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16. Abstract

The five papers in this volume describe analyses of fatally-injured pedestrians and occupants by age, based on traffic accident data. All five were written between June 1983 and May 1988. The topics addressed include fatality odds when drivers of different ages are involved together in an accident, number of fatalities by type (standardized by population counts and number of nonfatal injuries), and changes in fatalities over time (by victim age and vehicle type). The principal accident data sources are the Fatal Accident Reporting System (FARS), the National Crash Severity Study (NCSS), and the National Accident Sampling System (NASS).

A brief description of each paper is given in the Foreword.

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FOREWORD

This volume contains five papers about accident victims of different ages, written between June 1983 and May 1988. Over these six years, changes in the number and nature of traffic fatalities reflected other national changes. Population increased (with shifts in the age distribution); the economy varied (with uneven affects on different age groups); and other social changes (some more-permanent, some less-quantified, many unidentified) occurred. These five papers describe differences between age groups and changes within age groups.

"Comparison by Age of Drivers in Two-Car Fatal Crashes" (June 1983) compares driver fatalities by age, controlling for some differences in crash severity. Older drivers were much more likely to be killed than were younger drivers when they were involved together; the difference increased as the age difference increased; but the older driver was more likely to be in a vehicle struck in the side. The implications are that driver age affects crash type and survivability, and that both must be accounted for in comparing outcomes.

"Traffic Victim Age and Gender Distributions" (August 1984) presents comparisons of fatalities and injuries (counts, accident rates, and population rates), for pedestrians and occupants, for males and females, in five-year age groups. Fatality and injury rates increased with age, even into the eighties and nineties; however, older people were less likely to die at the scene and more likely to be hospitalized before dying. This suggests greater opportunities for treatment for older people's injuries and greater need for prevention of younger people's injuries.

"Traffic Deaths of Older Teenagers from 1975 through 1986" (June 1987) explores the fatality increase from 1985 to 1986 and considers the influence of population and economic trends on this group. The large increases across time and road categories suggests that as the economy improved, teenagers gained access to vehicles. This implies that new drivers may need special protection to develop their skills during more-prosperous times.

"Traffic Deaths of Young Children from 1975 through 1986" (October 1987) shows a decline in child occupant fatalities consistent with increases in child restraint use and effectiveness. There was a larger decline in child (through thirteen years old) pedestrian fatalities for all times and places. This suggests that child accident risk is changing, and that children are being exposed to accidents less as pedestrians and more as car occupants.

"Pedestrian Fatalities by Victim Age and Striking Vehicle Type from 1975 through 1986" (May 1988) found that the child pedestrian decline noted in the previously-mentioned study applied to people up through the early twenties and to older people (from the mid-forties). The decline by striking vehicle type largely reflected changes in vehicle use -- more light trucks, smaller cars, and foreign cars; however, differences among vehicle types are difficult to interpret with the available data. It appears that detailed data on vehicle use and pedestrian exposure are needed to answer the many questions about why pedestrian fatality declines occur and what role (if any) vehicle changes play in them.

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Comparison by Age of Drivers in Two-Car Fatal Crashes (June 1983)

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PURPOSE AND KEY RESULTS

Most analysis of accidents by driver age is limited by the lack of relevant measures of exposure to accidents. For example, the young are known to have higher rates of accidents per licensed driver; however, they are also known to drive more frequently for social purposes than do their elders. Adequate controls for differences in driving patterns (where and when) by age are currently not available. This paper is an attempt to circumvent this difficulty by a comparative analysis of the two drivers in a two-car fatal crash.

There is a small but consistent tendency for the drivers involved together in a two-car fatal crash to be about the same age. This may largely reflect travel patterns -- people of the same age are more likely to drive at the same times and to the same places than is the population as a whole. However, the youngest (under 20 years) and oldest (over 64 years) drivers are also disproportionately involved with one another in fatal crashes. It is suggested that the differences in driving behaviors and skills between the young and the old make it difficult for each to anticipate or compensate for the driving actions of the other.

When two cars collide, the older driver is much more likely to receive fatal injuries than is the younger driver. In a fatal crash, the odds that the older driver was the fatality increase as the difference between the ages of the drivers increases. At the extreme, in a fatal crash between a driver under 20 years and a driver over 64 years, the older driver is five times as likely to have died as is the younger driver.

Alcohol involvement in fatal crashes is reported most frequently for those aged 20 through 24 years. The rate of reported drinking decreases steadily with age for older drivers. Drivers under 20 years old who are involved in a fatal accident are reported to have been drinking about as frequently as are those aged 35 through 49 years. These results may imply that alcohol most seriously degrades the driving skills of young people (those 20 through 24 years). However, young people probably also tend to drive for social purposes more frequently than do their elders.

Driving violations are seldom charged against a fatally-injured driver. Of surviving drivers in fatal accidents, the frequency of violations charged as a result of the accident decreases steadily with age. This is true over all surviving drivers and within male and female categories. The exception is that, as a group, drivers over 64 years are charged with a violation about as frequently as are those aged 25 through 34 years. Females are charged only about two-thirds as frequently as males, but the difference by sex decreases with age.

Driver factors which are reported to have contributed to the accident decrease with age, except for the over 64 age group. These older people are reported to have failed to yield the right-of-way in one-quarter of the fatal accidents in which they were survivors. This is in contrast to a rate of 7 percent for those under 65 years. Older drivers also have higher rates of failure to observe signs and inattention. Younger people are more frequently reported as having been driving too fast, operating recklessly, and driving on the wrong side of the road.

The relative frequency of driving a struck (rather than a striking) vehicle increases with age. This is consistent with the greater odds of fatality for older people, the lower rate of violations charged to older people (with the exception of the group over 64 years old), and the patterns of driver contributory factors by age. It is estimated that increased fatality risk for older people is less a result of the increased crash forces they experience than it is a result of decreased resistance to these crash forces.

AGES OF DRIVERS

In two-car fatal crashes, there is a correlation between the ages of the drivers — they are slightly more likely to be of approximately the same age than would otherwise be expected. An interesting anomaly is that drivers under 20 years old are also disproportionately involved with drivers over 64 years old.

Table 1 shows the number of two-car fatal crashes reported on the 1979 through 1981 Fatal Accident Reporting System (FARS). These 15,336 fatal crashes have been categorized by the ages of the two drivers.

Table 1: Ages of Drivers in Two-car Fatal Crashes
Cases Observed
1979-1981 FARS

	Age Category					
Age Category	15 - 19	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	507	998	1,187	851	610	528
20 - 24		686	1,557	1,053	728	548
25 - 34			941	1,230	886	655
35 - 49				465	619	509
50 - 64					247	375
65+						156

Table 2 summarizes the age distribution of the 30,672 drivers involved.

Table 2: Ages of Drivers in Two-car Fatal Crashes
Distribution of Drivers
1979-1981 FARS

Age Category	Number	Percent
15-19	5,188	16.91
20-24	6,256	20.40
25-34	7,397	24.12
35-49	5,192	16.93
50-64	3,712	12.10
65+	2,927	9.54
Total	30,672	100.00

If the ages of the drivers in an accident were unrelated to each other, then the expected number of interactions could be computed directly from Table 2. For example, the number of accidents expected with two drivers under 20 years is

16.91 percent x 16.91 percent x 15,336 accidents

= 2.86 percent x 15,336 accidents

= 439 accidents.

The expected number of accidents involving drivers in different age categories is computed as shown for a driver under 20 years with a driver over 64 years:

2 x 16.91 percent x 9.54 percent x 15,336 accidents

= 3.23 percent x 15,336 accidents

= 495 accidents.

These two example computations follow directly from the expansion of

$$(A + B + C + D + E + F)^2.$$

The result is Table 3 for expected driver age interactions.

Table 3: Ages of Drivers in Two-car Fatal Crashes
Cases Expected if Driver Ages Were Uncorrelated
1979-1981 FARS

	Age Category					
Age Category	15 - 19	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	439	1,058	1,251	878	628	495
20 - 24		638	1,509	1,059	757	597
25 - 34			892	1,252	895	706
35 - 49				439	628	495
50 - 64					225	354
65+						140

A measure of the deviation of the expected number of cases from the observed number of cases is provided by the ratio of

$$\frac{\text{cases observed}}{\text{cases expected}}$$

for each cell of Tables 1 and 3. The results are shown in Table 4. A value greater than 1.00 implies more cases observed than expected.

