,729,007	48.17%	1,866,067	48.27%
25,000–50,000	171,960	9.24	130,506	9.51	477,660	8.43	338,387	8.75
50,000–100,000	171,302	9.20	137,848	10.05	638,610	11.27	490,193	12.68
100,000+	549,745	29.54	368,970	26.89	1,615,709	28.52	1,037,786	26.84
Unknown	69,467	3.73	49,994	3.64	204,356	3.61	133,559	3.45
Total	1,861,304	100.00%	1,372,290	100.00%	5,665,342	100.00%	3,865,992	100.00%

Table 4-3 lists mileage-based involvement rates for different types of collisions by gender. Women are involved in more rear-end and angle collisions per mile than men. Men have slightly higher involvement rates in single-vehicle accidents than women. Head-on and sideswipe rates per mile are about the same between men and women. For whatever reason, women's higher propensity for involvement in rear-end and angle accidents compared to men drives their overall higher rate. Per mile driven, women experience 20% more rear-end collisions and 30% more angle collisions than men.

Table 4–3
Involvement Rates Per 100 Million Miles
by Collision Type and Gender
1990 GES and 1990 NPTS

Collision Type	Injury Involvements		All Involvements	
	Male	Female	Male	Female
Single-Vehicle	38.56	37.36	104.91	92.66
Rear-end	59.11	77.72	168.86	203.19
Head-on	5.55	5.76	9.49	9.28
Angle	75.86	105.27	239.90	311.15
Sideswipe	4.90	5.15	34.58	33.38
Other/Unknown	0.93	0.89	5.09	4.36
Total	184.91	232.16	562.82	654.03

Another possible explanation for the observed gender differences in accident rates is related to the fact that women, on average, drive fewer miles than men. It has been suggested in the literature that the accident rate per mile *decreases* as the number of miles driven *increases* (Burg, 1973; Chipman, 1982; Spolander, 1983; Veevers, 1982). The argument is that annual mileage represents one's current level of driving experience. The more experienced drivers are thought to be more proficient in the driving task and so will do a better job of avoiding accidents, leading to a lower accident rate. A simple test of this hypothesis is to regress average annual mileage on the accident rate. This was done using NPTS travel data and all police-reported accidents from GES. The observations were age groups in five-year increments. The results showed only a weak, inverse association between average annual

mileage (AAM) and accident rates, whether the regression was done separately by gender or by combining the genders. This is not surprising, since accident rates are certainly associated with many other factors than just average annual mileage. Figures 4-2 through 4-4 show that age is significantly associated with accident rate.

In an effort to control for age, the ratio of female to male AAM was calculated for each age group (data from Table A-16). This ratio will be one if both sexes drive the same amount, under one if males drive more than females, and so on. Similarly, the ratio of female to male accident rates was calculated for each age group (data from Table A-14). If the hypothesis that higher annual mileages are associated with lower rates is true, then there will be an association between the ratio of AAM by gender and the ratio of accident rates. In this case, we would expect that as the ratio of AAM by gender increases, the ratio of accident rates decreases. Age is controlled for by making the comparison within relatively narrow age bands.

Figure 4-8 shows some of the results of this analysis. The ratio of AAM is plotted against the ratio of accident rates and a regression line is fitted to the points. The scatter plot and regression line show that there is an association and it is in the expected direction. The fit of the line is quite good, with an R^2 of 0.77. The slope of the line indicates that the relationship is strong, with a coefficient of -2.06. In age groups where women drive much less than men, their accident rates are higher than men's (ratios over 1.0). As their average annual travel approaches that of men, the female accident rate becomes closer to that of men and, in fact, where female average annual travel is about 70% or more of that of men, their accident rates are lower than men's. The age groups of the points are identified on the scatter plot. Females in the two youngest age groups have the highest AAM relative to men and are the only age groups with involvement rates below that of men. Without these two points, the relationship would be weaker, although still significant. The labels on the points illustrate that there is a general tendency for women to drive less relative to men with increasing age, and for their involvement rate to increasingly exceed that of men.

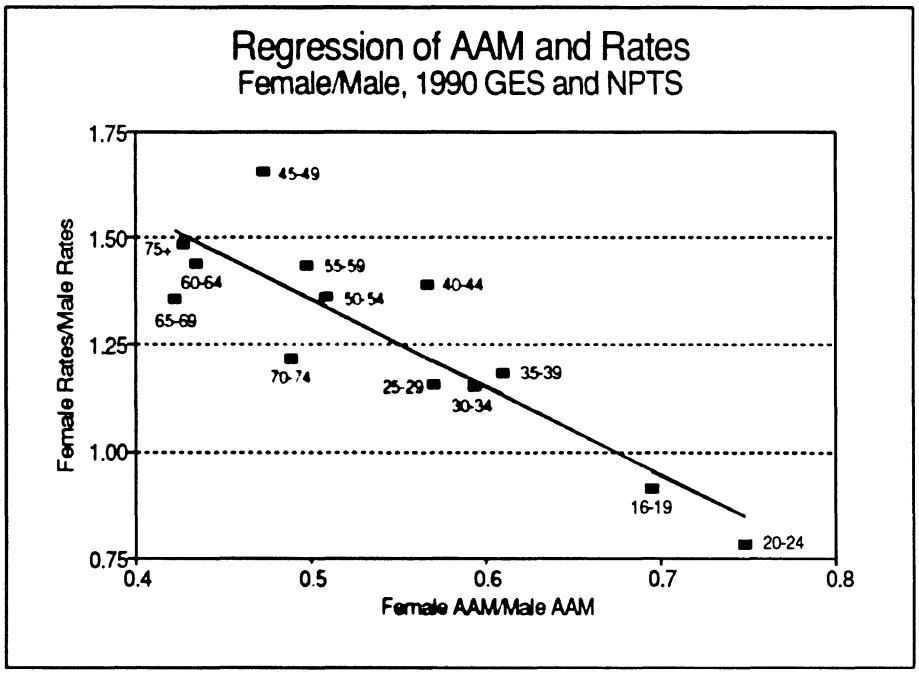

Figure 4-8

In sum, the fact that women drive less relative to men may be related to women's higher involvement rate in non-fatal accidents. The differences may also involve travel patterns, although there is no evidence that women's higher rate can be attributed to a higher share of urban travel. Ideally one requires travel data that are categorized according to many factors known to influence the risk of accident. These include rural/urban, but also road class, day/night (discussed in the following section), and traffic density. Cross-classifying involvements and mileage according to such factors could point to gender-related differences in travel patterns that help explain the difference in accident rates. Other possible explanations may involve women's slower reaction times compared to men (AAA, 1952; Sivak et al., 1981; Wright and Shephard, 1978), or the possibility that women are more prone to distraction and perceptual errors than their male counterparts (Storie, 1977). This is a research topic that requires more work, and it is likely that multiple, interacting factors are responsible for the difference in rates by gender.

5 Mileage-Based Rates by Light Condition

This section compares daytime and nighttime involvement rates. In general, nighttime driving is associated with a higher risk of accident involvement due to factors such as reduced visibility, fatigue, and higher incidence of alcohol use. Ideally, one would wish to calculate rates according to actual light condition, whether it was light or dark. This assessment can be made with the accident data, but it is not possible to make the determination for all of the NPTS trips. Instead, daytime was defined as 6 AM to 9 PM and nighttime as 9 PM to 6 AM for both the travel and accident data. NPTS includes information on the starting time and duration in minutes of each trip. This information was used to classify the mileage from each trip as either daytime or nighttime. Mileage from trips spanning the cutoff times was proportionately split between day and night, assuming a constant speed of travel.

Day/night assignments could only be made for personal travel, since that was reported as individual trips in the NPTS travel day file. Work mileage was reported as a weekly estimate with no information on the time of travel. An arbitrary decision was made to assign all work mileage to daytime travel. Personal trips with an unknown start time or an unknown duration could not be classified as day or night and were excluded from the rate calculations. This resulted in a loss of 3.6% of the mileage data. Missing data rates for the time of the accident are quite low in FARS and GES. Only 0.5% of fatal involvements, 0.4% of injury involvements, and 0.6% of all involvements could not be classified as day or night. Because the missing data rate is higher in NPTS than in the accident files, the resulting involvement rates are relatively higher than the overall rates calculated previously without respect to light condition. In some cases, both the nighttime and daytime rates for a particular age cohort are higher than the overall rate for that group. This occurs more often among the older age groups because they have a higher missing data rate for time of travel than the younger groups. One could redistribute the unknown NPTS mileage into day and night categories. Since the day/night distribution of the unknown miles may well be biased with respect to driver age and gender, however, we decided to minimize data manipulation and make no adjustment. Therefore, the absolute rates presented in this section are most properly compared to each other and not to the rates presented in earlier sections.

5.1 Fatal Rates by Day and Night

Drivers of all ages combined experienced 10.37 fatal involvements per 100 million miles at night and 2.25 during the day in 1990 (Table A-17). In general the difference between daytime and nighttime fatal rates was more pronounced among the younger age groups than the older ones (Fig. 5-1). For example, among drivers age 20-24, the nighttime rate was 6.1 times the daytime rate, while among drivers in the oldest age group, the nighttime rate was only 1.1 times the daytime rate. Note also that the highest nighttime rates were for the youngest drivers, while the highest daytime rates were for drivers 75 and over.

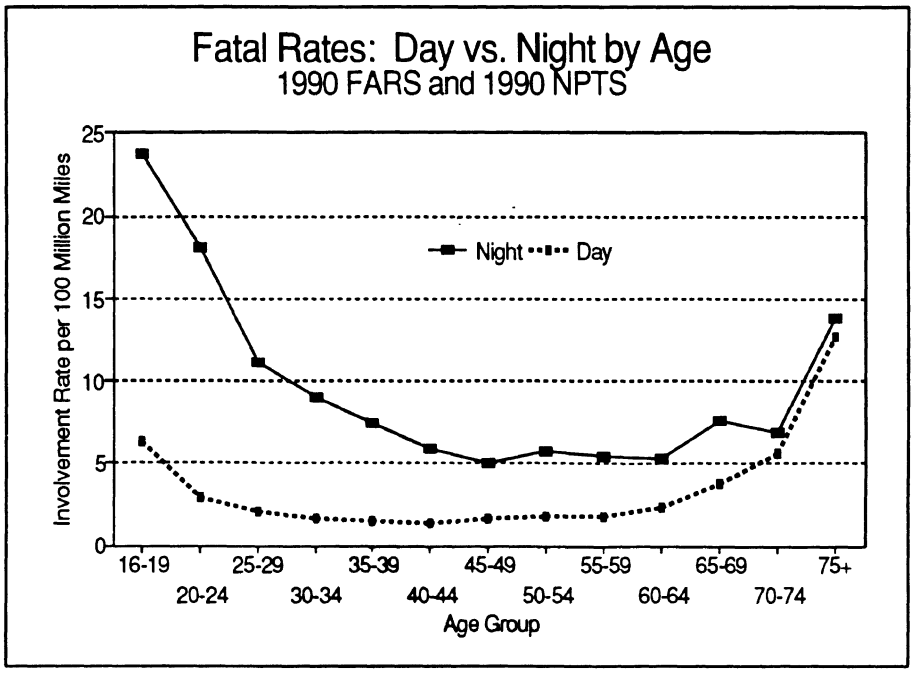

Figure 5-1

Both males and females experienced higher fatal involvements rates at night than during the day (Fig. 5-2). The male rate jumped from 2.44 during the day to 12.25 at night, while the female rate increased from 1.90 to 6.20. While men had a higher risk of fatal involvement than women both during the day and at night, their nighttime risk was more pronounced. The fatal involvement rate for men was 1.3 times that of women during the day, but 2.0 times that of women at night.

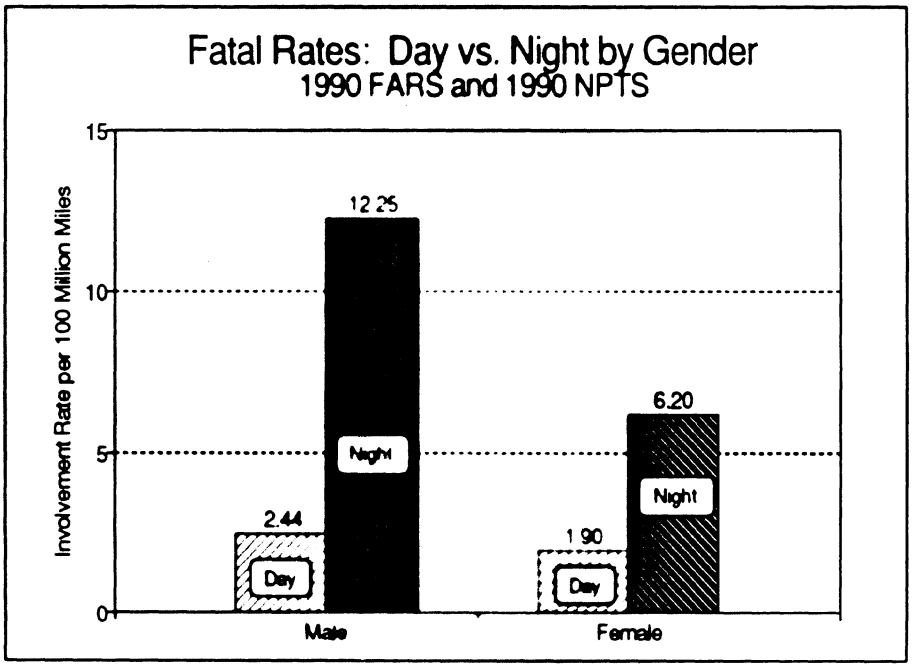

Figure 5-2

Daytime fatal rates by age and gender are plotted in Figure 5-3. While the rates are slightly higher for males, in general the two curves are very similar. Men had higher rates up to about age 40, the rates were very close between men and women from age 40 to 74, and women had the higher rate for the 75 and older group (Table A-18). The oldest group of drivers experienced the highest daytime rates among both men and women.

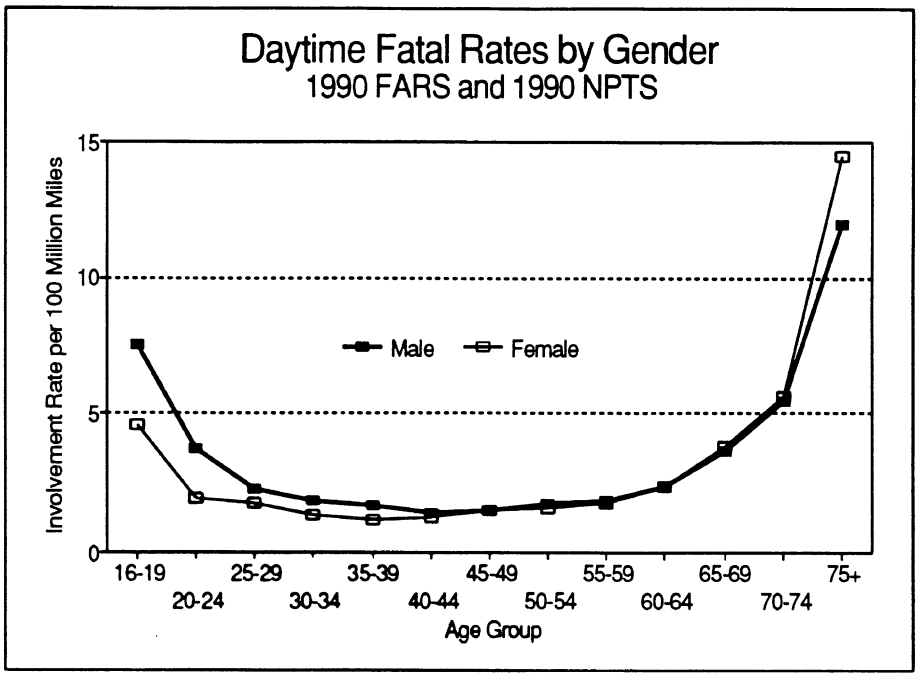

Figure 5-3

Nighttime fatal rates were higher for men than women in every age group except the 65-74 group (Fig. 5-4). Rates for the youngest male drivers were exceptionally high. Males 16-19 had a rate of 29.7 fatal involvements per 100 million miles, and males 20-24 had a rate of 28.8 (Table A-19). These rates are close to three times the rates experienced by drivers in general at night. To put this in perspective, excluding males 16-24 would lower the overall male nighttime fatal involvement rate from 12.2 to 8.9. Excluding males 16-24 would lower the fatal involvement rate for all drivers, both male and female, from 10.4 to 8.0.