Table 4: Ages of Drivers in Two-car Fatal Crashes
Cases Observed/Cases Expected
1979-1981 FARS

	Age Category					
Age Category	15 - 19	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	1.15	0.94	0.95	0.97	0.97	1.07
20 - 24		1.08	1.03	0.99	0.96	0.92
25 - 34			1.05	0.98	0.99	0.93
35 - 49				1.06	0.99	1.03
50 - 64					1.10	1.06
65+						1.11

In general, drivers are disproportionately involved with other drivers of about the same age. This may largely reflect similarities in times and places of travel. An exception to this pattern is the larger than expected involvement of drivers under 20 years with drivers over 64 years. This may result from the conflict between the driving behavior, skills, and inexperience of the young and the old. The very old and the very young may also tend to drive together because of similarities in lifestyles (for example, both groups contain large numbers of non-working people).

FATALITY CONSEQUENCES

When two cars collide in a fatal accident, the older driver is more likely to receive fatal injuries than is the younger driver. The greater the difference in the ages, the more likely is it that the older driver has been killed.

Table 5 summarizes the data on driver fatalities by whether the drivers are in the same or different age categories. In some cases, no driver has been killed. As all of these are fatal accidents, this implies that another passenger or possibly a non-motorist has been killed.

Table 5: Fatalities in Two-car Fatal Crashes
Counts of Accidents by Similarity of Age Categories
1979-1981 FARS

	Number of Drivers Killed			
Age Categories	None	One	Two	Total
Same	823	1,981	198	3,002
Different	3,391	8,198	745	12,334
Total	4,214	10,179	943	15,336

For a comparison of fatality consequences by age, it is the 12,334 cases of drivers in different age categories that are of interest. Tables 6, 7, and 8 show the distributions of accidents in which only the younger driver, only the older driver, and both the younger and the older drivers have been killed, respectively.

Table 6: Fatalities in Two-car Fatal Crashes
Accidents with Only the Younger Driver Killed
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	300	299	246	111	44
20 - 24		467	299	149	52
25 - 34			373	214	76
35 - 49				176	81
50 - 64					70

Table 7: Fatalities in Two-car Fatal Crashes
Accidents with Only the Older Driver Killed
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	344	428	321	283	330
20 - 24		568	387	352	321
25 - 34			462	402	347
35 - 49				247	272
50 - 64					177

Table 8: Fatalities in Two-car Fatal Crashes
Accidents with Both Drivers Killed
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	37	109	61	48	28
20 - 24		71	81	71	34
25 - 34			40	52	32
35 - 49				19	26
50 - 64					6

There were 2,957 cases in which only the younger driver was killed (Table 6), 5,241 cases in which only the older driver was killed (Table 7), and 745 cases in which both drivers were killed (Table 8). The ratio of older fatalities (sum of Tables 7 and 8) to younger fatalities (sum of Tables 6 and 8) is shown by age interaction in Table 9.

Table 9: Fatalities in Two-car Fatal Crashes
Older Fatalities/Younger Fatalities
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	1.13	1.32	1.24	2.08	4.97
20 - 24		1.19	1.23	1.92	4.13
25 - 34			1.22	1.71	3.51
35 - 49				1.36	2.79
50 - 64					2.41

There does not appear to be a threshold at which fatality risk suddenly increases. Instead, the odds of old to young fatalities increase steadily across rows (as age differences increase) and decrease steadily down columns (as age differences decrease). There is, however, an unusually large fatality risk associated with drivers over 64 years old. They have 5 times as many fatalities as do drivers under 20 years when they are involved together. Even when drivers over 64 years are involved in fatal accidents with drivers 50 through 64 years, they are 2.4 times as likely to be killed as are the younger drivers.

If accidents in which both drivers are killed are interpreted as being more severe or unsurvivable, then it makes some sense to also compute the odds of fatality for younger drivers (Table 6) and older drivers (Table 7) when only one of the two is killed. The results are shown as Table 10.

Table 10: Fatalities in Two-car Fatal Crashes
Older Fatalities Only/Younger Fatalities Only
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	1.15	1.43	1.30	2.55	7.50
20 - 24		1.22	1.29	2.36	6.17
25 - 34			1.24	1.88	4.57
35 - 49				1.40	3.36
50 - 64					2.53

When only one driver is killed, the odds imply that it is much more likely to be the older rather than the younger driver who is killed. Later discussion of crash configuration will help to explain some of this difference in fatality risk.

ALCOHOL INVOLVEMENT

The highest rate of alcohol involvement in two-car fatal crashes is reported for drivers aged 20 through 24 years. The implications of this, in terms of driver habits and problems, are not obvious.

Table 11 shows the number of drivers for whom the police form states or implies that alcohol was present. Because of the legal implications of such a statement on a police report, the computed rates of alcohol involvement are known to be uniformly low. These drivers are not necessarily legally drunk.

Table 11: Alcohol Reported in Two-car Fatal Crashes
Counts of Drivers
1979-1981 FARS

Age Category	Drivers	Reported Drinking	Rate
15 - 19	5,188	1,417	27 %
20 - 24	6,256	2,188	35 %
25 - 34	7,397	2,287	31 %
35 - 49	5,192	1,344	26 %
50 - 64	3,712	668	18 %
65+	2,927	232	8 %
Total	30,672	8,136	27 %

Drivers aged 20 through 24 have the highest reported rate of alcohol involvement, and the rate decreases steadily with age. However, based upon Table 11 alone, it is not possible to separate the effect of exposure

(young people may tend to drive more for social purposes) from causation (alcohol may more seriously degrade the driving skills of younger, more inexperienced drivers).

Slightly higher rates of alcohol use are reported for drivers who are involved in a fatal accident with another driver in the same age category. Table 12 shows the data for these 6,004 drivers.

Table 12: Alcohol Reported in Two-car Fatal Crashes with Both Drivers in the Same Age Category
Counts of Drivers
1979-1981 FARS

Age Category	Drivers	Reported Drinking	Rate
15 - 19	1,014	291	29 %
20 - 24	1,372	545	40 %
25 - 34	1,882	598	32 %
35 - 49	930	285	31 %
50 - 64	494	101	20 %
65+	312	12	4 %
Total	6,004	1,832	31 %

The summary provided by Table 13 shows consistently higher rates of alcohol involvement reported for accidents between drivers of approximately the same age, with the exception of drivers over 64 years old.

Table 13: Alcohol Reported in Two-car Fatal Crashes by Similarity of Age of Drivers 1979-1981 FARS

	Other Driver Age Category	
Age Category	Different	Same
15 - 19	27 %	29 %
20 - 24	34 %	40 %
25 - 34	31 %	32 %
35 - 49	25 %	31 %
50 - 64	18 %	20 %
65+	8 %	4 %
Total	25 %	31 %

Table 13 may reflect a tendency of drinking drivers within an age group to frequent the same roads at the same time. If so, drivers are more exposed to alcohol-related crashes with others of their approximate age. However, the data may also imply that when they have not been drinking, drivers are especially adept at avoiding collisions with a driver of a similar age and with similar habits.

For accidents in which both drivers are in the same age category, Table 14 summarizes the number of reported alcohol involvements per accident.

Table 14: Alcohol Reported in Two-car Fatal Crashes with Both Drivers in the Same Age Category Counts of Accidents 1979-1981 FARS

Age Category	Number of Drivers Reported Drinking			
	None	One	Two	Total
15 - 19	270	183	54	507
	(53 %)	(36 %)	(11 %)	(100 %)
20 - 24	258	311	117	686
	(38 %)	(45 %)	(17 %)	(100 %)
25 - 34	447	390	104	941
	(48 %)	(41 %)	(11 %)	(100 %)
35 - 49	219	207	39	465
	(47 %)	(45 %)	(8 %)	(100 %)
50 - 64	161	71	15	247
	(65 %)	(29 %)	(6 %)	(100 %)
65+	144	12	0	156
	(92 %)	(8 %)	(-)	(100 %)
Total	1,499	1,174	329	3,002
	(50 %)	(39 %)	(11 %)	(100 %)

If there were no relationship between the reported alcohol use of the two drivers involved in these accidents, then the expected numbers of accidents in which both drivers had reported alcohol use could be computed from Table 12. For example, alcohol is reported for 28.7 percent of drivers under 20 years who are involved in a fatal crash with

another driver under 20 years. If the alcohol rates for the two drivers were independent of each other, then the rate of two alcohol-involved young drivers would be

28.7 percent x 28.7 percent

= 8.2 percent.

Of the 507 accidents involving two drivers under 20 years old,

8.2 percent x 507

= 42

would have alcohol reported for both drivers. The expected numbers of accidents with two drinking drivers were computed under the independence assumption for each age group and are shown as Table 15.

Table 15: Alcohol Reported in Two-car Fatal Crashes with Both Drivers Drinking and in the Same Age Category Observed versus Expected Accidents 1979-1981 FARS

Age Category	Observed	Expected	Observed/Expected
15 - 19	54	42	1.29
20 - 24	117	108	1.08
25 - 34	104	95	1.09
35 - 49	39	44	0.89
50 - 64	15	10	1.50
65+	0	0	-
Total	329	299	1.10

The larger number of observed two-drinking driver fatal crashes, as compared to the expected number of these crashes, is consistent with the suggestion made based upon Table 13. Drinking drivers may tend to frequent the same roads at the same times. However, at least part of the difference noted in Table 15 may be attributable to missing alcohol data. This is made clearer using an example. If 20 percent of fatal accidents involving alcohol do not have a police notation because of local procedures or legal constraints, then effect is as shown in Table 16.

Table 16: Alcohol Reported in Two-car Fatal Crashes with Both Drivers Aged 15 through 19 years Hypothetical Example Illustrating Effect of 20 Percent Underreporting of Alcohol

	Observed	Hypothetical
Drivers drinking:		
One	183	229
Two	54	68
None	270	210
Total	507	507

The number of hypothesized drinking drivers would be

$$229 + (2 \times 68) = 365$$

which would be

$$365/1,014 = 36 \text{ percent.}$$

Under an assumption of independence, the expected number of accidents with both drivers drinking would be

$$36 \text{ percent} \times 36 \text{ percent} \times 507 \text{ accidents}$$
$$= 13 \text{ percent} \times 507 \text{ accidents}$$
$$= 66 \text{ accidents.}$$

This is very close to the hypothesized 68 accidents with two young drinking drivers. Thus, the possibility of a substantial underreporting of alcohol involvement makes it impossible to conclude that there is a correlation between drinking of the two drivers in an accident, based upon the data presented here.

VIOLATIONS CHARGED AND DRIVER FACTORS

Violations are seldom charged to fatally-injured drivers. Of surviving drivers, the rate of violations charged as a result of a fatal accident decreases with age, with the exception of the over 64 age category. Females are less often charged than are males, but the difference decreases with age.

Table 17 shows that only 5 percent of the fatally-injured drivers are charged with a violation as a result of a fatal accident, as opposed to a third of the surviving drivers.

Table 17: Violations Charged in Two-car Fatal Crashes
Counts of Drivers by Fatality Status
1979-1981 FARS

	Known Violation Status		
Fatality Status	Drivers	Charged	Rate
Fatality	11,933	645	5 %
Survivor	17,096	5,645	33 %
Total	29,029	6,290	22 %

Because fatality status is related to age, the rates of violations by age are computed in Table 18 for surviving drivers only. Rates of charged violations decrease with age except for drivers in the over 64 age category.

Table 18: Violations Charged in Two-car Fatal Crashes
Counts of Surviving Drivers by Age
1979-1981 FARS

	Known Violation Status		
Age Category	Drivers	Charged	Rate
15 - 19	3,259	1,327	41 %
20 - 24	3,779	1,508	40 %
25 - 34	4,242	1,362	32 %
35 - 49	2,914	716	25 %
50 - 64	1,792	376	21 %
65+	1,110	356	32 %
Total	17,096	5,645	33 %

Table 19 shows that females have a lower rate of violations charged than do males of the same age, but the differences decrease with age.

Table 19: Violations Charged in Two-car Fatal Crashes
Counts of Surviving Drivers by Age and Sex
1979-1981 FARS

	Known Violation Status		
Age Category/Sex	Drivers	Charged	Rate
15 - 19 Male	2,475	1,118	45 %
15 - 19 Female	784	209	27 %
20 - 24 Male	2,997	1,307	44 %
20 - 24 Female	782	201	26 %
25 - 34 Male	3,178	1,124	35 %
25 - 34 Female	1,064	238	22 %
35 - 49 Male	2,044	538	26 %
35 - 49 Female	870	178	20 %
50 - 64 Male	1,230	261	21 %
50 - 64 Female	562	115	20 %
65+ Male	789	243	31 %
65+ Female	321	113	35 %
Total Male	12,713	4,591	36 %
Total Female	4,383	1,054	24 %
Total	17,096	5,645	33 %

Table 20 shows the primary driver contributory factor for surviving drivers in two-car fatal crashes. The incidence of most factors decreases with driver age. An important exception is that 24 percent of drivers over age 64 were reported to have failed to yield the right of way, as compared to only 7 percent of young drivers. These older drivers also have higher rates of two similar contributory factors: failure to observe signs and inattention. More active forms of contributory factors (driving too fast, operating recklessly, driving on the wrong side of the roads) are more frequently noted for younger than for older drivers. These differences may in part reflect age-specific reporting biases — the young are expected to be more reckless, and the old are expected to be more absentminded.

Table 20: Driver Factors in Two-car Fatal Crashes
Counts of Surviving Drivers by Age
1979-1981 FARS

	Age Category					
Driver Factor	15 - 19	20 - 24	25 - 34	35 - 49	50 - 64	65+
None	1,374	1,788	2,416	1,931	1,209	531
	38 %	44 %	53 %	63 %	64 %	44 %
Driving too fast	472	489	408	149	54	30
	13 %	12 %	9 %	5 %	3 %	2 %
Failure to yield	278	217	280	184	176	285
	8 %	5 %	6 %	6 %	9 %	24 %
Run out of lane/off road	310	381	347	195	91	63
	9 %	9 %	8 %	6 %	5 %	5 %
Operating recklessly	315	323	278	165	72	53
	9 %	8 %	6 %	5 %	4 %	4 %
Driving wrong side of road	241	262	284	129	88	34
	7 %	6 %	6 %	4 %	5 %	3 %
Failure to observe signs	238	232	200	106	78	70
	7 %	6 %	4 %	3 %	4 %	6 %
Inattention	106	143	110	60	44	43
	3 %	3 %	2 %	2 %	2 %	4 %
Other	247	267	253	139	74	101
	7 %	7 %	6 %	5 %	4 %	8 %
Total coded	3,581	4,102	4,576	3,058	1,886	1,210
	100 %	100 %	100 %	100 %	100 %	100 %

CRASH CONFIGURATION

In two-car fatal collisions between drivers of different ages, the younger driver is more likely to be driving a striking vehicle than is the older driver. However, in close to half of these crashes both drivers were reported to be in a striking vehicle (generally a head-on crash). These results reflect driving habits by age but do not in themselves imply greater responsibility for the crash by any age group.

Table 21 shows that crashes between two drivers in the same age category are slightly more likely to involve two striking cars than is the case for drivers in different age categories. However, in each case, approximately half of the crashes are striking-to-striking and half are striking-to-struck.

Table 21: Configuration of Two-car Fatal Crashes
Counts of Accidents by Similarity of Age Categories
1979-1981 FARS

	Crash Configuration			
Age Categories	Striking/ Struck	Striking/ Striking	Other	Total
Same	1,369	1,535	98	3,002
Different	6,015	5,904	415	12,334
Total	7,384	7,439	513	15,336

Tables 22, 23, and 24 show the crash configurations by age for drivers of different age categories involved together.

Table 22: Configuration of Two-car Fatal Crashes
Accidents with Only the Younger Driver Striking
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	249	318	236	217	268
20 - 24		372	268	253	274
25 - 34			288	247	306
35 - 49				150	212
50 - 64					128

Table 23: Configuration of Two-car Fatal Crashes
Accidents with Only the Older Driver Striking
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	226	243	148	102	61
20 - 24		289	176	118	66
25 - 34			222	155	98
35 - 49				137	88
50 - 64					100

Table 24: Configuration of Two-car Fatal Crashes
Accidents with Both Drivers Striking
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	493	594	444	269	178
20 - 24		843	578	331	191
25 - 34			669	452	223
35 - 49				317	187
50 - 64					135

There were 4,487 cases in which only the younger driver was striking (Table 22); 2,897 cases in which only the older driver was striking (Table 23); and 7,439 cases in which both drivers were striking, such as in a head-on crash, (Table 24). The relative frequency of the younger driver as striking (Tables 22 and 24) to the older driver as striking (Tables 23 and 24) is shown in Table 25.