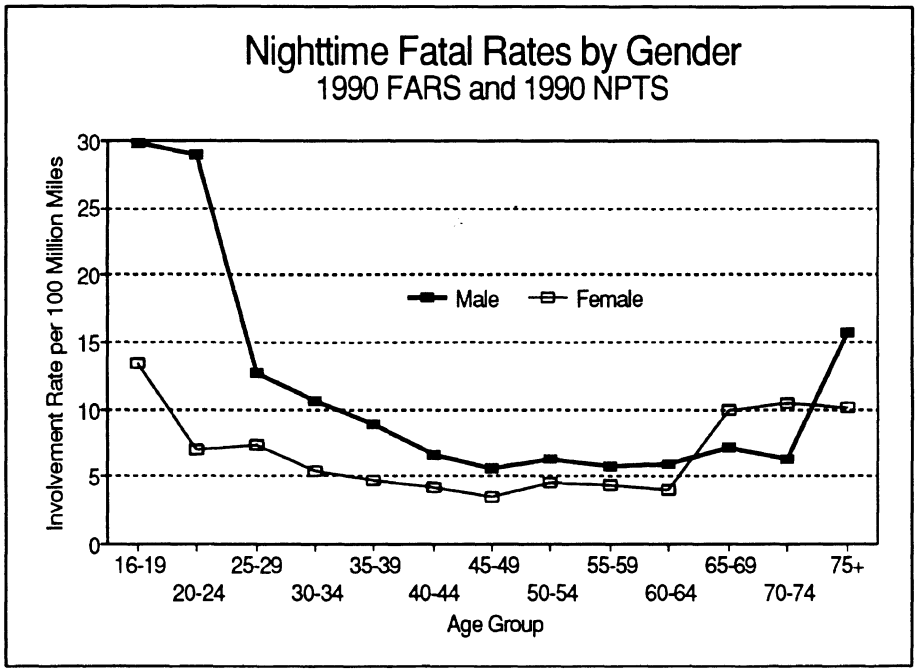

Figure 5-4

5.2 Injury and All Rates by Day and Night

Injury rate curves by light condition are plotted in Figure 5-5. Drivers of all ages experienced 3.45 injury involvements per million miles at night and 1.95 during the day (Table A-20). This is less of a difference than was the case for fatal involvements. The nighttime injury involvement rate is 1.8 times the daytime rate, while for fatal involvements, the nighttime rate was 4.6 times the daytime rate. As shown in Figure 5-5, nighttime injury rates were somewhat higher than daytime rates up through age 44, but the gap between the two curves is much less than was the case for fatals. Beyond age 45, the injury curves show the day and night rates to be quite close, and in some age groups the daytime rate exceeds the nighttime rate. Teenage drivers had the highest injury involvement rates of all drivers during the day and especially at night.

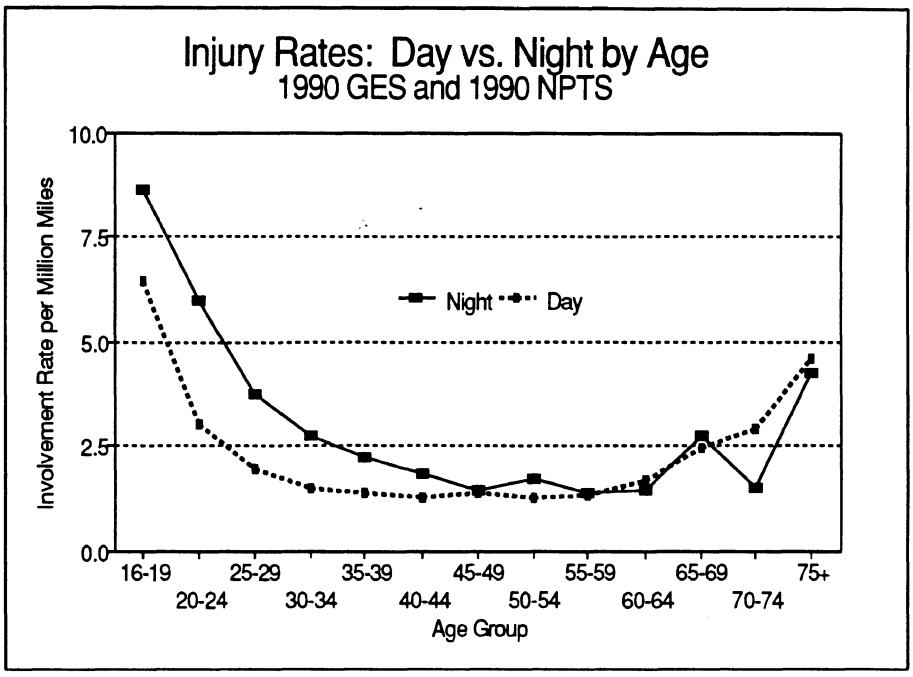

Figure 5-5

There is an interesting difference in the injury involvement rates between men and women according to light condition (Fig. 5-6). During the day, female drivers had a higher rate than male drivers, but this was reversed at nighttime. The difference in rates between men and women was not large in either case. During the day, the female rate was 1.4 times the male rate, and at night, the male rate was 1.2 times the female rate. Nighttime rates exceeded daytime rates for both men and women, but especially for men.

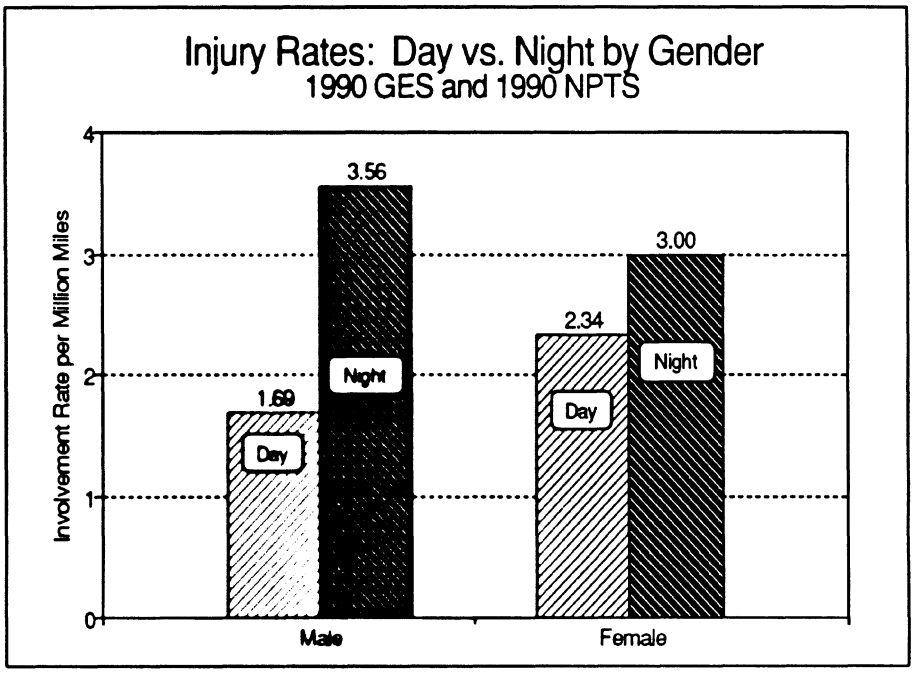

Figure 5-6

Daytime injury involvement rate curves for men and women by age group are plotted in Figure 5-7. The rates were very similar in the early age groups, but beyond age 25 women had the higher rates. This is very similar to the pattern observed for injury involvements during all times of day. During the daytime, teenage drivers had the highest rates among both men and women (Table A-21), although the rate for women 75 and over (6.0 involvements per million miles) was very close to the rate for teenage women (6.7 involvements).

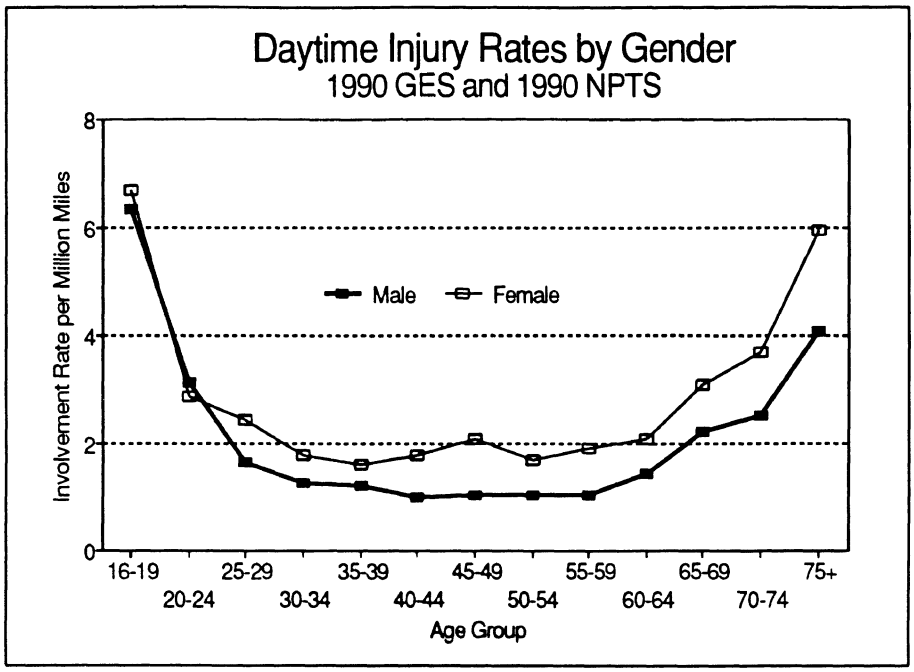

Figure 5-7

The nighttime injury rate curves are shown in Figure 5-8. Men and women had very similar rates in every age group except the 20-24 group. Male drivers that age had a rate of 8.7 involvements per million miles, which is 2.7 times the female rate of 3.2 (Table A-22). The difference in rates between males and females in this age group is largely responsible for the overall higher nighttime injury rates for men compared to women.

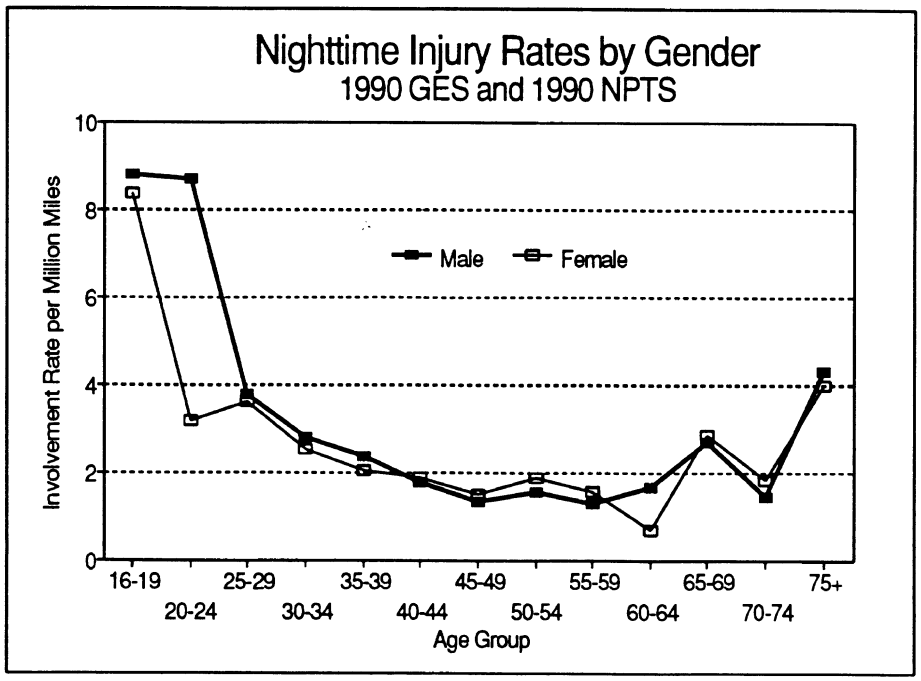

Figure 5-8

Involvement rates for all police-reported accidents are plotted in Figure 5-9 according to light condition. The curves are quite similar to the injury involvement curves. Drivers of all ages experienced 9.13 involvements per million miles at night and 5.93 during the day (Table A-23). The nighttime rate was only 1.5 times the daytime rate, which is even closer than was the case for the injury rates. The nighttime rate for all involvements was slightly higher than the daytime rate for every age group up through age 54, but for each of the older age groups, the daytime rate was higher.

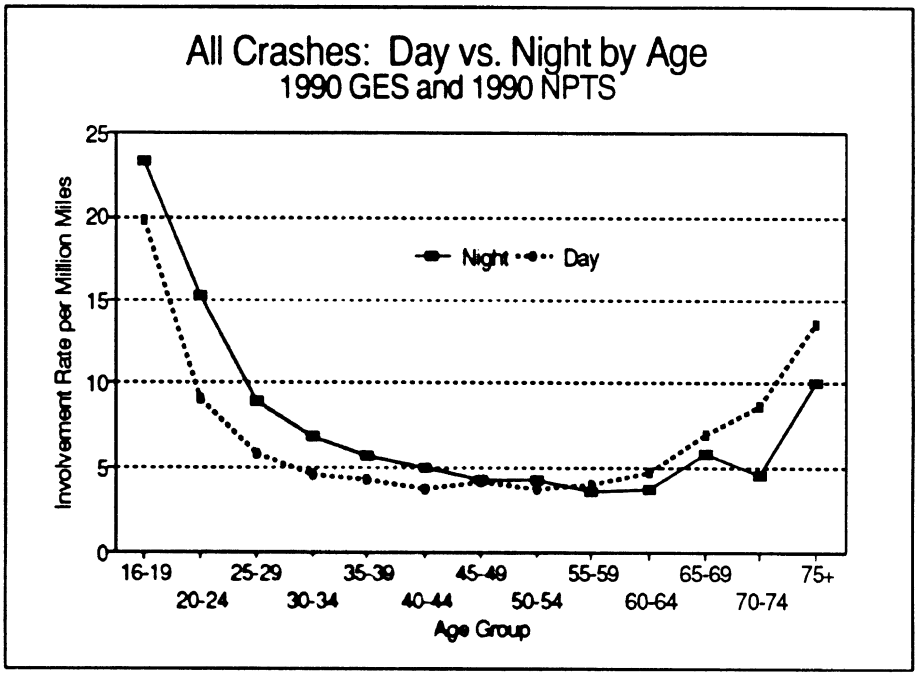

Figure 5-9

Involvement rates for males and females in all police-reported accidents by day and night are shown in Figure 5-10. Again, in a pattern similar to injury involvements, women had the higher rate during the day (6.67 to 5.35), and men had the higher rate at night (9.28 to 7.61). During the day, the rate for women was 1.2 times that for men, and at night, the men's rate was 1.2 times the women's rate.