Table 25: Configuration of Two-car Fatal Crashes
Younger Striking/Older Striking
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	1.03	1.09	1.15	1.31	1.87
20 - 24		1.07	1.12	1.30	1.81
25 - 34			1.07	1.15	1.65
35 - 49				1.03	1.45
50 - 64					1.12

The data show that the larger the difference in driver ages, the greater is the likelihood that the younger driver was in the striking vehicle. This is made clearer by limiting the description to cases involving one striking vehicle and one struck vehicle (eliminating the cases in which both cars were reported as striking). The results, derived from Tables 22 and 23, are presented as Table 26.

Table 26: Configuration of Two-car Fatal Crashes
Younger Striking Only/Older Striking Only
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	1.10	1.31	1.59	2.13	4.39
20 - 24		1.29	1.52	2.14	4.15
25 - 34			1.30	1.59	3.12
35 - 49				1.09	2.41
50 - 64					1.28

At least part of the higher odds of fatality for older drivers relative to younger drivers with whom they collide (Tables 9 and 10) is explained by the greater likelihood that their vehicles have been struck in the side (Tables 25 and 26). In a crash, the side structure offers less protection than does the front.

The results of crash configuration by age are also consistent with the data on driver contributory factors (Table 20), especially with the tendency of older drivers to fail to yield the right of way. Table 27 summarizes the crash configuration from the driver's perspective and regardless of the age category of the other involved driver.

Table 27: Configuration of Two-car Fatal Crashes
Counts of Drivers by Striking versus Struck
1979-1981 FARS

	Relationship of Subject Vehicle to Other Vehicle			
Age Category	Total	Striking to Struck	Struck by Striking	Both Striking
15 - 19	5,024	1,540	1,032	2,452
	(100 %)	(31 %)	(21 %)	(49 %)
20 - 24	6,063	1,693	1,198	3,172
	(100 %)	(28 %)	(20 %)	(52 %)
25 - 34	7,125	1,784	1,576	3,765
	(100 %)	(25 %)	(22 %)	(53 %)
35 - 49	5,030	1,106	1,215	2,709
	(100 %)	(22 %)	(24 %)	(54 %)
50 - 64	3,589	747	1,074	1,768
	(100 %)	(21 %)	(30 %)	(49 %)
65+	2,815	514	1,289	1,012
	(100 %)	(18 %)	(46 %)	(36 %)
Total	29,646	7,384	7,384	14,878
	(100 %)	(25 %)	(25 %)	(50 %)

Overall, half of all vehicles strike another striking vehicle, a quarter strike a non-striking vehicle, and the remaining quarter are vehicles struck by a striking vehicle. A much larger proportion of younger than of older drivers were in the striking vehicle, especially in cases of a striking vehicle colliding with a non-striking vehicle. The effect of crash configuration on fatality risk by age is discussed in the following section.

FATALITY CONSEQUENCES CONTROLLED FOR CRASH CONFIGURATION

The greater vulnerability of older drivers in two-car fatal crashes appears to result more from their lower resistance to crash forces than from their tendency to be drivers of a struck vehicle (and to consequently be subjected to greater crash forces).

Tables 28, 29, and 30 were derived from the 5,904 accidents in which both drivers were in a striking vehicle and in which the drivers were in different age categories. Overall, there were 1,692 cases in which only the younger driver was killed (Table 28), 2,415 cases in which only the older driver was killed (Table 29), and 634 cases in which both drivers were killed (Table 30). In the remaining 1,163 cases neither driver was killed.

Table 28: Fatalities in Two-car Fatal Crashes with Both Vehicles in a Striking Role Accidents with Only the Younger Driver Killed 1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	185	159	138	57	28
20 - 24		275	182	77	29
25 - 34			225	117	47
35 - 49				104	42
50 - 64					27

Table 29: Fatalities in Two-car Fatal Crashes with Both Vehicles in a Striking Role Accidents with Only the Older Driver Killed 1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	166	235	167	122	112
20 - 24		309	220	158	100
25 - 34			266	196	94
35 - 49				117	91
50 - 64					62

Table 30: Fatalities in Two-car Fatal Crashes with Both Vehicles in a Striking Role Accidents with Both Drivers Killed 1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	34	58	37	35	13
20 - 24		95	57	36	22
25 - 34			67	60	27
35 - 49				43	29
50 - 64					21

The ratio of older fatalities (sum of Tables 29 and 30) to younger fatalities (sum of Tables 28 and 30) is shown in Table 31.

Table 31: Fatalities in Two-car Fatal Crashes
with Both Vehicles in a Striking Role
Older Fatalities/Younger Fatalities
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	0.91	1.35	1.17	1.71	3.05
20 - 24		1.09	1.16	1.72	2.39
25 - 34			1.14	1.45	1.64
35 - 49				1.09	1.69
50 - 64					1.73

These odds ratios are in general much lower than the odds ratios computed for all crash configurations (Table 9).

The incremental effect of being older can be computed as

$$\frac{\text{older fatalities} - \text{younger fatalities}}{\text{younger fatalities}}$$

$$= \frac{\text{older fatalities}}{\text{younger fatalities}} - 1$$

$$= \text{odds of fatality} - 1.$$

The effect of crash configuration on fatality risk can then be estimated as

$$\frac{[\text{ (Table 9 entry)} - 1\ ] - [\text{ (Table 31 entry)} - 1\ ]}{\text{(Table 9 entry)} - 1}$$

The results are shown in Table 32.

Table 32: Fatalities in Two-car Fatal Crashes
Portion of Increased Fatality Risk to Older Drivers
Attributable to Differences in Crash Configuration by Age
1979-1981 FARS

	Age Category				
Age Category	20 - 24	25 - 34	35 - 49	50 - 64	65+
15 - 19	-	-	29 %	34 %	48 %
20 - 24		53 %	30 %	22 %	56 %
25 - 34			36 %	37 %	75 %
35 - 49				75 %	61 %
50 - 64					48 %

When summed over all accident configurations, the fatality odds for older versus younger drivers are

$$\frac{5,241}{2,957} = 1.77 \text{ (from Tables 6, 7, and 8).}$$

When only striking-to-striking accidents are included, the fatality odds are only

$$\frac{2,415}{1,692} = 1.43 \text{ (from Tables 28, 29, and 30).}$$

[If the odds ratios by age interaction category for striking-to-striking accidents (Table 31) are prorated according to their occurrence among all accident configurations (Table 1), essentially the same result is obtained -- fatality odds ratio of 1.42.]

The interpretation of these results is that the older driver has a 77 percent higher risk of fatality in a two-car fatal crash. Controlling for crash configuration (the tendency of older drivers to be in a struck vehicle), the older driver still has a 43 percent higher fatality risk. This risk may be attributable to reduced resistance to impact forces, with age.

APPENDIX

DEFINITIONS

All data presented here are from the 1979, 1980, and 1981 files of the Fatal Accident Reporting System (FARS). The FARS 1981 Coding and Validation Manual describes the variables available on the automated files -- 1979 and 1980 variables have already been recoded when necessary for consistency with 1981 conventions.

The files were subsetted to two-car crashes involving drivers of known age and over 14 years old. In terms of the FARS variables, the requirements for the accident included

Vehicles Involved = 2;
Vehicle Forms = 2; and
First Harmful Event = collision with a motor vehicle in transport (value 12).

For each vehicle and driver,

Body Type = car (values 1-9);
Person Type = driver (value 1); and
Age > 14 (values 15-97)

For all comparisons between the two drivers in an accident, the younger driver has been designated as Driver 1. The older driver in the accident is Driver 2. In cases where both drivers were the same age

(number of years old), no analytical importance should be inferred from the classification of Drivers 1 and 2. The drivers were subsequently put into one of six age categories for simplification of comparisons:

15 - 19 years,

20 - 25 years,

26 - 34 years,

35 - 49 years,

50 - 64 years, and

Over 65 years (values 65-97).