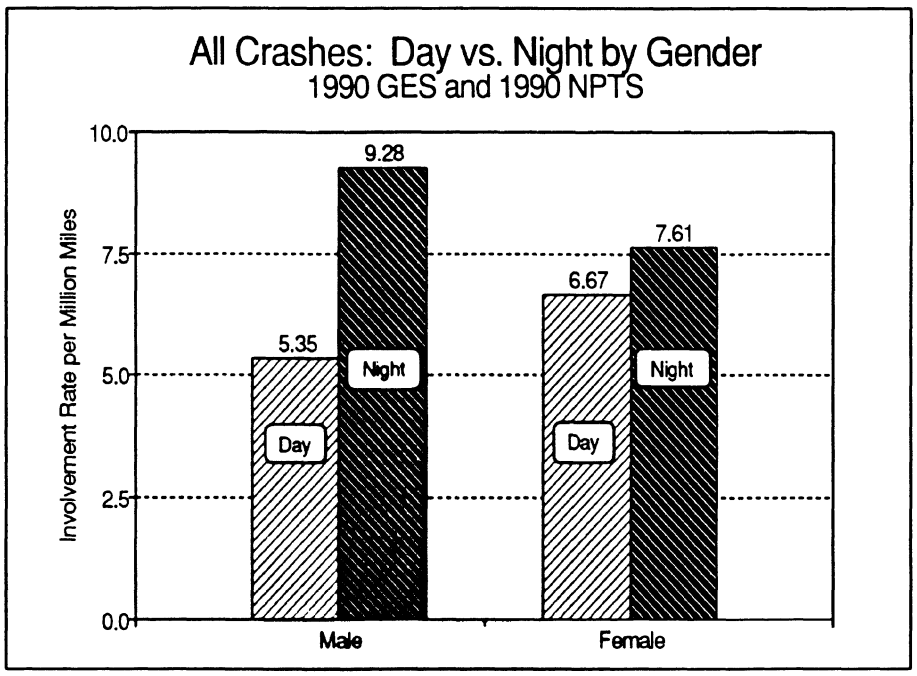

Figure 5-10

More specifically, the elevated overall accident involvement rate for women during the daytime was restricted to drivers 25 and over (Figure 5-11). Between age 16 and 24, men had a higher daytime involvement rate than women (Table A-24). At nighttime, men had a higher overall involvement rate than women from age 16 all the way through age 39 (Figure 5-12). The nighttime rates were similar between men and women for all the older age groups, with drivers of neither gender having the clearly higher involvement rate (Table A-25).

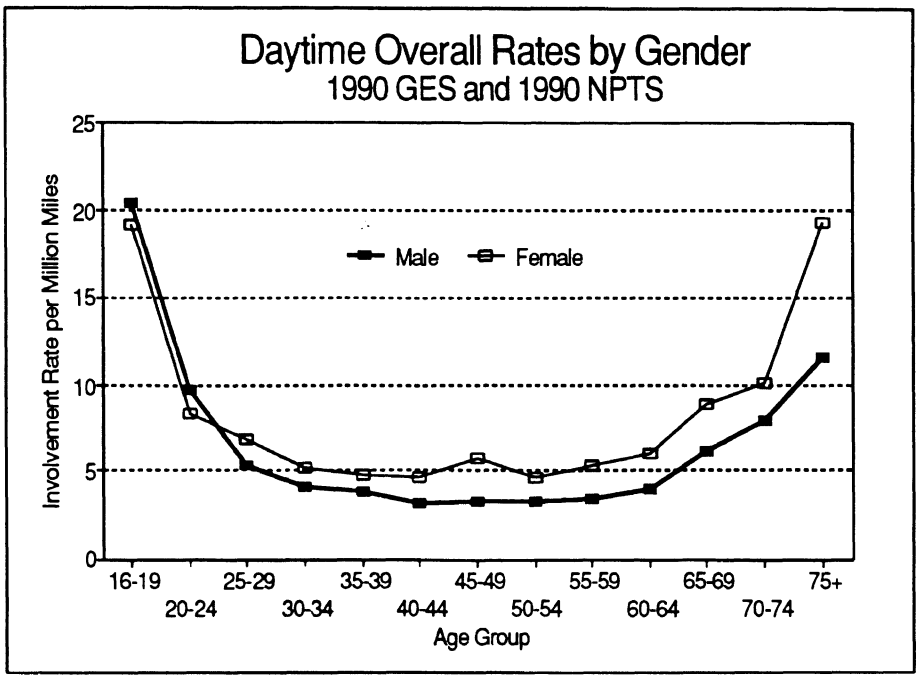

Figure 5-11

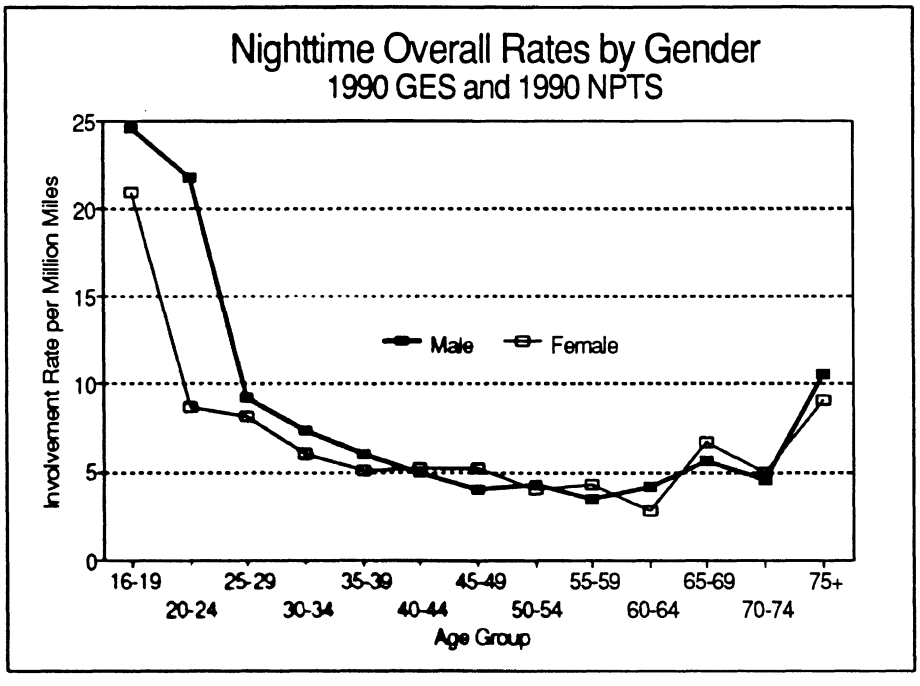

Figure 5-12

5.3 Discussion of Rates by Light Condition

We have seen that in general accident rates per mile driven are higher at night than during the day, although this is more true for fatal involvements than for less severe accidents. Elevated nighttime risk is especially apparent for male drivers and younger drivers. For non-fatal accidents, older drivers often had higher involvement rates in the daytime than at night. This was especially true for female drivers.

At the end of the last section, the possibility was raised that women's higher rate of involvement in non-fatal accidents compared to men could be a consequence of greater urban travel by women. No support was found for this idea, but another possibility is that women have a higher share of nighttime travel than do men. This idea also fails since only 9.6% of women's travel is at night, compared to 11.4% of men's travel.

We can look at mileage rates for various collision types, this time expanding the comparisons to include light condition. Earlier we noted that women have a higher rate per mile of rear-end and angle collisions than do men. As Table 5-1 shows, this is true only during the daytime. At night, the rates of rear-end and angle collisions between men and women are very similar, with men having the slightly higher rates. In fact, for both injury and all police-reported involvements, men have higher nighttime rates than women in every type of collision, but especially single-vehicle, head-on, and sideswipe accidents.

Furthermore, men's risk of involvement in single-vehicle accidents at night is 5.3 times their daytime rate. Their risk of involvement in each of the other types of collisions is less than two times the corresponding daytime rate. Women's risk of involvement in single-vehicle accidents at night is 3.4 times their daytime risk. Women's higher nighttime than daytime rate is almost entirely attributable to their higher risk of single-vehicle involvements at night. Men's elevated nighttime rate is also largely driven by single-vehicle involvements, but the higher risk is seen across all types of collisions.

Table 5–1
Involvement Rates Per 100 Million Miles
by Collision Type, Gender, and Light Condition
1990 GES and 1990 NPTS

INJURY INVOLVEMENTS				
Collision Type	Daytime		Nighttime	
	Male	Female	Male	Female
Single-Vehicle	26.46	31.79	141.89	102.56
Rear-end	59 08	81 61	76.40	69.37
Head-on	4 83	5 65	12.67	9.11
Angle	73 78	108 70	113.51	111.17
Sideswipe	4 45	4 98	9.68	7.72
Other/Unknown	0 82	0 95	2.03	0.43
Total	169 41	233 68	356.19	300.37
ALL INVOLVEMENTS				
Collision Type	Daytime		Nighttime	
	Male	Female	Male	Female
Single-Vehicle	72 30	77 47	385.12	265.06
Rear-end	172 86	215 28	183.81	162.85
Head-on	8 88	9 34	16.34	12.49
Angle	243 21	326 65	280.62	276.81
Sideswipe	33 24	33 69	54.79	41.62
Other/Unknown	4 89	4 70	7.67	2.48
Total	535 39	667 12	928.36	761.31

The role of alcohol in nighttime accidents also deserves mention. For accidents at all levels of severity, a greater percentage of drivers were under the influence of alcohol at night than during the day. In 1990, in the daytime, 2.0% of drivers in all police-reported accidents, 3.0% of drivers in injury accidents, and 13.4% of drivers in fatal accidents were under the influence of alcohol. The corresponding percentages at night were 16.1%, 22.8%, and 40.9%. A higher percentage of male drivers than female drivers were under the influence, and single-vehicle accidents had the greatest percentage of alcohol-involved drivers. Among nighttime fatal involvements, 49.4% of male drivers and 37.5% of female drivers in single-vehicle accidents were under the influence of alcohol.

6 Changes in Travel and Rates Between 1983 and 1990

The NPTS was last conducted in 1983. In this section, comparisons are made between the 1983 NPTS and the 1990 NPTS in terms of total number of miles driven, licensure rate, and average annual mileage. Accident rates per mile are also compared between these two years. The main changes that occurred during this time period were a large increase in the amount of travel in passenger vehicles but a drop in the accident rate per mile. The 1983 travel and accident data used in this section come from work done by Williams and Carsten (1989).

6.1 Travel

Overall, the number of miles driven in passenger vehicles rose from 1,136 billion in 1983 to 1,598 billion in 1990, an increase of 40.7% (Table A-26). Driver travel by age group for the two years is plotted in Figure 6-1. In terms of absolute number of miles, the greatest increases were among drivers age 25 to 54. Travel grew by 25 billion to 80 billion miles for each of the age groups in this range. In terms of percentage increase, the single largest rise was for the group of drivers 75 and over, whose mileage grew 90%, from 10.4 billion miles in 1983 to 19.8 billion miles in 1990 (Table A-26). Travel rose by over 70% among the 70-74 group and by close to 70% among drivers 40-49.

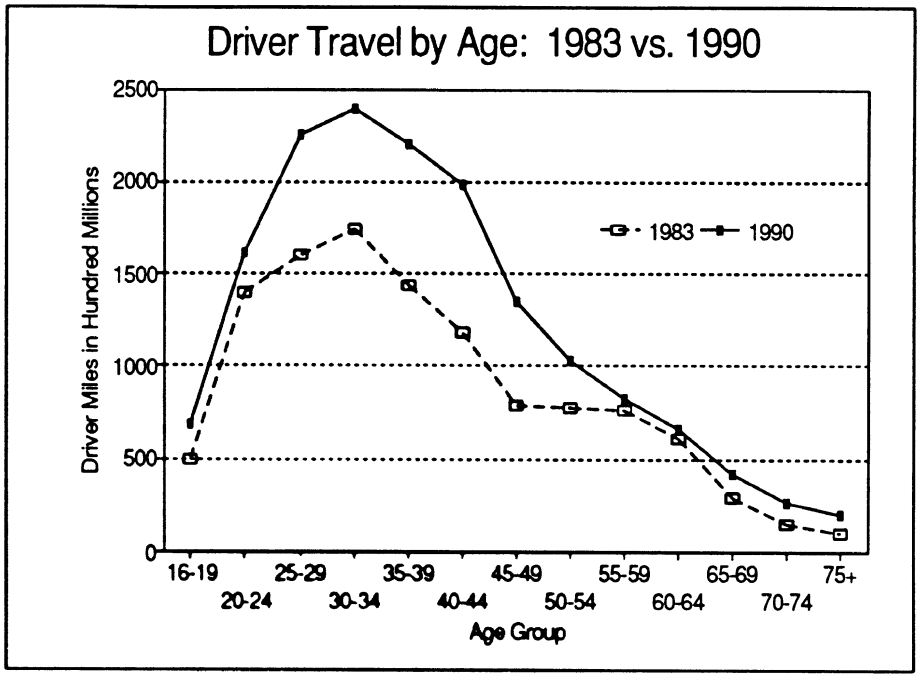

Figure 6-1

Mileage for male drivers rose from 766 billion to 1,007 billion from 1983 to 1990, an increase of 31.5% (Table A-27). Mileage for female drivers rose relatively more, growing from 370 billion to 591 billion, an increase of 59.8% (Table A-28). Because of this, the gap in travel between men and women narrowed between 1983 and 1990, although male drivers accounted for the bulk of the travel in both years (Fig. 6-2). The male share of the travel declined from 67.4% to 63.0%, while women's share of driver mileage rose from 32.6% to 37.0%.

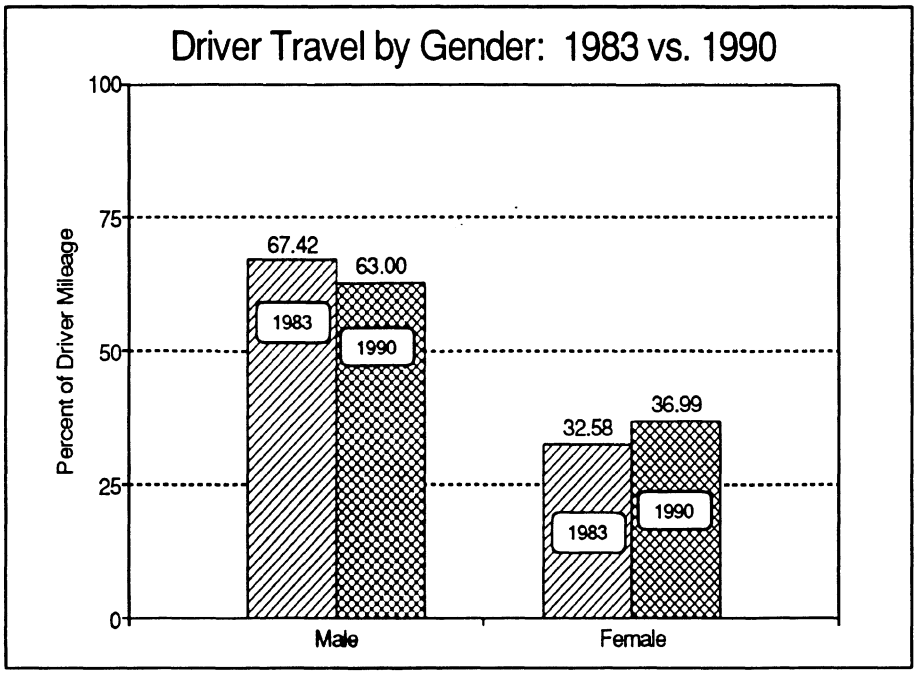

Figure 6-2

Mileage for male drivers by age group for 1983 and 1990 is plotted in Figure 6-3. As with travel overall, the largest increases in number of miles occurred for age groups between 25 and 54. In terms of percentage increase, the largest rise was among drivers 70 and over, whose mileage grew by 88% (Table A-27). The next largest increase was among drivers 45-49, whose mileage rose 72%.

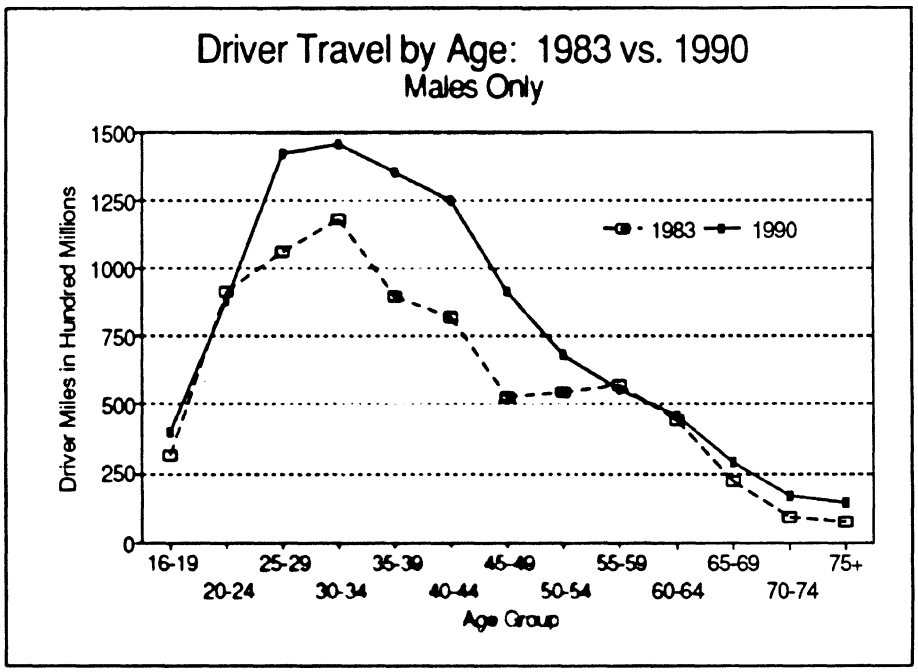

Figure 6-3

Large increases in number of miles occurred among female drivers age 25 to 54, as was the case with male drivers, and also among females age 16 to 24 (Fig. 6-

4). The percentage increase in female travel between 1983 and 1990 was larger than the corresponding male percentage in every age group except two (45-49 and 70-74). A particular difference in travel changes between male and female drivers was in the 16-24 age group (Table A-28). Travel rose 51.8% between 1983 and 1990 for female drivers this age and just 4.5% for male drivers the same age.

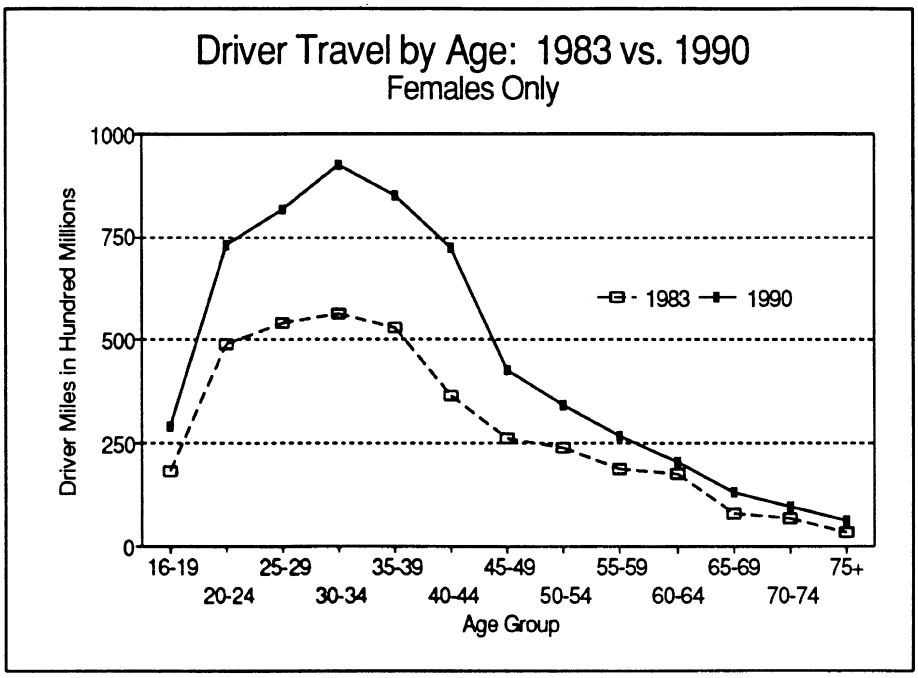

Figure 6-4

6.2 Licensure Rate and Average Annual Mileage

Figure 6-5 compares the percent of licensed drivers out of all persons of driving age between 1983 and 1990 using NPTS data. Overall, the licensure rate rose from 81.4% to 88.1% between those two years (Table A-29), and the percent of licensed drivers increased in every single age group. Increases in the licensure rate were especially apparent among older persons. In 1983, 61.2% of people 65 and over held licenses, and this increased to 75.2% in 1990. The male licensure rate for individuals 65 and over rose from 80.3% in 1983 to 88.5% in 1990, while the female licensure rate for that age group went from 48.3% to 65.6%.

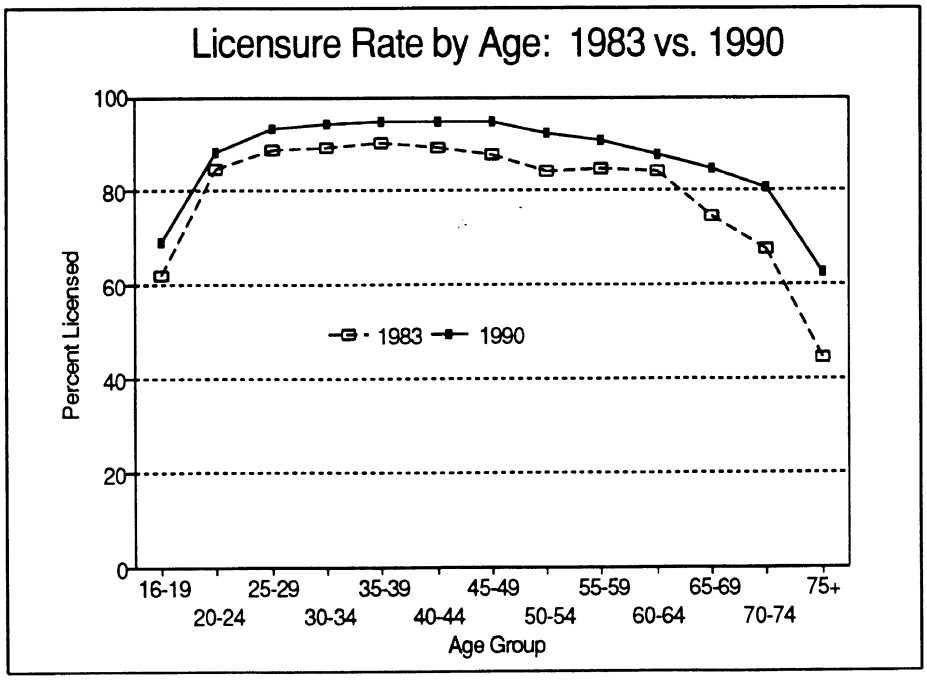

Figure 6-5

Average annual mileage per driver also increased between 1983 and 1990 (Fig. 6-6). Overall, average annual mileage rose from 7,925 to 9,771 miles, an increase of 23% (Table A-29). Increases were especially notable among younger drivers. Average annual mileage increased 36% for drivers 16-19 and 31% for drivers 20-24.

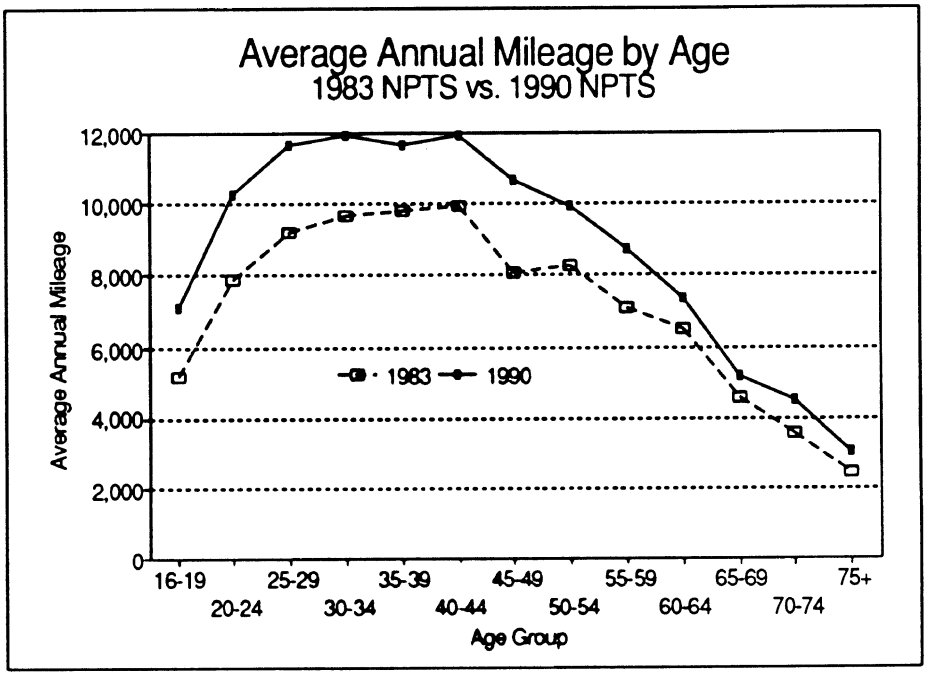

Figure 6-6

Figure 6-7 compares overall travel distributions across driver age groups between 1983 and 1990. The distribution of travel by age was relatively stable between the two years, but some minor differences are apparent (Table A-30). The percent of mileage driven by persons 16 to 34 declined from 46.2% to 43.4%, and mileage by the 50 to 69 group dropped from 21.5% to 18.3%. This was countered by increases among drivers 35-49 (30.0% to 34.6%) and by drivers 70 and older (2.3% to 2.9%). Thus, even though the licensure rate among the elderly has increased dramatically and their average annual mileage has risen as well, this group continues to account for only a tiny (although higher than in 1983) share of the overall mileage. In contrast, 53% of all passenger-vehicle travel in 1990 was recorded by drivers in their twenties and thirties.

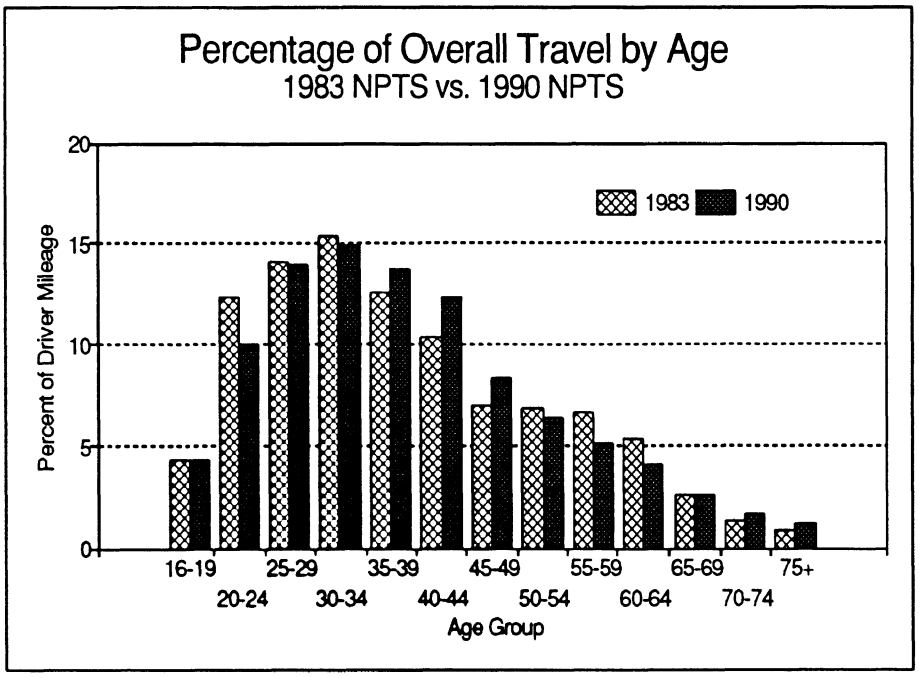

Figure 6-7

6.3 Fatal Rates

The mileage-based fatal involvement rate showed a 20.6% drop between 1983 and 1990. In 1983 there were 3.81 fatal involvements per 100 million miles (Table A-31), and this declined to 3.03 in 1990. The fatal rate decreased in every age group except drivers 60-64, who recorded a slight increase (Fig. 6-8). Drops in the fatal involvement rate were especially pronounced at either end of the age spectrum. The rate fell 26.7% for drivers 16-19, 22.4% for those 20-24, and 21.2% for drivers 25-29. Among older drivers, the rate fell 20.8% for drivers 70-74 and 22.2% for drivers 75 and older. Part of the reason for the large overall decline in the fatal involvement rate is the shifts in the travel distribution by age group between 1983 and 1990, as discussed above. For example, the mileage share for drivers 20-24, a group with a higher than average fatal involvement rate, dropped from 12% to 10% of the total miles between 1983 and 1990 (Table A-30). Meanwhile, travel by drivers 35-49 rose from 30% to 35% of the overall, and the fatal rate for this group is lower than average.

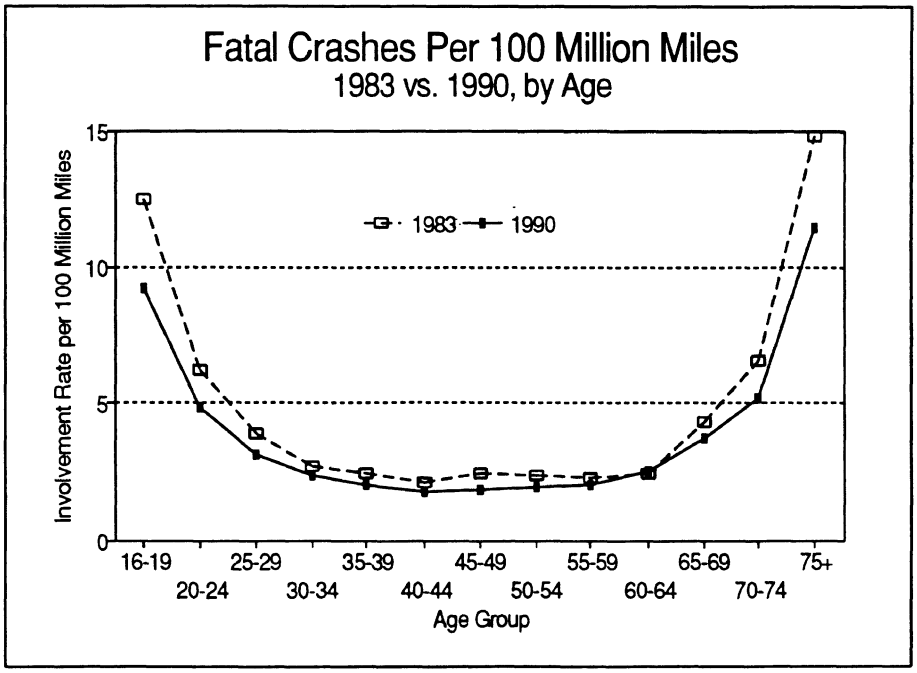

Figure 6-8

The fatal involvement rate declined for both male and female drivers between 1983 and 1990 (Fig. 6-9). The male rate dropped 18.3%, from 4.23 to 3.46 fatal involvements per 100 million miles. The female rate dropped 22.0%, from 2.87 to 2.24.