These categories were chosen as inherently meaningful, but they are also consistent with the presentation of driver and occupant data in the FARS 1981 Annual Report.

A driver may be known to have or to have not been charged with a violation as a result of the accident. If a driver had violations pending or had an unknown violation status, the driver was not included in the analysis of violations.

Several summary variables were created to describe the accident in terms of driver attributes. These summary variables are defined in the chart. An individual driver fatality is defined as a yes/no variable. Injury severity either is or is not coded as fatality. Alcohol involvement on the part of a driver is another yes/no variable. Any indication of use (however small) is coded as yes; indications of no use or no indication about use are both coded as no. Most vehicles have a vehicle role listed as striking or struck. If both vehicles were listed as struck

or if either vehicle had a vehicle role listed as non-collision, both striking and struck, or unknown, then the accident was excluded from the analysis of crash configuration.

Chart: Definitions of Summary Variables

Variable Value	Driver Attributes Driver 1 (Younger) & Driver 2 (Older)
Fatality	Injury Severity:
Young	= fatality (= 4) & ≠ fatality (≠ 4)
Old	≠ fatality (≠ 4) & = fatality (= 4)
Both	= fatality (= 4) & = fatality (= 4)
Neither	≠ fatality (≠ 4) & ≠ fatality (≠ 4)
Other	[no other possible combinations]
Drinking	Alcohol Involvement:
Young	= yes (= 1) & = no (= 0)
Old	= no (= 0) & = yes (= 1)
Both	= yes (= 1) & = yes (= 1)
Neither	= no (= 0) & = no (= 0)
Other	[no other possible combinations]
Striking	Vehicle Role:
Young	= striking (= 1) & = struck (= 2)
Old	= struck (= 2) & = striking (= 1)
Both	= striking (= 1) & = striking (= 1)
Other	[combinations of non-collision (0), both (3), and unknown (9); or two struck (2) vehicles]

Table A: Comparison of Driver Ages

DRIVER AGE COMPARISON FOR TWO-CAR FATAL ACCIDENTS
FOR 1979-1981 FARS, DRIVERS 15 YEARS AND OLDER

TABLE OF AGECAT1 BY AGECAT2

AGECAT1 / AGECAT2 FREQUENCY	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	507	998	1187	851	610	528	4681
20-24	0	686	1557	1053	728	548	4572
25-34	0	0	941	1230	886	655	3712
35-49	0	0	0	465	619	509	1593
50-64	0	0	0	0	247	375	622
65 +	0	0	0	0	0	156	156
TOTAL	507	1684	3685	3599	3090	2771	15336

Table B: Comparison of Fatalities by Age

DRIVER AGE COMPARISON FOR TWO-CAR FATAL ACCIDENTS
FOR 1979-1981 FARS, DRIVERS 15 YEARS AND OLDER

TABLE OF AGECAT1 BY AGECAT2
CONTROLLING FOR FATAL=YOUNG

AGECAT1 FREQUENCY \ AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	171	300	299	246	111	44	1171
20-24	0	229	467	299	149	52	1196
25-34	0	0	287	373	214	76	950
35-49	0	0	0	164	176	81	421
50-64	0	0	0	0	87	70	157
65 +	0	0	0	0	0	38	38
TOTAL	171	529	1053	1082	737	361	3933

CONTROLLING FOR FATAL=OLD

AGECAT1 FREQUENCY \ AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	138	344	428	321	283	330	1844
20-24	0	217	568	387	352	321	1845
25-34	0	0	323	462	402	347	1534
35-49	0	0	0	161	247	272	680
50-64	0	0	0	0	93	177	270
65 +	0	0	0	0	0	73	73
TOTAL	138	561	1319	1331	1377	1520	6246

CONTROLLING FOR FATAL=BOTH

AGECAT1 FREQUENCY \ AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	25	37	69	43	39	15	228
20-24	0	37	109	61	48	28	283
25-34	0	0	71	81	71	34	257
35-49	0	0	0	40	52	32	124
50-64	0	0	0	0	19	26	45
65 +	0	0	0	0	0	6	6
TOTAL	25	74	249	225	229	141	943

CONTROLLING FOR FATAL=NEITHER

AGECAT1 FREQUENCY \ AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	173	317	391	241	177	139	1438
20-24	0	203	413	306	179	147	1248
25-34	0	0	260	314	199	198	971
35-49	0	0	0	100	144	124	368
50-64	0	0	0	0	48	102	150
65 +	0	0	0	0	0	39	39
TOTAL	173	520	1064	961	747	749	4214

Table C: Comparison of Alcohol Involvement by Age

DRIVER AGE COMPARISON FOR TWO-CAR FATAL ACCIDENTS
FOR 1979-1981 FARS, DRIVERS 15 YEARS AND OLDER

TABLE OF AGECAT1 BY AGECAT2
CONTROLLING FOR DRINK=YOUNG

AGECAT1 AGECAT2

FREQUENCY	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	96	179	248	174	114	66	877
20-24	0	179	372	289	215	94	1149
25-34	0	0	223	305	244	104	876
35-49	0	0	0	124	128	64	316
50-64	0	0	0	0	43	40	83
65 +	0	0	0	0	0	9	9
TOTAL	96	358	843	892	744	377	3310

CONTROLLING FOR DRINK=OLD

AGECAT1 AGECAT2

FREQUENCY	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	87	220	202	134	64	31	738
20-24	0	132	332	187	88	35	774
25-34	0	0	167	215	117	48	547
35-49	0	0	0	83	90	35	208
50-64	0	0	0	0	28	26	54
65 +	0	0	0	0	0	3	3
TOTAL	87	352	701	619	387	178	2324

CONTROLLING FOR DRINK=BOTH

AGECAT1 AGECAT2

FREQUENCY	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	54	111	133	67	29	5	399
20-24	0	117	188	97	50	7	459
25-34	0	0	104	118	48	15	285
35-49	0	0	0	39	36	13	88
50-64	0	0	0	0	15	5	20
65 +	0	0	0	0	0	0	0
TOTAL	54	228	425	321	178	45	1251

CONTROLLING FOR DRINK=NEITHER

AGECAT1 AGECAT2

FREQUENCY	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	270	488	604	476	403	426	2667
20-24	0	258	665	480	375	412	2190
25-34	0	0	447	592	477	488	2004
35-49	0	0	0	219	365	397	981
50-64	0	0	0	0	161	304	465
65 +	0	0	0	0	0	144	144
TOTAL	270	746	1716	1767	1781	2171	8451

Table D: Violations Charged by Fatality Status

DRIVER AGE COMPARISON FOR TWO-CAR FATAL ACCIDENTS
FOR 1979-1981 FARS, DRIVERS 15 YEARS AND OLDER

TABLE OF VIOL_CHG BY INJ_SEV

VIOL_CHG / FREQUENCY	0 NO INJURY	1 POSSIBLE INJURY	2 NON-INCAPACITATING INJURY	3 INCAPACITATING INJURY	4 FATALITY	5 DIED PRIOR TO ACCIDENT	6 INJURED, SEVERITY UNKNOWN	9 UNKNOWN	TOTAL
NO	1707	1254	3236	5162	11288	78	1	13	22739
YES	959	614	1869	2175	645	17	0	11	6298
PENDING	131	82	277	515	84	3	0	1	1093
UNKNOWN	56	48	153	226	48	12	0	7	550
TOTAL	2853	1998	5535	8078	12865	110	1	32	30672

Table E: Violations Charged to Survivors by Age and Sex

DRIVER AGE COMPARISON FOR TWO-CAR FATAL ACCIDENTS
FOR 1979-1981 FARS, DRIVERS 15 YEARS AND OLDER

TABLE OF VIOL_CHG BY AGECAT

VIOL_CHG / FREQUENCY	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
NO	1932	2271	2880	2198	1416	754	11451
YES	1327	1508	1362	716	376	356	5645
PENDING	238	256	258	115	74	68	1009
UNKNOWN	129	107	122	62	38	44	502
TOTAL	3626	4142	4622	3091	1904	1222	18607

CONTROLLING FOR SEX= 1
MALES

VIOL_CHG / FREQUENCY	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
NO	1357	1690	2054	1506	969	546	8122
YES	1118	1307	1124	538	261	243	4591
PENDING	191	202	194	80	55	47	769
UNKNOWN	106	86	97	45	25	30	389
TOTAL	2772	3285	3469	2169	1310	866	13871