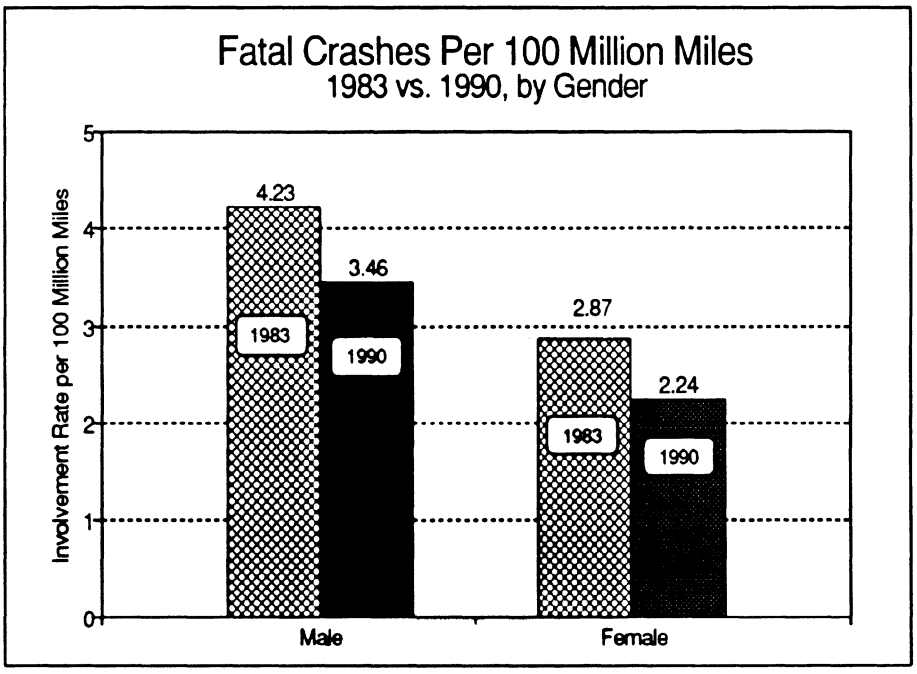

Figure 6-9

Figure 6-10 shows the fatal involvement rate curves for men in 1983 and 1990, and Figure 6-11 shows the similar curves for women. In general, the changes in fatal rates between 1983 and 1990 are similar for male and female drivers. The

only notable differences are at the ends of the age spectrum. The fatal involvement rate for men 16-24 dropped 12% between the two years, from 9.36 to 8.22 involvements per 100 million miles. However, the fatal involvement rate for women 16-24 fell much more sharply, from 5.23 to 3.55, a drop of 32%. Among drivers 70 and older, the male rate fell 30%, from 11.41 to 7.98, while the female rate showed an 8% rise, going from 7.17 to 7.76. The change in rates for drivers 25-69 was almost the same between men and women, falling 15% for male drivers and 18% for female drivers. Fatal rates by five-year age groups for men and women in 1983 are presented in Table A-32.

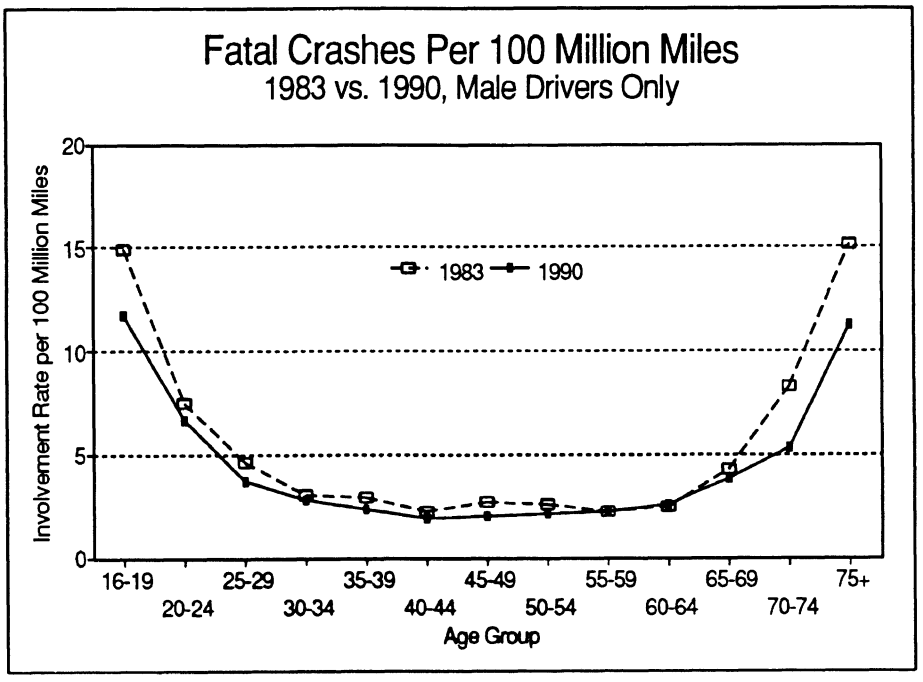

Figure 6-10

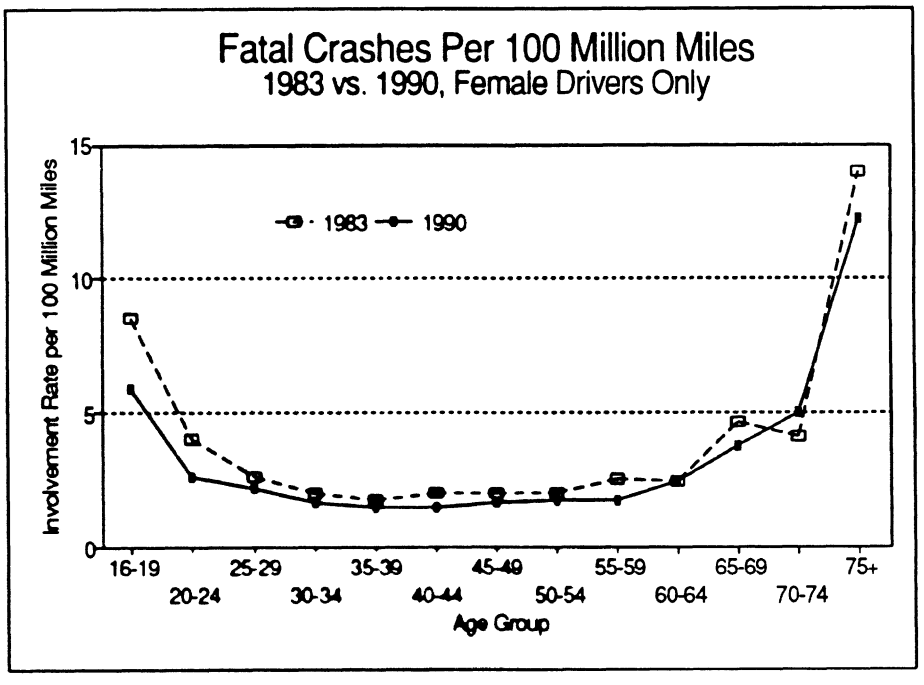

Figure 6-11

6.4 Injury and All Rates

The source for non-fatal accident data in 1983 presented in this section is the National Accident Sampling System (NASS). NASS was an annual accident data collection effort initiated in 1977 by the National Center for Statistics and Analysis of NHTSA. Trained teams of accident investigators collected data from accidents selected by means of a probability sample. NASS produced detailed information on vehicle crashworthiness and occupant injury outcomes. In addition, NASS data yielded national estimates of the annual number of police-reported accidents, just as GES does currently. Because of small sample sizes in NASS, three years of data (1982-1984) were averaged to produce the estimated number of involvements in 1983.

Injury rates declined even more steeply between 1983 and 1990 than did fatal rates. In 1983 there were 3.12 injury involvements per million miles, compared to 2.04 in 1990, a drop of 34.4%. For both male and female drivers, the injury involvement rate declined in every single age group between the two years (Fig. 6-12, Fig. 6-13). The percentage decline in the injury rate was virtually identical for male and female drivers. The rate for men fell 34.9%, and the rate for women fell 35.0%. Injury involvements for male drivers declined from 2.84 per million miles in 1983 to 1.85 in 1990. The rate for female drivers decreased from 3.57 to 2.32 (Table A-33).

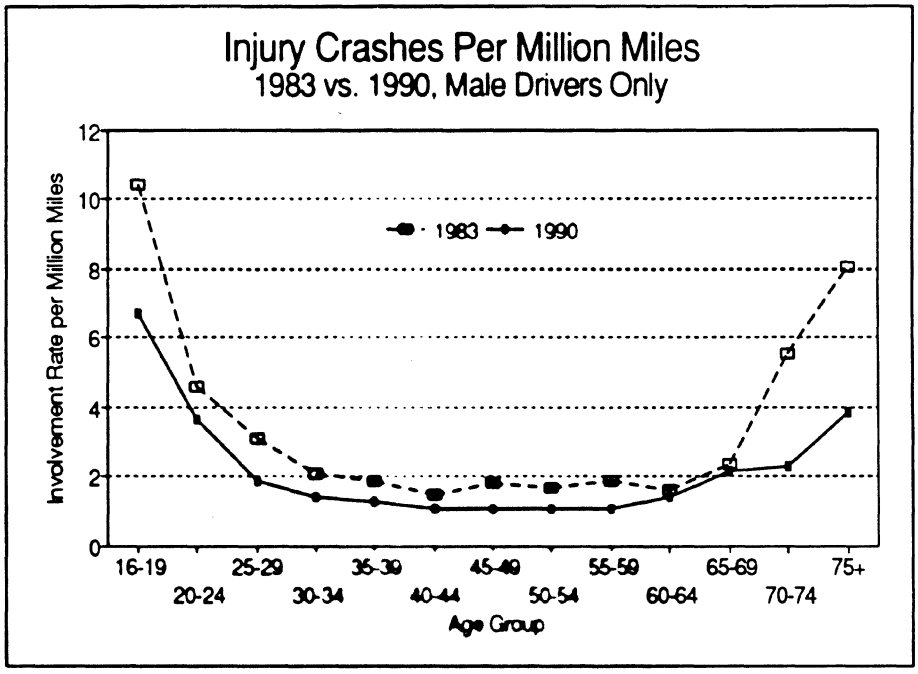

Figure 6-12

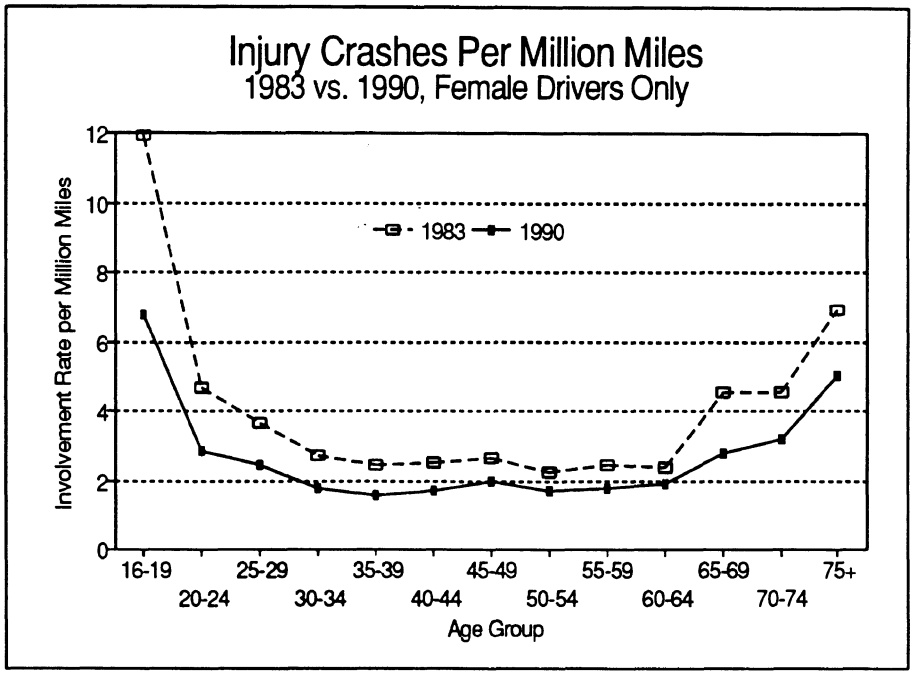

Figure 6-13

Rates for all police-reported accidents declined 22.6% between 1983 and 1990, which is similar to the drop in the fatal involvement rate. The involvement rate in 1983 was 7.86 per million miles compared to 6.08 in 1990. As with injury involvements, rates declined in every age group for both male and female drivers (Figs. 6-14, 6-15), and men and women showed similar drops in rates. For male drivers, the rate fell 22.0%, from 7.22 to 5.63. The rate for female drivers fell 23.3%, from 8.53 to 6.54 (Table A-34).

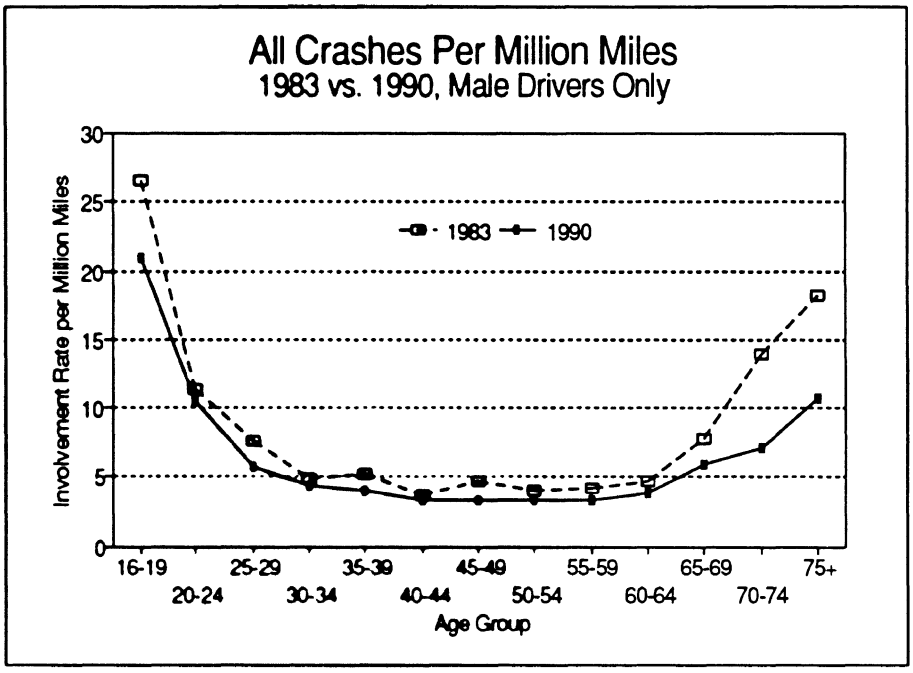

Figure 6-14

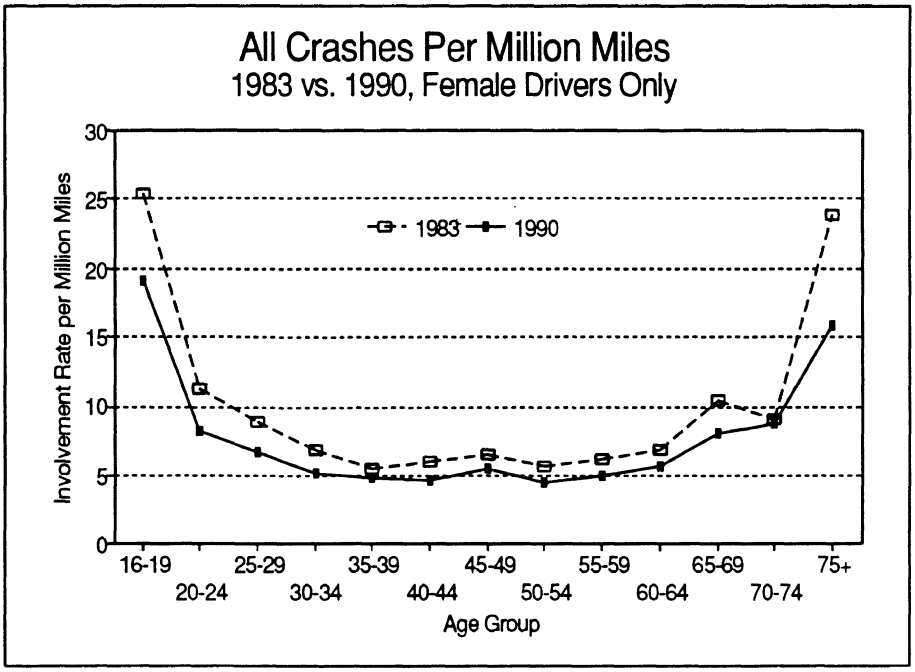

Figure 6-15

Data supplied by the 1983 and 1990 NPTS provide an encouraging view of traffic safety trends in the 1980s. Passenger vehicle travel increased dramatically between 1983 and 1990, but the rate of accidents per vehicle-mile travelled declined. Passenger vehicle travel rose by 41%, the percent of the driving-age population holding a license increased from 81% to 88%, and average annual mileage per licensed driver climbed from 7,925 to 9,771 miles. Per mile of travel, however, fatal involvements decreased 21%, injury involvements dropped 34%, and all police-reported accidents fell 23%. Lower accident rates were enjoyed by drivers of all ages and by men as well as women.