CONTROLLING FOR SEX= 2
FEMALES

VIOL_CHG / FREQUENCY	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
NO	575	581	826	692	447	208	3329
YES	209	201	238	178	115	113	1054
PENDING	47	54	64	35	19	21	240
UNKNOWN	23	21	25	17	13	14	113
TOTAL	854	857	1153	922	594	356	4736

Table F: Surviving Driver Contributing Factors by Age and Sex

DRIVER AGE COMPARISON FOR TWO-CAR FATAL ACCIDENTS
FOR 1979-1981 FARS, DRIVERS 15 YEARS AND OLDER

TABLE OF DR_CF1 BY AGECAT

DR_CF1 / FREQUENCY	AGECAT 15-19	20-24	25-34	35-49	50-64	65 +	TOTAL	
0	1374	1788	2416	1931	1209	531	9249	NONE
1	26	39	21	14	4	6	110	DROWSY, SLEEPY, ASLEEP, FATIGUED
2	1	2	2	5	5	2	17	ILL, BLACKOUT
3	0	2	0	1	0	0	3	DEPRESSION
4	0	4	3	1	1	0	9	DRUGS -- MEDICATION
5	8	11	12	4	1	2	38	OTHER DRUGS
6	186	143	110	60	44	43	586	INATTENTION (TALKING, EATING, ETC.)
7	1	13	11	2	1	2	30	PHYSICAL IMPAIRMENTS
19	0	0	2	0	0	1	3	SUSPENDED OR REVOKED LICENSE
21	1	1	2	0	0	1	5	IMPROPER LOADING OF VEHICLE
22	0	1	0	0	1	0	2	TOWING OR PUSHING VEHICLE IMPROPERLY
23	9	10	11	5	3	0	38	FAILURE TO DIM OR PUT ON LIGHTS WHEN REQUIRED
24	6	6	6	2	0	2	22	OPERATING WITHOUT REQUIRED EQUIPMENT
26	20	20	25	7	8	9	89	FOLLOWING IMPROPERLY
27	16	23	15	9	6	6	75	IMPROPER OR ERRATIC LANE CHANGE
28	310	381	347	195	91	63	1387	FAILURE TO KEEP IN LANE/ RUN OFF ROAD
29	2	0	1	1	1	0	5	ILLEGAL DRIVING ON ROAD SHOULDER/DITCH/SIDEWALK
30	4	4	6	2	0	4	20	IMPROPER ENTRY/EXIT FROM TRAFFICWAY
31	1	1	3	3	2	2	12	STARTING/BACKING IMPROPERLY
33	27	15	14	7	4	2	69	PASSING WHERE PROHIBITED
34	5	6	3	1	0	2	17	PASSING ON WRONG SIDE
35	55	46	34	19	9	16	179	OTHER IMPROPER PASSING
36	315	323	278	165	72	53	1206	RECKLESS/ERRATIC/CARELESS DRIVING
37	12	17	5	1	1	0	36	HIGH-SPEED POLICE CHASE
38	278	217	280	184	176	285	1420	FAILURE TO YIELD RIGHT-OF-WAY
39	238	232	200	106	78	70	924	FAILURE TO OBSERVE SIGNS/ DEVICES/OFFICERS/ZONES
40	0	0	1	0	0	0	1	BY-PASSING PROHIBITIVE/ CHANNELING BARRIER
41	1	0	1	2	0	0	4	FAILURE TO OBSERVE WARNINGS/ INSTRUCTIONS
42	1	1	1	0	1	0	4	FAILURE TO SIGNAL INTENTIONS
44	472	489	408	149	54	30	1602	DRIVING TOO FAST FOR CONDITIONS/SPEED LIMIT
45	1	1	0	1	0	1	4	DRIVING LESS THAN POSTED MINIMUM
47	1	3	3	1	5	7	20	TURNING FROM WRONG LANE
48	14	12	22	19	10	20	97	OTHER IMPROPER TURN
50	14	20	29	24	4	9	100	DRIVING WRONG WAY ON ONE-WAY ROAD
51	241	262	284	129	88	34	1038	DRIVING ON WRONG SIDE OF ROAD
52	7	2	2	1	0	2	14	OPERATOR INEXPERIENCE
53	2	0	2	0	1	1	6	UNFAMILIAR WITH ROAD
54	12	7	16	7	6	4	52	STOPPING IN ROADWAY (VEHICLE NOT ABANDONED
99	45	40	46	33	18	12	194	UNKNOWN
TOTAL	3626	4142	4622	3091	1904	1222	18607	

Table F: Surviving Driver Contributing Factors by Age and Sex — Males

DRIVER AGE COMPARISON FOR TWO-CAR FATAL ACCIDENTS
FOR 1979-1981 FARS, DRIVERS 15 YEARS AND OLDER

TABLE OF DR_CF1 BY AGECAT
CONTROLLING FOR SEX= 1

DR_CF1	AGECAT						TOTAL	
FREQUENCY	15-19	20-24	25-34	35-49	50-64	65 +		
0	936	1313	1721	1335	851	393	6549	NONE
1	24	36	20	11	3	4	98	DROWSY, SLEEPY, ASLEEP, FATIGUED
2	0	2	2	5	1	2	12	ILL, BLACKOUT
3	0	1	0	1	0	0	2	DEPRESSION
4	0	4	3	1	1	0	9	DRUGS -- MEDICATION
5	7	11	11	4	1	2	36	OTHER DRUGS
6	78	119	86	43	23	31	380	INATTENTION (TALKING, EATING, ETC.)
7	1	12	10	2	1	2	28	PHYSICAL IMPAIRMENTS
19	0	0	2	0	0	0	2	SUSPENDED OR REVOKED LICENSE
21	1	1	2	0	0	1	5	IMPROPER LOADING OF VEHICLE
22	0	0	0	0	1	0	1	TOWING OR PUSHING VEHICLE IMPROPERLY
23	8	8	9	4	3	0	32	FAILURE TO DIM OR PUT ON LIGHTS WHEN REQUIRED
24	6	5	4	2	0	2	19	OPERATING WITHOUT REQUIRED EQUIPMENT
26	15	15	19	6	5	7	67	FOLLOWING IMPROPERLY
27	13	21	14	7	5	3	63	IMPROPER OR ERRATIC LANE CHANGE
28	242	313	275	142	62	36	1070	FAILURE TO KEEP IN LANE/ RUN OFF ROAD
29	2	0	1	0	1	0	4	ILLEGAL DRIVING ON ROAD SHOULDER/DITCH/SIDEWALK
30	4	4	3	2	0	3	16	IMPROPER ENTRY/EXIT FROM TRAFFICWAY
31	1	1	1	2	2	1	8	STARTING/BACKING IMPROPERLY
33	20	13	13	5	3	2	56	PASSING WHERE PROHIBITED
34	5	5	3	1	0	2	16	PASSING ON WRONG SIDE
35	50	41	30	15	7	15	158	OTHER IMPROPER PASSING
36	278	283	235	133	55	38	1822	RECKLESS/ERRATIC/CARELESS DRIVING
37	12	16	5	1	1	0	35	HIGH-SPEED POLICE CHASE
38	199	156	195	110	96	194	950	FAILURE TO YIELD RIGHT-OF-WAY
39	191	187	146	66	49	43	682	FAILURE TO OBSERVE SIGNS/ DEVICES/OFFICERS/ZONES
40	0	0	1	0	0	0	1	BY-PASSING PROHIBITIVE/ CHANNELING BARRIER
41	1	0	0	2	0	0	3	FAILURE TO OBSERVE WARNINGS/ INSTRUCTIONS
42	1	0	1	0	0	0	2	FAILURE TO SIGNAL INTENTIONS
44	416	437	346	122	41	24	1386	DRIVING TOO FAST FOR CONDITIONS/SPEED LIMIT
45	1	1	0	1	0	0	3	DRIVING LESS THAN POSTED MINIMUM
47	1	3	1	0	5	4	14	TURNING FROM WRONG LANE
48	11	9	14	13	6	14	67	OTHER IMPROPER TURN
50	12	18	22	17	2	7	78	DRIVING WRONG WAY ON ONE-WAY ROAD
51	192	207	220	91	67	22	799	DRIVING ON WRONG SIDE OF ROAD
52	4	1	2	1	0	1	9	OPERATOR INEXPERIENCE
53	1	0	2	0	1	1	5	UNFAMILIAR WITH ROAD
54	7	5	11	4	5	2	34	STOPPING IN ROADWAY (VEHICLE NOT ABANDONED
99	32	37	39	20	12	18	158	UNKNOWN
TOTAL	2772	3285	3469	2169	1310	866	13871	