7 Summary of Accident Involvement by Age and Gender

In this concluding section, three age-groups of the driving-age population will be compared in terms of the three measures of exposure used in this report (vehicle-miles of travel, number of licensed drivers, and number of people) and in terms of their number of involvements in fatal, injury, and all police-reported accidents. The three age groups are 16-24, 25-64, and 65 and over. The comparisons will be based on distributions of the exposure measures and distributions of the number of involvements across these three age groups. Comparing distributions allows one to quickly see instances of over-representation or under-representation. For example, if an age cohort comprises a higher percentage of involvements than it does a measure of exposure, then that group is over-represented in involvements compared with persons of all ages.

Table 7-1 presents these distributions based on 1983 and 1990 data. Missing data have been excluded from this table and subsequent ones in this section. Comparing the fatal involvement distribution to the mileage distribution, one sees that in both 1983 and 1990 younger drivers had a much higher share of fatal involvements than of travel. Older drivers were also overinvolved, while drivers 25-64 were underinvolved in fatal accidents compared to their share of the mileage.

Table 7–1
Age Distribution of Exposure and Involvement Categories
1983 and 1990

Percent Distribution of:	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Total mileage	16.71%	14.51%	78.43%	79.95%	4.87%	5.54%
Licensed drivers	19.08	15.63	70.50	71.79	10.42	12.58
Driving-age population	20.65	17.28	65.49	67.98	13.86	14.75
Fatal involvements	34.92	29.57	56.14	59.51	8.94	10.92
Injury involvements	34.49	31.26	58.37	60.90	7.14	7.84
All involvements	33.80	31.28	58.66	61.04	7.54	7.68

Dividing the share of involvements by the share of mileage yields a measure of relative risk for a group. For example, dividing the percentage of fatal involvements for the 16-24 group in 1983 by its percentage of travel yields 2.09 (Table 7-2). This indicates that persons this age had 2.09 times the risk of involvement in a fatal accident per mile of driving compared to all people in 1983. In 1990, the relative risk for this age group had dropped slightly, to 2.04. The relative risk of fatal involvement for persons 25-64 increased slightly from 1983 to 1990, going from 0.72 to 0.74, but this group remained underinvolved in fatal accidents compared to persons of all ages. The mileage-based relative risk of fatal accident involvement also increased for persons 65 and over, rising from 1.84 to 1.97. Therefore, while the 16-24 group had a higher relative risk of fatal involvements than the 65+ group in both 1983 and 1990, the difference between the two groups narrowed between the two years. The relative risk for the younger group declined slightly, while the relative risk for the older group showed a small increase.

Table 7–2
Relative Risk Based on Three Exposure Categories
1983 and 1990

RELATIVE RISK PER MILE						
Involvement Severity	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Fatal	2.09	2.04	0.72	0.74	1.84	1.97
Injury	2.06	2.15	0.74	0.76	1.47	1.42
All	2.02	2.16	0.75	0.76	1.55	1.39
RELATIVE RISK PER DRIVER						
Involvement Severity	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Fatal	1.83	1.89	0.80	0.83	0.86	0.87
Injury	1.81	2.00	0.83	0.85	0.69	0.62
All	1.77	2.00	0.83	0.85	0.72	0.61
RELATIVE RISK PER CAPITA						
Involvement Severity	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Fatal	1.69	1.71	0.86	0.88	0.65	0.74
Injury	1.67	1.81	0.89	0.90	0.52	0.53
All	1.64	1.81	0.90	0.90	0.54	0.52

For non-fatal involvements, comparisons of the distributions again show overinvolvement for younger drivers and, to a lesser extent, older drivers. However, the trends in relative risk observed between 1983 and 1990 in the fatal involvements do not hold for the non-fatal involvements. The overinvolvement of the 16-24 group became slightly more pronounced between 1983 and 1990, with their relative risk of involvement in all police-reported accidents per mile rising from 2.02 to 2.16 (Table 7-2). Older drivers experienced a drop in relative risk, with this measure falling from 1.55 to 1.39. The relative risk for persons 25-64 in all police-reported involvements remained stable between 1983 and 1990.

If the involvement distributions are compared to the distributions of licensed drivers or the driving-age population, younger persons continue to be overinvolved in accidents, although to a slightly lesser extent than if mileage is used as the basis of exposure. Persons 25-64 are underinvolved using drivers or population as the exposure basis, although not to the same extent as when mileage is used. The most dramatic change in switching from mileage to drivers or population as the exposure basis is seen among drivers 65 and older. This group is overinvolved on a mileage basis, but underinvolved per driver and even more underinvolved per capita. Per capita, this group has a lower relative risk than either of the other two age groups of involvement in accidents at any level of severity (Table 7-2). Per driver, the same is true for non-fatal accidents. For fatal accidents, however, this group has a slightly higher relative risk measure than the 25-64 group per driver. As discussed previously, older people have a much lower risk per driver and per capita compared to

their mileage-based risk because relatively few people this age drive at all, and those who do drive accumulate a small number of miles each year relative to younger people.

Table 7–3
Age Distribution of Exposure and Involvement Categories
1983 and 1990, Males Only

Percent Distribution of:	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Total mileage	16.02%	12.82%	79.01%	81.16%	4.98%	6.02%
Licensed drivers	19.37	15.19	69.82	72.22	10.81	12.59
Driving-age population	21.53	17.36	66.75	69.53	11.73	13.11
Fatal involvements	35.53	30.40	55.80	59.27	8.67	10.33
Injury involvements	34.87	32.21	57.55	59.25	7.58	8.54
All involvements	34.56	31.96	57.43	60.01	8.01	8.04

Table 7–4
Relative Risk Based on Three Exposure Categories
1983 and 1990, Males Only

RELATIVE RISK PER MILE						
Involvement Severity	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Fatal	2.22	2.37	0.71	0.73	1.74	1.72
Injury	2.18	2.51	0.73	0.73	1.52	1.42
All	2.16	2.49	0.73	0.74	1.61	1.34
RELATIVE RISK PER DRIVER						
Involvement Severity	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Fatal	1.83	2.00	0.80	0.82	0.80	0.82
Injury	1.80	2.12	0.82	0.82	0.70	0.68
All	1.78	2.10	0.82	0.83	0.74	0.64
RELATIVE RISK PER CAPITA						
Involvement Severity	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Fatal	1.65	1.75	0.84	0.85	0.74	0.79
Injury	1.62	1.86	0.86	0.85	0.65	0.65
All	1.61	1.84	0.86	0.86	0.68	0.61

Table 7-3 and 7-4 present the same set of distributions and the associated relative risk measures for men only, and Tables 7-5 and 7-6 do the same for women. Beginning with comparisons on a mileage basis, the same general patterns of overinvolvement for younger and older drivers hold true for men and women

separately. More interesting differences come from calculating measures of relative risk per mile in 1983 and 1990. For example, young male drivers showed an increase in their relative risk of involvement in accidents at all three levels of severity between the two years (Table 7-4). Male drivers 65 and older experienced a decrease in their relative risk of involvement at all levels of severity. The situation is exactly reversed among female drivers, however. Young women showed a decrease in relative risk and older women showed an increased relative risk of involvement in accidents at all severity levels between 1983 and 1990 (Table 7-6).

Table 7–5
Age Distribution of Exposure and Involvement Categories
1983 and 1990, Females Only

Percent Distribution of:	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Total mileage	18.13%	17.39%	77.23%	77.89%	4.64%	4.72%
Licensed drivers	18.78	16.07	71.20	71.36	10.01	12.57
Driving-age population	19.85	17.20	64.35	66.59	15.80	16.21
Fatal involvements	33.07	27.39	57.18	60.16	9.75	12.45
Injury involvements	33.88	29.99	59.69	63.10	6.43	6.91
All involvements	32.48	30.31	60.80	62.52	6.71	7.17

Table 7–6
Relative Risk Based on Three Exposure Categories
1983 and 1990, Females Only

RELATIVE RISK PER MILE						
Involvement Severity	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Fatal	1.82	1 58	0 74	0.77	2.10	2.64
Injury	1.87	1 72	0 77	0.81	1.39	1.46
All	1.79	1 74	0 79	0.80	1.45	1.52
RELATIVE RISK PER DRIVER						
Involvement Severity	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Fatal	1.76	1 70	0 80	0.84	0.97	0.99
Injury	1.80	1.87	0 84	0.88	0.64	0.55
All	1.73	1.89	0 85	0.88	0.67	0.57
RELATIVE RISK PER CAPITA						
Involvement Severity	16–24		25–64		65+	
	1983	1990	1983	1990	1983	1990
Fatal	1.67	1 59	0 89	0.90	0.62	0.77
Injury	1.71	1 74	0 93	0.95	0.41	0.43
All	1.64	1 76	0 94	0.94	0.42	0.44

Between 1983 and 1990, young men also showed an increase in relative risk of involvement in accidents at all levels of severity on a per driver and per capita basis. Older men generally showed a slight decrease in relative risk per driver and per capita in non-fatal involvements and a slight increase in fatal involvements. Young women experienced a decrease in relative risk in fatal involvements and an increase in non-fatal involvements per driver and per capita between 1983 and 1990. Like older men, older women showed an increase in relative risk of fatal involvements per capita and per driver. They showed a decrease in relative risk in non-fatal involvements per driver but a slight increase per capita.

There are many ways to assess the risk of accident involvement associated with particular groups of people. This report has illustrated several of them. Regardless of whether miles driven, number of drivers, or number of people is used as the basis of comparison, persons age 16 to 24 are overinvolved in accidents of all levels of severity. Persons age 25 to 64 are underinvolved, using any of the three measures of exposure. People over the age of 64 have a higher risk of accident involvement, particularly fatal involvements, per mile driven, but are underinvolved in relation to their national share of licensed drivers or persons of driving age. Gender also needs to be part of risk assessments. Women 25 and over have a higher rate of involvement in non-fatal accidents per mile driven than do men, while men have higher fatal involvement rates than women. To really understand differences between groups in mileage-based rates requires travel data that are split by environmental conditions such as road class, rural/urban, and day/night. For example, the NPTS data allow categorization of mileage by time of day, a surrogate for light condition. Analysis of the data in this way showed that women's higher rate of non-fatal involvements compared with men's was entirely due to their accident experience in the daytime, not at night.

References

American Automobile Association, Traffic Engineering and Safety Department. 1952. Age and complex reaction time. Report No. 41.

American Automobile Association, Traffic Engineering and Safety Department. 1966. Reaction time as related to age. Report No. 69.

Burg, A. 1973. The effects of exposure to risk on driving record. Report No. UCLA-ENG-7350. Los Angeles: Institute of Transportation and Traffic Engineering, University of California.

Chipman, M.L. 1982. The role of exposure experience and demerit point levels in the risk of collision. Accident Analysis and Prevention 14(6):475-483.

Evans, L. 1988. Risk of fatality from physical trauma versus sex and age. Journal of Trauma 28(3):368-378.

Finn, P. and Bragg, B.W.E. 1986. Perception of the risk of an accident by young and older drivers. Accident Analysis and Prevention 18(4):289-298.

Matthews, M.L. and Moran, A.R. 1986. Age differences in male drivers' perception of accident risk: the role of perceived driving ability. Accident Analysis and Prevention 18(4):299-313.

Pike, J.A. 1989. The quantitative effect of age on injury outcome. 89-1A-W-020. 12th Experimental Safety Vehicle Conference, Gothenburg, Sweden.

Polus, A., Hocherman, I., and Efrat, E. 1988. Evaluation of the accident rates of male and female drivers. Transportation Research Record 1172, pp. 42-46.

Research Triangle Institute. 1991. 1990 Nationwide Personal Transportation Survey, User's Guide to the Public Use Tapes. Report No. FHWA-PL-92-007. Washington, D.C.: Federal Highway Administration.

Sivak, M., Post, D.V., and Olson, P.L. 1981. Automobile rear lights: effects of the number, mounting height, and lateral position on reaction times of following drivers. Perceptual and Motor Skills 52(3):795-802.

Spolander, K. 1983. Accident risks of drivers—a model tested on men and women. VTI Rapport, No. 268. Linkoping, Sweden: Swedish Road and Traffic Research Institute.

Storie, V.J. 1977. Male and female car drivers: differences observed in accidents. TRRL Laboratory Report 761. Crowthorne, Berkshire, U.K.: Transport and Road Research Laboratory.

Veevers, J. 1982. Women in the driver's seat: trends in sex differences in driving and death. Population Research and Policy Review 1(2):171-182.

Welford, A.T. 1977. Motor performance. In Handbook of the psychology of aging, Birren, J.E. and Schaie, K.W. (eds.), pp. 450-496. New York: Van Nostrand Reinhold.

Williams, A.F. and Carsten, O. 1989. Driver age and crash involvement. American Journal of Public Health 79(3):326-327.

Wright, G.R. and Shephard, R.J. 1978. Brake reaction time—effects of age, sex, and carbon monoxide. Archives of Environmental Health 33(3):141-150.