Table F: Surviving Driver Contributing Factors by Age and Sex -- Females

DRIVER AGE COMPARISON FOR TWO-CAR FATAL ACCIDENTS
FOR 1979-1981 FARS, DRIVERS 15 YEARS AND OLDER

TABLE OF DR_CF1 BY AGECAT
CONTROLLING FOR SEX= 2

DR_CF1 / FREQUENCY	AGECAT 15-19	20-24	25-34	35-49	50-64	65 +	TOTAL	
0	438	475	695	596	358	138	2700	NONE
1	2	3	1	3	1	2	12	DROWSY, SLEEPY, ASLEEP, FATIGUED
2	1	0	0	0	4	0	5	ILL, BLACKOUT
3	0	1	0	0	0	0	1	DEPRESSION
4	0	0	0	0	0	0	0	DRUGS -- MEDICATION
5	1	0	1	0	0	0	2	OTHER DRUGS
6	28	24	24	17	21	12	126	INATTENTION (TALKING, EATING, ETC.)
7	0	1	1	0	0	0	2	PHYSICAL IMPAIRMENTS
19	0	0	0	0	0	1	1	SUSPENDED OR REVOKED LICENSE
21	0	0	0	0	0	0	0	IMPROPER LOADING OF VEHICLE
22	0	1	0	0	0	0	1	TOWING OR PUSHING VEHICLE IMPROPERLY
23	1	2	2	1	0	0	6	FAILURE TO DIM OR PUT ON LIGHTS WHEN REQUIRED
24	0	1	2	0	0	0	3	OPERATING WITHOUT REQUIRED EQUIPMENT
26	5	5	6	1	3	2	22	FOLLOWING IMPROPERLY
27	3	2	1	2	1	3	12	IMPROPER OR ERRATIC LANE CHANGE
28	68	68	72	53	29	27	317	FAILURE TO KEEP IN LANE/ RUN OFF ROAD
29	0	0	0	1	0	0	1	ILLEGAL DRIVING ON ROAD SHOULDER/DITCH/SIDEWALK
30	0	0	3	0	0	1	4	IMPROPER ENTRY/EXIT FROM TRAFFICWAY
31	0	0	2	1	0	1	4	STARTING/BACKING IMPROPERLY
33	7	2	1	2	1	0	13	PASSING WHERE PROHIBITED
34	0	1	0	0	0	0	1	PASSING ON WRONG SIDE
35	5	5	4	4	2	1	21	OTHER IMPROPER PASSING
36	37	40	43	32	17	15	184	RECKLESS/ERRATIC/CARELESS DRIVING
37	0	1	0	0	0	0	1	HIGH-SPEED POLICE CHASE
38	79	61	85	74	80	91	470	FAILURE TO YIELD RIGHT-OF-WAY
39	47	45	54	40	29	27	242	FAILURE TO OBSERVE SIGNS/ DEVICES/OFFICERS/ZONES
40	0	0	0	0	0	0	0	BY-PASSING PROHIBITIVE/ CHANNELING BARRIER
41	0	0	1	0	0	0	1	FAILURE TO OBSERVE WARNINGS/ INSTRUCTIONS
42	0	1	0	0	1	0	2	FAILURE TO SIGNAL INTENTIONS
44	56	52	62	27	13	6	216	DRIVING TOO FAST FOR CONDITIONS/SPEED LIMIT
45	0	0	0	0	0	1	1	DRIVING LESS THAN POSTED MINIMUM
47	0	0	2	1	0	3	6	TURNING FROM WRONG LANE
48	3	3	8	6	4	6	30	OTHER IMPROPER TURN
50	2	2	7	7	2	2	22	DRIVING WRONG WAY ON ONE-WAY ROAD
51	49	55	64	38	21	12	239	DRIVING ON WRONG SIDE OF ROAD
52	3	1	0	0	0	1	5	OPERATOR INEXPERIENCE
53	1	0	0	0	0	0	1	UNFAMILIAR WITH ROAD
54	5	2	5	3	1	2	18	STOPPING IN ROADWAY (VEHICLE NOT ABANDONED
99	13	3	7	13	6	2	44	UNKNOWN
TOTAL	854	857	1153	922	594	356	4736	

Table G: Comparison of Vehicle Striking Role by Age

DRIVER AGE COMPARISON IN TWO-CAR FATAL ACCIDENTS
FOR 1979-1981 FARS, DRIVERS 15 YEARS AND OLDER

TABLE OF AGECAT1 BY AGECAT2
CONTROLLING FOR STRIKING=YOUNG

AGECAT1 / AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	137	249	318	236	217	268	1425
20-24	0	150	372	268	253	274	1317
25-34	0	0	203	288	247	306	1044
35-49	0	0	0	96	150	212	458
50-64	0	0	0	0	61	128	189
65 +	0	0	0	0	0	54	54
TOTAL	137	399	893	888	928	1242	4487

CONTROLLING FOR STRIKING=OLD

AGECAT1 / AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	115	226	243	148	102	61	895
20-24	0	150	289	176	118	66	799
25-34	0	0	208	222	155	98	683
35-49	0	0	0	102	137	88	327
50-64	0	0	0	0	46	100	146
65 +	0	0	0	0	0	47	47
TOTAL	115	376	740	648	558	460	2897

CONTROLLING FOR STRIKING=BOTH

AGECAT1 / AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	237	493	594	444	269	178	2215
20-24	0	368	843	578	331	191	2311
25-34	0	0	492	669	452	223	1836
35-49	0	0	0	257	317	187	761
50-64	0	0	0	0	132	135	267
65 +	0	0	0	0	0	49	49
TOTAL	237	861	1929	1948	1501	963	7439

CONTROLLING FOR STRIKING=OTHER

AGECAT1 / AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	18	30	32	23	22	21	146
20-24	0	18	53	31	26	17	145
25-34	0	0	38	51	32	28	149
35-49	0	0	0	10	15	22	47
50-64	0	0	0	0	8	12	20
65 +	0	0	0	0	0	6	6
TOTAL	18	48	123	115	103	106	513

Table H: Comparison of Fatalities by Age Controlling for Vehicle Striking Role

DRIVER AGE COMPARISON IN TWO-CAR FATAL ACCIDENTS
FOR 1979-1981 FARS, DRIVERS 15 YEARS AND OLDER

TABLE OF AGECAT1 BY AGECAT2
CONTROLLING FOR STRIKING=BOTH FATAL=YOUNG

AGECAT1 / AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	82	185	159	138	57	28	649
20-24	0	129	275	182	77	29	692
25-34	0	0	170	225	117	47	559
35-49	0	0	0	109	104	42	255
50-64	0	0	0	0	52	27	79
65 +	0	0	0	0	0	13	13
TOTAL	82	314	604	654	407	186	2247

CONTROLLING FOR STRIKING=BOTH FATAL=OLD

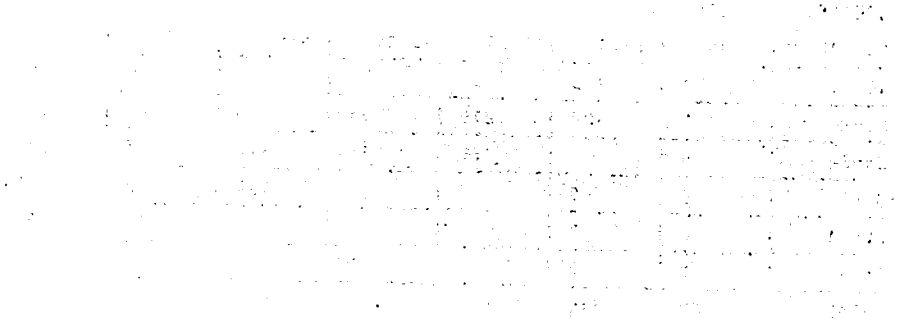
AGECAT1 / AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	71	166	235	167	122	112	873
20-24	0	125	309	220	158	100	912
25-34	0	0	168	266	196	94	724
35-49	0	0	0	84	117	91	292
50-64	0	0	0	0	48	62	110
65 +	0	0	0	0	0	16	16
TOTAL	71	291	712	737	641	475	2927