Appendix A: Tables

Table A-1
Fatal Involvements Per 100 Million Miles
1990 FARS and 1990 NPTS

Age Group	Fatal Involvements	10^8 VMT	Fatal Rate
16–19	6,323	686	9.21
20–24	7,833	1,614	4.85
25–29	6,993	2,243	3.12
30–34	5,680	2,386	2.38
35–39	4,471	2,204	2.03
40–44	3,477	1,982	1.75
45–49	2,484	1,343	1.85
50–54	2,035	1,031	1.97
55–59	1,700	828	2.05
60–64	1,646	656	2.51
65–69	1,569	415	3.78
70–74	1,375	264	5.20
75+	2,282	198	11.53
Unknown	470	127	3.70
Total	48,338	15,978	3.03

Table A-2
Injury Involvements Per Million Miles
1990 GES and 1990 NPTS

Age Group	Injury Involvements	10^6 VMT	Injury Rate
16–19	463,161	68,645	6.75
20–24	532,610	161,358	3.30
25–29	474,677	224,339	2.12
30–34	376,235	238,616	1.58
35–39	310,994	220,391	1.41
40–44	255,979	198,176	1.29
45–49	181,482	134,291	1.35
50–54	130,809	103,125	1.27
55–59	105,886	82,759	1.28
60–64	103,609	65,634	1.58
65–69	98,239	41,548	2.36
70–74	69,048	26,444	2.61
75+	82,534	19,785	4.17
Unknown	80,460	12,716	6.33
Total	3,265,723	1,597,827	2.04

Table A-3
All Involvements Per Million Miles
1990 GES and 1990 NPTS

Age Group	All Involvements	10^6 VMT	Overall Rate
16–19	1,381,167	68,645	20.12
20–24	1,544,449	161,358	9.57
25–29	1,364,020	224,339	6.08
30–34	1,125,846	238,616	4.72
35–39	943,359	220,391	4.28
40–44	741,992	198,176	3.74
45–49	542,010	134,291	4.04
50–54	382,009	103,125	3.70
55–59	322,140	82,759	3.89
60–64	288,684	65,634	4.40
65–69	272,373	41,548	6.56
70–74	204,255	26,444	7.72
75+	242,045	19,785	12.23
Unknown	363,130	12,716	28.56
Total	9,717,478	1,597,827	6.08

Table A-4
Fatal Involvements Per Licensed Driver
1990 FARS and 1990 NPTS

Age Group	Fatal Involvements	Licensed Drivers (Thousands)	Involvements per 100,000 Drivers
16–19	6,323	9,546	66.2
20–24	7,833	15,658	50.0
25–29	6,993	19,190	36.4
30–34	5,680	19,901	28.5
35–39	4,471	18,889	23.7
40–44	3,477	16,587	21.0
45–49	2,484	12,547	19.8
50–54	2,035	10,334	19.7
55–59	1,700	9,408	18.1
60–64	1,646	8,877	18.5
65–69	1,569	8,022	19.6
70–74	1,375	5,800	23.7
75+	2,282	6,459	35.3
Unknown	470	1,807	26.0
Total	48,338	163,025	29.7

Table A-5
Fatal Involvements Per Capita
1990 FARS and 1990 NPTS

Age Group	Fatal Involvements	Population (Thousands)	Involvements per 100,000 Population
16–19	6,323	13,851	45.6
20–24	7,833	17,728	44.2
25–29	6,993	20,594	34.0
30–34	5,680	21,195	26.8
35–39	4,471	19,963	22.4
40–44	3,477	17,501	19.9
45–49	2,484	13,268	18.7
50–54	2,035	11,218	18.1
55–59	1,700	10,402	16.3
60–64	1,646	10,128	16.3
65–69	1,569	9,487	16.5
70–74	1,375	7,167	19.2
75+	2,282	10,302	22.2
Unknown	470	2,310	20.3
Total	48,338	185,113	26.1

Table A-6
Licensure Rate by Age
1990 NPTS

Age Group	Licensed Drivers	Total Population	Percent Licensed
16–19	9,546,089	13,851,166	68.92
20–24	15,657,637	17,728,336	88.32
25–29	19,189,586	20,593,673	93.18
30–34	19,901,092	21,194,839	93.90
35–39	18,888,768	19,963,324	94.62
40–44	16,587,494	17,500,955	94.78
45–49	12,546,911	13,267,543	94.57
50–54	10,334,032	11,218,151	92.12
55–59	9,407,873	10,401,970	90.44
60–64	8,877,378	10,127,913	87.65
65–69	8,021,845	9,486,770	84.56
70–74	5,799,956	7,166,930	80.93
75+	6,458,869	10,301,510	62.70
Unknown	1,807,141	2,309,939	78.23
Total	163,024,671	185,113,020	88.07

Table A-7
Average Annual Mileage Per License Holder
1990 NPTS

Age Group	Miles Driven	Licensed Drivers	Average Miles Driven
16–19	67,574,369,197	9,546,089	7,079
20–24	160,862,331,564	15,657,637	10,274
25–29	223,630,113,689	19,189,586	11,654
30–34	238,041,494,699	19,901,092	11,961
35–39	219,999,203,117	18,888,768	11,647
40–44	197,916,335,806	16,587,494	11,932
45–49	134,208,324,487	12,546,911	10,697
50–54	102,643,982,106	10,334,032	9,933
55–59	82,673,805,527	9,407,873	8,788
60–64	65,096,662,879	8,877,378	7,333
65–69	41,498,383,405	8,021,845	5,173
70–74	26,304,428,918	5,799,956	4,535
75+	19,730,298,934	6,458,869	3,055
Unknown	12,684,013,112	1,807,141	7,019
Total	1,592,863,747,438	163,024,671	9,771

Table A-8
Injury Involvements Per Licensed Driver
1990 GES and 1990 NPTS

Age Group	Injury Involvements	Licensed Drivers (Thousands)	Involvements per 100,000 Drivers
16–19	463,161	9,546	4,852
20–24	532,610	15,658	3,402
25–29	474,677	19,190	2,474
30–34	376,235	19,901	1,891
35–39	310,994	18,889	1,646
40–44	255,979	16,587	1,543
45–49	181,482	12,547	1,446
50–54	130,809	10,334	1,266
55–59	105,886	9,408	1,126
60–64	103,609	8,877	1,167
65–69	98,239	8,022	1,225
70–74	69,048	5,800	1,190
75+	82,534	6,459	1,278
Unknown	80,460	1,807	4,452
Total	3,265,723	163,025	2,003

Table A-9
Injury Involvements Per Capita
1990 GES and 1990 NPTS

Age Group	Injury Involvements	Population (Thousands)	Involvements per 100,000 Population
16–19	463,161	13,851	3,344
20–24	532,610	17,728	3,004
25–29	474,677	20,594	2,305
30–34	376,235	21,195	1,775
35–39	310,994	19,963	1,558
40–44	255,979	17,501	1,463
45–49	181,482	13,268	1,368
50–54	130,809	11,218	1,166
55–59	105,886	10,402	1,018
60–64	103,609	10,128	1,023
65–69	98,239	9,487	1,036
70–74	69,048	7,167	963
75+	82,534	10,302	801
Unknown	80,460	2,310	3,483
Total	3,265,723	185,113	1,764

Table A-10
All Involvements Per Licensed Driver
1990 GES and 1990 NPTS

Age Group	All Involvements	Licensed Drivers (Thousands)	Involvements per 100,000 Drivers
16–19	1,381,167	9,546	14,468
20–24	1,544,449	15,658	9,864
25–29	1,364,020	19,190	7,108
30–34	1,125,846	19,901	5,657
35–39	943,359	18,889	4,994
40–44	741,992	16,587	4,473
45–49	542,010	12,547	4,320
50–54	382,009	10,334	3,697
55–59	322,140	9,408	3,424
60–64	288,684	8,877	3,252
65–69	272,373	8,022	3,395
70–74	204,255	5,800	3,522
75+	242,045	6,459	3,747
Unknown	363,130	1,807	20,094
Total	9,717,478	163,025	5,961

Table A-11
All Involvements Per Capita
1990 GES and 1990 NPTS

Age Group	All Involvements	Population (Thousands)	Involvements per 100,000 Population
16–19	1,381,167	13,851	9,971
20–24	1,544,449	17,728	8,712
25–29	1,364,020	20,594	6,623
30–34	1,125,846	21,195	5,312
35–39	943,359	19,963	4,725
40–44	741,992	17,501	4,240
45–49	542,010	13,268	4,085
50–54	382,009	11,218	3,405
55–59	322,140	10,402	3,097
60–64	288,684	10,128	2,850
65–69	272,373	9,487	2,871
70–74	204,255	7,167	2,850
75+	242,045	10,302	2,350
Unknown	363,130	2,310	15,720
Total	9,717,478	185,113	5,249

Table A-12
Fatal Involvements Per 100 Million Miles
Males vs. Females, 1990 FARS and NPTS

Age Group	Males			Females		
	Fatal Involvements	10^8 VMT	Fatal Rate	Fatal Involvements	10^8 VMT	Fatal Rate
16–19	4,620	397	11 65	1,703	290	5.87
20–24	5,913	885	6 68	1,916	728	2.63
25–29	5,183	1,427	3 63	1,810	817	2.22
30–34	4,141	1,462	2 83	1,539	924	1.67
35–39	3,213	1,352	2 38	1,258	852	1.48
40–44	2,406	1,255	1 92	1,071	727	1.47
45–49	1,769	915	1 93	715	428	1.67
50–54	1,435	688	2 09	600	344	1.75
55–59	1,226	558	2 20	473	270	1.75
60–64	1,163	455	2 56	483	201	2.40
65–69	1,092	290	3 77	477	126	3.79
70–74	904	171	5 28	471	93	5.05
75+	1,585	141	11 27	697	57	12.19
Unknown	159	72	2 21	16	54	0.30
Total	34,809	10,066	3 46	13,229	5,911	2.24

Table A-13
Injury Involvements Per Million Miles
Males vs. Females, 1990 GES and NPTS

Age Group	Males			Females		
	Injury Involvements	10^6 VMT	Injury Rate	Injury Involvements	10^6 VMT	Injury Rate
16–19	265,100	39,652	6.69	198,033	28,993	6.83
20–24	323,205	88,520	3.65	209,291	72,837	2.87
25–29	272,051	142,667	1.91	202,499	81,673	2.48
30–34	209,306	146,204	1.43	166,814	92,412	1.81
35–39	175,404	135,205	1.30	135,474	85,186	1.59
40–44	131,406	125,482	1.05	124,572	72,694	1.71
45–49	97,488	91,518	1.07	83,994	42,773	1.96
50–54	73,452	68,773	1.07	57,241	34,351	1.67
55–59	58,101	55,762	1.04	47,756	26,996	1.77
60–64	64,933	45,495	1.43	38,675	20,140	1.92
65–69	62,695	28,956	2.17	35,544	12,592	2.82
70–74	39,358	17,113	2.30	29,690	9,331	3.18
75+	53,977	14,068	3.84	28,556	5,718	4.99
Unknown	34,827	7,185	4.85	14,148	5,411	2.61
Total	1,861,304	1,006,599	1.85	1,372,290	591,107	2.32

Table A-14
All Involvements Per Million Miles
Males vs. Females, 1990 GES and NPTS

Age Group	Males			Females		
	All Involvements	10^6 VMT	Overall Rate	All Involvements	10^6 VMT	Overall Rate
16–19	826,933	39,652	20.85	553,967	28,993	19.11
20–24	941,102	88,520	10.63	602,812	72,837	8.28
25–29	819,866	142,667	5.75	543,268	81,673	6.65
30–34	650,812	146,204	4.45	474,055	92,412	5.13
35–39	539,392	135,205	3.99	402,438	85,186	4.72
40–44	411,125	125,482	3.28	330,753	72,694	4.55
45–49	305,375	91,518	3.34	236,634	42,773	5.53
50–54	227,362	68,773	3.31	154,532	34,351	4.50
55–59	190,041	55,762	3.41	131,939	26,996	4.89
60–64	175,991	45,495	3.87	112,414	20,140	5.58
65–69	171,096	28,956	5.91	100,974	12,592	8.02
70–74	122,653	17,113	7.17	81,602	9,331	8.75
75+	150,897	14,068	10.73	91,148	5,718	15.94
Unknown	132,696	7,185	18.47	49,454	5,411	9.14
Total	5,665,342	1,006,599	5.63	3,865,992	591,107	6.54

Table A-15
Miles Driven by Age and Gender
1990 NPTS

Age Group	Male Mileage	Female Mileage	Female Mileage as Percent of Male Mileage
16–19	39,651,955,257	28,993,166,118	73.12
20–24	88,520,392,832	72,837,351,090	82.28
25–29	142,666,525,333	81,672,567,186	57.25
30–34	146,204,400,480	92,412,063,037	63.21
35–39	135,204,917,858	85,185,583,849	63.00
40–44	125,482,318,033	72,693,749,497	57.93
45–49	91,517,630,800	42,773,173,252	46.74
50–54	68,773,138,164	34,351,434,161	49.95
55–59	55,762,195,309	26,996,494,294	48.41
60–64	45,494,546,247	20,139,654,609	44.27
65–69	28,955,737,379	12,592,016,606	43.49
70–74	17,113,054,420	9,331,107,863	54.53
75+	14,067,719,979	5,717,587,954	40.64
Unknown	7,184,575,367	5,410,646,038	75.31
Total	1,006,599,107,458	591,106,595,552	58.72

Table A-16
Licensure Rate and Average Annual Mileage Per License Holder
1990 NPTS

Age Group	Males		Females	
	Percent Licensed	Average Miles Driven	Percent Licensed	Average Miles Driven
16–19	68.9%	8,394	69.0%	5,838
20–24	90.2	11,831	86.7	8,855
25–29	94.4	14,822	92.0	8,470
30–34	95.6	15,125	92.4	8,986
35–39	95.5	14,530	93.8	8,857
40–44	96.3	15,260	93.3	8,665
45–49	97.1	14,478	92.1	6,858
50–54	96.3	13,130	88.3	6,692
55–59	95.6	11,679	85.7	5,809
60–64	95.8	10,206	80.7	4,440
65–69	93.3	7,308	77.5	3,089
70–74	91.2	6,203	73.5	3,037
75+	81.5	4,231	50.4	1,811
Unknown	87.8	11,110	75.3	4,766
Total	92.1%	12,508	84.5%	7,116

Table A-17
Fatal Involvements Per 100 Million Miles
Day vs. Night, 1990 FARS and NPTS

Age Group	Day			Night		
	Fatal Involvements	10^8 VMT	Fatal Rate	Fatal Involvements	10^8 VMT	Fatal Rate
16–19	3,456	552	6.27	2,835	119	23.80
20–24	3,960	1,339	2.96	3,825	211	18.11
25–29	3,896	1,889	2.06	3,057	273	11.19
30–34	3,375	2,068	1.63	2,274	254	8.94
35–39	2,842	1,919	1.48	1,593	215	7.42
40–44	2,405	1,751	1.37	1,057	181	5.85
45–49	1,771	1,162	1.52	702	138	5.08
50–54	1,516	899	1.69	507	88	5.74
55–59	1,325	724	1.83	372	69	5.38
60–64	1,374	578	2.38	267	50	5.35
65–69	1,360	366	3.71	205	27	7.59
70–74	1,267	228	5.55	105	15	6.87
75+	2,165	172	12.61	107	8	13.79
Unknown	202	105	1.92	266	8	34.45
Total	30,914	13,753	2.25	17,172	1,657	10.37

Table A-18
Daytime Fatal Involvements Per 100 Million Miles
Males vs. Females, 1990 FARS and NPTS

Age Group	Males			Females		
	Fatal Involvements	10^8 VMT	Fatal Rate	Fatal Involvements	10^8 VMT	Fatal Rate
16–19	2,341	311	7.53	1,115	241	4.63
20–24	2,766	729	3.79	1,194	610	1.96
25–29	2,684	1,184	2.27	1,212	705	1.72
30–34	2,280	1,247	1.83	1,095	821	1.33
35–39	1,919	1,159	1.66	923	760	1.21
40–44	1,578	1,109	1.42	827	642	1.29
45–49	1,199	789	1.52	572	373	1.53
50–54	1,040	592	1.76	476	306	1.55
55–59	924	492	1.88	401	232	1.72
60–64	940	398	2.36	434	180	2.41
65–69	936	257	3.64	424	109	3.89
70–74	820	149	5.51	447	80	5.62
75+	1,497	126	11.92	668	46	14.50
Unknown	78	61	1.28	9	43	0.21
Total	21,002	8,604	2.44	9,797	5,148	1.90

Table A-19
Nighttime Fatal Involvements Per 100 Million Miles
Males vs. Females, 1990 FARS and NPTS

Age Group	Males			Females		
	Fatal Involvements	10^8 VMT	Fatal Rate	Fatal Involvements	10^8 VMT	Fatal Rate
16–19	2,252	76	29.70	583	43	13.46
20–24	3,103	108	28.84	718	104	6.93
25–29	2,473	194	12.77	584	80	7.34
30–34	1,834	173	10.58	440	81	5.43
35–39	1,260	143	8.80	333	71	4.66
40–44	816	123	6.65	241	58	4.15
45–49	563	100	5.65	139	39	3.59
50–54	386	61	6.29	121	27	4.49
55–59	299	52	5.70	72	17	4.32
60–64	218	38	5.81	49	12	3.94
65–69	155	22	7.07	50	5	9.86
70–74	81	13	6.24	24	2	10.41
75+	80	5	15.70	27	3	10.12
Unknown	81	3	23.20	7	4	1.65
Total	13,601	1,111	12.25	3,388	546	6.20

Table A-20
Injury Involvements Per Million Miles
Day vs. Night, 1990 GES and NPTS

Age Group	Day			Night		
	Injury Involvements	10^6 VMT	Injury Rate	Injury Involvements	10^6 VMT	Injury Rate
16–19	357,345	55,153	6.48	103,040	11,912	8.65
20–24	404,438	133,863	3.02	126,763	21,120	6.00
25–29	370,240	188,906	1.96	102,608	27,321	3.76
30–34	305,140	206,846	1.48	69,678	25,448	2.74
35–39	261,186	191,946	1.36	48,547	21,462	2.26
40–44	222,310	175,125	1.27	33,003	18,071	1.83
45–49	161,364	116,164	1.39	19,572	13,824	1.42
50–54	114,673	89,857	1.28	14,987	8,830	1.70
55–59	95,704	72,444	1.32	9,543	6,914	1.38
60–64	95,930	57,792	1.66	7,278	4,994	1.46
65–69	90,083	36,627	2.46	7,439	2,700	2.76
70–74	66,743	22,845	2.92	2,306	1,528	1.51
75+	79,048	17,164	4.61	3,291	776	4.24
Unknown	56,276	10,547	5.34	23,609	772	30.57
Total	2,680,478	1,375,278	1.95	571,665	165,672	3.45

Table A-21
Daytime Injury Involvements Per Million Miles
Males vs. Females, 1990 GES and NPTS

Age Group	Males			Females		
	Injury Involvements	10^6 VMT	Injury Rate	Injury Involvements	10^6 VMT	Injury Rate
16–19	196,580	31,085	6.32	160,736	24,068	6.68
20–24	228,503	72,904	3.13	175,821	60,958	2.88
25–29	197,532	118,412	1.67	172,701	70,494	2.45
30–34	159,465	124,746	1.28	145,675	82,099	1.77
35–39	140,788	115,907	1.21	120,397	76,038	1.58
40–44	109,031	110,917	0.98	113,280	64,208	1.76
45–49	83,564	78,894	1.06	77,799	37,270	2.09
50–54	62,875	59,246	1.06	51,681	30,611	1.69
55–59	50,896	49,196	1.03	44,779	23,248	1.93
60–64	58,218	39,786	1.46	37,711	18,006	2.09
65–69	56,592	25,726	2.20	33,490	10,901	3.07
70–74	37,478	14,891	2.52	29,265	7,954	3.68
75+	51,573	12,557	4.11	27,475	4,607	5.96
Unknown	24,510	6,114	4.01	12,122	4,312	2.81
Total	1,457,606	860,382	1.69	1,202,935	514,774	2.34

Table A-22
Nighttime Injury Involvements Per Million Miles
Males vs. Females, 1990 GES and NPTS

Age Group	Males			Females		
	Injury Involvements	10^6 VMT	Injury Rate	Injury Involvements	10^6 VMT	Injury Rate
16–19	66,858	7,582	8.82	36,182	4,330	8.36
20–24	93,452	10,758	8.69	33,311	10,362	3.21
25–29	73,623	19,360	3.80	28,866	7,961	3.63
30–34	48,995	17,338	2.83	20,568	8,110	2.54
35–39	33,773	14,318	2.36	14,658	7,144	2.05
40–44	21,991	12,263	1.79	11,013	5,808	1.90
45–49	13,655	9,956	1.37	5,917	3,867	1.53
50–54	9,864	6,136	1.61	5,123	2,693	1.90
55–59	6,901	5,246	1 32	2,642	1,668	1.58
60–64	6,357	3,752	1.69	921	1,242	0.74
65–69	5,979	2,193	2.73	1,461	507	2.88
70–74	1,880	1,298	1 45	425	230	1.85
75+	2,219	509	4.36	1,071	267	4.02
Unknown	10,031	349	28.73	1,883	423	4.45
Total	395,578	111,058	3.56	164,041	54,614	3.00

Table A-23
All Involvements Per Million Miles
Day vs. Night, 1990 GES and NPTS

Age Group	Day			Night		
	All Involvements	10^6 VMT	Overall Rate	All Involvements	10^6 VMT	Overall Rate
16–19	1,095,131	55,153	19.86	277,278	11,912	23.28
20–24	1,213,956	133,863	9.07	323,375	21,120	15.31
25–29	1,112,666	188,906	5.89	244,246	27,321	8.94
30–34	946,676	206,846	4.58	175,216	25,448	6.89
35–39	816,843	191,946	4.26	123,074	21,462	5.73
40–44	648,657	175,125	3.70	90,025	18,071	4.98
45–49	480,044	116,164	4.13	59,603	13,824	4.31
50–54	342,630	89,857	3.81	37,240	8,830	4.22
55–59	295,479	72,444	4.08	25,226	6,914	3.65
60–64	268,977	57,792	4.65	18,903	4,994	3.78
65–69	255,713	36,627	6.98	15,703	2,700	5.82
70–74	196,970	22,845	8.62	6,995	1,528	4.58
75+	233,917	17,164	13.63	7,840	776	10.10
Unknown	244,046	10,547	23.14	107,513	772	139.23
Total	8,151,704	1,375,278	5.93	1,512,239	165,672	9.13

Table A-24
All Daytime Involvements Per Million Miles
Males vs. Females, 1990 GES and NPTS

Age Group	Males			Females		
	All Involvements	10^6 VMT	Overall Rate	All Involvements	10^6 VMT	Overall Rate
16–19	635,090	31,085	20 43	459,775	24,068	19.10
20–24	702,698	72,904	9 64	510,723	60,958	8.38
25–29	635,467	118 412	5 37	476,595	70,494	6.76
30–34	521,202	124,746	4 18	424,611	82,099	5.17
35–39	450,783	115 907	3 89	365,198	76,038	4.80
40–44	349,258	110,917	3 15	299,286	64,208	4.66
45–49	264,767	78,894	3 36	215,277	37,270	5.78
50–54	199,500	59,246	3 37	143,013	30,611	4.67
55–59	170,880	49,196	3 47	124,440	23,248	5.35
60–64	159,768	39,786	4 02	108,931	18,006	6.05
65–69	158,644	25 726	6 17	96,767	10,901	8.88
70–74	116,795	14 891	7 84	80,175	7,954	10.08
75+	145,221	12,557	11 56	88,696	4,607	19.25
Unknown	96,361	6,114	15 76	40,701	4,312	9.44
Total	4,606,433	860,382	5 35	3,434,187	514,774	6.67

Table A-25
All Nighttime Involvements Per Million Miles
Males vs. Females, 1990 GES and NPTS

Age Group	Males			Females		
	All Involvements	10^6 VMT	Overall Rate	All Involvements	10^6 VMT	Overall Rate
16–19	186,594	7,582	24.61	90,683	4,330	20.94
20–24	233,263	10,758	21.68	90,112	10,362	8.70
25–29	179,398	19,360	9.27	64,566	7,961	8.11
30–34	126,515	17,338	7.30	48,587	8,110	5.99
35–39	86,471	14,318	6.04	35,936	7,144	5.03
40–44	60,105	12,263	4.90	29,920	5,808	5.15
45–49	39,754	9,956	3.99	19,849	3,867	5.13
50–54	26,466	6,136	4.31	10,775	2,693	4.00
55–59	18,185	5,246	3.47	7,041	1,668	4.22
60–64	15,463	3,752	4.12	3,440	1,242	2.77
65–69	12,328	2,193	5.62	3,375	507	6.65
70–74	5,858	1,298	4.51	1,136	230	4.93
75+	5,398	509	10.60	2,442	267	9.16
Unknown	35,219	349	100.85	7,918	423	18.72
Total	1,031,017	111,058	9.28	415,780	54,614	7.61

Table A-26
Miles Driven by Age Group
1983 NPTS and 1990 NPTS

Age Group	1983 Mileage (Millions)	1990 Mileage (Millions)	Percent Increase 1983 to 1990
16–19	49.450	68,645	38.82
20–24	140.245	161,358	15.05
25–29	160.267	224,339	39.98
30–34	174.309	238,616	36.89
35–39	143.138	220,391	53.97
40–44	118.327	198,176	67.48
45–49	79.386	134,291	69.16
50–54	77.967	103,125	32.27
55–59	75.771	82,759	9.22
60–64	61.401	65,634	6.89
65–69	29.372	41,548	41.45
70–74	15.497	26,444	70.64
75+	10.406	19,785	90.13
Unknown	0	12,716	—
Total	1,135.536	1,597,827	40.71

Table A-27
Miles Driven by Age Group, Males Only
1983 NPTS and 1990 NPTS

Age Group	1983 Mileage (Millions)	1990 Mileage (Millions)	Percent Change 1983 to 1990
16–19	31,269	39,652	26.81
20–24	91,347	88,520	–3.09
25–29	106,367	142,667	34.13
30–34	117,943	146,204	23.96
35–39	89,914	135,205	50.37
40–44	82,010	125,482	53.01
45–49	53,314	91,518	71.66
50–54	54,104	68,773	27.11
55–59	57,230	55,762	–2.56
60–64	43,948	45,495	3.52
65–69	21,498	28,956	34.69
70–74	9,075	17,113	88.57
75+	7,517	14,068	87.14
Unknown	0	7,185	—
Total	765,536	1,006,599	31.49

Table A-28
Miles Driven by Age Group, Females Only
1983 NPTS and 1990 NPTS

Age Group	1983 Mileage (Millions)	1990 Mileage (Millions)	Percent Increase 1983 to 1990
16–19	18,181	28,993	59.47
20–24	48,898	72,837	48.96
25–29	53,900	81,673	51.52
30–34	56,366	92,412	63.95
35–39	53,224	85,186	60.05
40–44	36,317	72,694	100.17
45–49	26,072	42,773	64.06
50–54	23,863	34,351	43.95
55–59	18,541	26,996	45.60
60–64	17,453	20,140	15.39
65–69	7,874	12,592	59.92
70–74	6,422	9,331	45.30
75+	2,889	5,718	97.91
Unknown	0	5,411	—
Total	370,000	591,107	59.76

Table A-29
Licensure Rate and Average Annual Mileage Per License Holder
1983 NPTS and 1990 NPTS

Age Group	1983		1990	
	Percent Licensed	Average Miles Driven	Percent Licensed	Average Miles Driven
16–19	62.2%	5,199	68.9%	7,079
20–24	84.7	7,865	88.3	10,274
25–29	88.6	9,211	93.2	11,654
30–34	89.3	9,679	93.9	11,961
35–39	90.4	9,830	94.6	11,647
40–44	88.9	9,988	94.8	11,932
45–49	87.9	8,115	94.6	10,697
50–54	84.1	8,336	92.1	9,933
55–59	84.8	7,122	90.4	8,788
60–64	84.0	6,518	87.7	7,333
65–69	74.6	4,600	84.6	5,173
70–74	67.5	3,590	80.9	4,535
75+	44.7	2,464	62.7	3,055
Unknown	—	—	78.2	7,019
Total	81.4%	7,925	88.1%	9,771

Table A-30
Percentage of Overall Travel by Age Group
1983 NPTS and 1990 NPTS

Age Group	Percent of 1983 Mileage	Percent of 1990 Mileage
16–19	4.35	4.30
20–24	12.35	10.10
25–29	14.11	14.04
30–34	15.35	14.93
35–39	12.61	13.79
40–44	10.42	12.40
45–49	6.99	8.40
50–54	6.87	6.45
55–59	6.67	5.18
60–64	5.41	4.11
65–69	2.59	2.60
70–74	1.36	1.66
75+	0.92	1.24
Unknown	0.00	0.80
Total	100.00	100.00

Table A-31
Fatal Involvements Per 100 Million Miles
1983 FARS and 1983 NPTS

Age Group	Fatal Involvements	10^8 VMT	Fatal Rate
16–19	6,211	495	12.56
20–24	8,775	1,402	6.26
25–29	6,339	1,603	3.96
30–34	4,673	1,743	2.68
35–39	3,573	1,431	2.50
40–44	2,517	1,183	2.13
45–49	1,950	794	2.46
50–54	1,826	780	2.34
55–59	1,722	758	2.27
60–64	1,492	614	2.43
65–69	1,275	294	4.34
70–74	1,018	155	6.57
75+	1,543	104	14.83
Unknown	360	0	—
Total	43,274	11,355	3.81

Table A-32
Fatal Involvements Per 100 Million Miles
Males vs. Females, 1983 FARS and NPTS

Age Group	Males			Females		
	Fatal Involvements	10^8 VMT	Fatal Rate	Fatal Involvements	10^8 VMT	Fatal Rate
16–19	4,664	313	14.92	1,547	182	8.51
20–24	6,813	913	7.46	1,961	489	4.01
25–29	4,921	1,064	4.63	1,418	539	2.63
30–34	3,546	1,179	3.01	1,127	564	2.00
35–39	2,658	899	2.96	915	532	1.72
40–44	1,793	820	2.19	724	363	1.99
45–49	1,439	533	2.70	511	261	1.96
50–54	1,353	541	2.50	473	239	1.98
55–59	1,247	572	2.18	475	185	2.56
60–64	1,069	439	2.43	423	175	2.42
65–69	909	215	4.23	366	79	4.65
70–74	754	91	8.31	264	64	4.11
75+	1,139	75	15.15	404	29	13.98
Unknown	113	0	—	14	0	—
Total	32,418	7,655	4.23	10,622	3,700	2.87

Table A-33
Injury Involvements Per Million Miles
Males vs. Females, 1982–84 NASS and 1983 NPTS

Age Group	Males			Females		
	Injury Involvements	10^6 VMT	Injury Rate	Injury Involvements	10^6 VMT	Injury Rate
16–19	327,070	31,269	10.46	217,275	18,181	11.95
20–24	421,703	91,347	4.62	228,889	48,898	4.68
25–29	329,477	106,367	3.10	199,783	53,900	3.71
30–34	244,943	117,943	2.08	153,111	56,366	2.72
35–39	173,043	89,914	1.92	131,038	53,224	2.46
40–44	119,773	82,010	1.46	92,423	36,317	2.54
45–49	97,913	53,314	1.84	69,073	26,072	2.65
50–54	92,517	54,104	1.71	54,492	23,863	2.28
55–59	107,434	57,230	1.88	44,876	18,541	2.42
60–64	70,724	43,948	1.61	41,365	17,453	2.37
65–69	51,228	21,498	2.38	35,784	7,874	4.54
70–74	50,648	9,075	5.58	29,035	6,422	4.52
75+	60,800	7,517	8.09	19,899	2,889	6.89
Unknown	25,516	0	—	4,332	0	—
Total	2,172,790	765,536	2.84	1,321,374	370,000	3.57

Table A-34
All Involvements Per Million Miles
Males vs. Females, 1982–84 NASS and 1983 NPTS

Age Group	Males			Females		
	All Involvements	10^6 VMT	Overall Rate	All Involvements	10^6 VMT	Overall Rate
16–19	827,821	31,269	26.47	461,659	18,181	25.39
20–24	1,042,849	91,347	11.42	549,917	48,898	11.25
25–29	819,944	106,367	7.71	475,601	53,900	8.82
30–34	579,981	117,943	4.92	379,732	56,366	6.74
35–39	481,362	89,914	5.35	288,170	53,224	5.41
40–44	308,294	82,010	3.76	216,523	36,317	5.96
45–49	253,215	53,314	4.75	167,161	26,072	6.41
50–54	219,945	54,104	4.07	134,493	23,863	5.64
55–59	241,793	57,230	4.22	113,550	18,541	6.12
60–64	204,222	43,948	4.65	118,191	17,453	6.77
65–69	169,632	21,498	7.89	82,103	7,874	10.43
70–74	126,692	9,075	13.96	57,776	6,422	9.00
75+	137,493	7,517	18.29	69,103	2,889	23.92
Unknown	110,373	0	—	41,945	0	—
Total	5,523,614	765,536	7.22	3,155,924	370,000	8.53