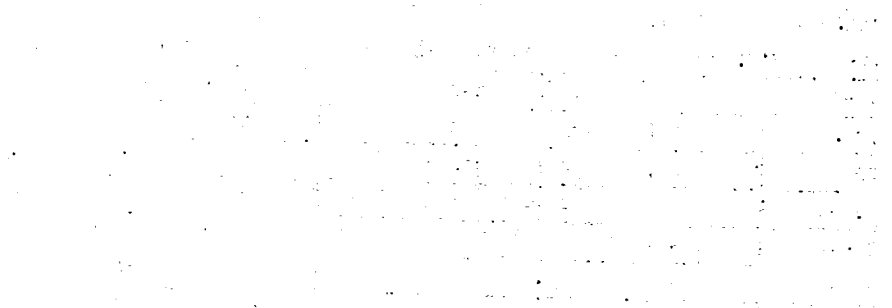
CONTROLLING FOR STRIKING=BOTH FATAL=BOTH

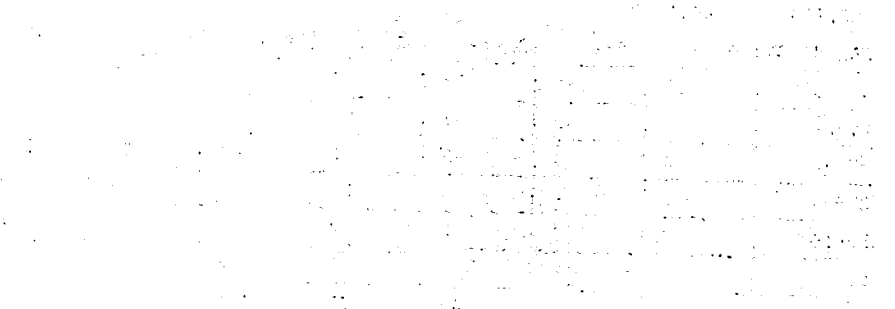
AGECAT1 / AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	22	34	58	37	35	13	199
20-24	0	35	95	57	36	22	245
25-34	0	0	65	67	60	27	219
35-49	0	0	0	31	43	29	103
50-64	0	0	0	0	17	21	38
65 +	0	0	0	0	0	6	6
TOTAL	22	69	218	192	191	118	810

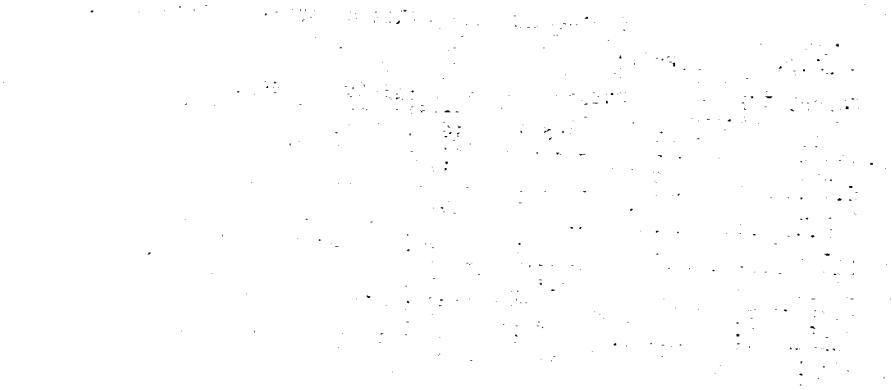
CONTROLLING FOR STRIKING=BOTH FATAL=NEITHER

AGECAT1 / AGECAT2	15-19	20-24	25-34	35-49	50-64	65 +	TOTAL
15-19	62	108	142	102	55	25	494
20-24	0	79	164	119	60	40	462
25-34	0	0	89	111	79	55	334
35-49	0	0	0	33	53	25	111
50-64	0	0	0	0	15	25	40
65 +	0	0	0	0	0	14	14
TOTAL	62	187	395	365	262	184	1455









Traffic Victim Age and Gender Distributions

(August 1984)

Contents

Purpose

This report is a collection of tables that describe traffic victims (generally fatalities) in terms of their age and gender. The text is provided solely to help the reader understand what is presented in each table and to highlight major differences among age groups or between males and females. This report is not in itself a study of age as a factor in traffic deaths. Rather, it is a resource for others who are themselves studying the experiences of a particular age group (such as the elderly), who are making projections of fatality changes resulting from the nation's shifting demographics, or who are merely browsing.

Fatality Counts

There were 51,091 traffic fatalities in 1980. Although later years of data are available from the Fatal Accident Reporting System (FARS), 1980 is used in this report for two reasons. First, 1980 population data are available as counts from the Bureau of the Census -- later years are available only as projections from the 1980 census using assumptions about birth and death rates. Second, the decline in traffic fatalities that began in 1981 and 1982 affected different portions of the population differently -- their degrees of economic vulnerability in periods of high unemployment appear to have greatly influenced the rate, degree, and timing of this decline.

Table 1 shows the counts of fatalities by five-year age groups and by mode of travel (categories of motorist and non-motorist travel). The data are also shown separately for males (Table 2) and females (Table 3) because the age distribution differs by gender. The gender of ten fatalities was not known -- they are included in Table 1, but not in Tables 2 and 3.

Table 1: Role of 1980 Fatalities

	Motorist			Non-motorist				
Age Group	Driver	Passenger	Unknown	Pedestrian	Pedalcyclist	Occupant	Other/ Unknown	Total
00-04	0	698	0	393	29	3	15	1,138
05-09	17	427	0	582	186	2	7	1,221
10-14	153	596	4	363	254	5	13	1,388
15-19	4,490	3,347	48	751	174	12	3	8,825
20-24	6,232	2,435	37	830	83	13	4	9,634
25-29	4,308	1,214	21	617	46	8	2	6,216
30-34	3,059	675	12	472	32	7	3	4,260
35-39	2,010	453	9	363	27	4	0	2,866
40-44	1,472	401	4	316	10	3	0	2,206
45-49	1,302	354	2	343	20	8	0	2,029
50-54	1,307	336	0	369	27	5	0	2,044
55-59	1,179	386	1	401	18	4	0	1,989
60-64	925	301	0	366	12	1	0	1,605
65-69	753	329	0	384	10	2	2	1,480
70-74	638	308	0	372	10	2	0	1,330
75-79	498	260	1	444	9	0	0	1,212
80-84	285	185	0	297	9	0	1	777
85-89	121	95	0	160	3	0	0	379
90-94	22	54	0	61	1	0	0	138
95 +	6	9	0	10	0	0	0	25
Unknown	39	109	0	176	5	0	0	329
Total	28,816	12,972	139	8,070	965	79	50	51,091

Table 2: Role of 1980 Male Fatalities

Age Group	Motorist			Non-motorist				
	Driver	Passenger	Unknown	Pedestrian	Pedalcyclist	Occupant	Other/ Unknown	Total
00-04	0	372	0	251	23	1	8	655
05-09	17	207	0	375	145	1	5	750
10-14	143	341	4	226	201	3	8	926
15-19	3,737	1,989	39	544	142	11	3	6,465
20-24	5,326	1,592	27	647	69	10	3	7,674
25-29	3,662	726	19	484	42	5	1	4,939
30-34	2,583	369	9	349	25	7	2	3,344
35-39	1,622	241	6	281	22	3	0	2,175
40-44	1,174	196	4	221	9	2	0	1,606
45-49	1,034	154	2	266	16	4	0	1,476
50-54	1,004	143	0	270	23	5	0	1,445
55-59	917	151	0	283	14	2	0	1,367
60-64	724	106	0	239	10	1	0	1,080
65-69	581	98	0	266	9	0	1	955
70-74	495	86	0	213	9	2	0	805
75-79	378	69	0	260	9	0	0	716
80-84	225	58	0	170	7	0	1	461
85-89	105	24	0	97	3	0	0	229
90-94	19	23	0	43	1	0	0	86
95 +	6	3	0	5	0	0	0	14
Unknown	30	68	0	123	3	0	0	224
Total	23,782	7,016	110	5,613	782	57	32	37,392

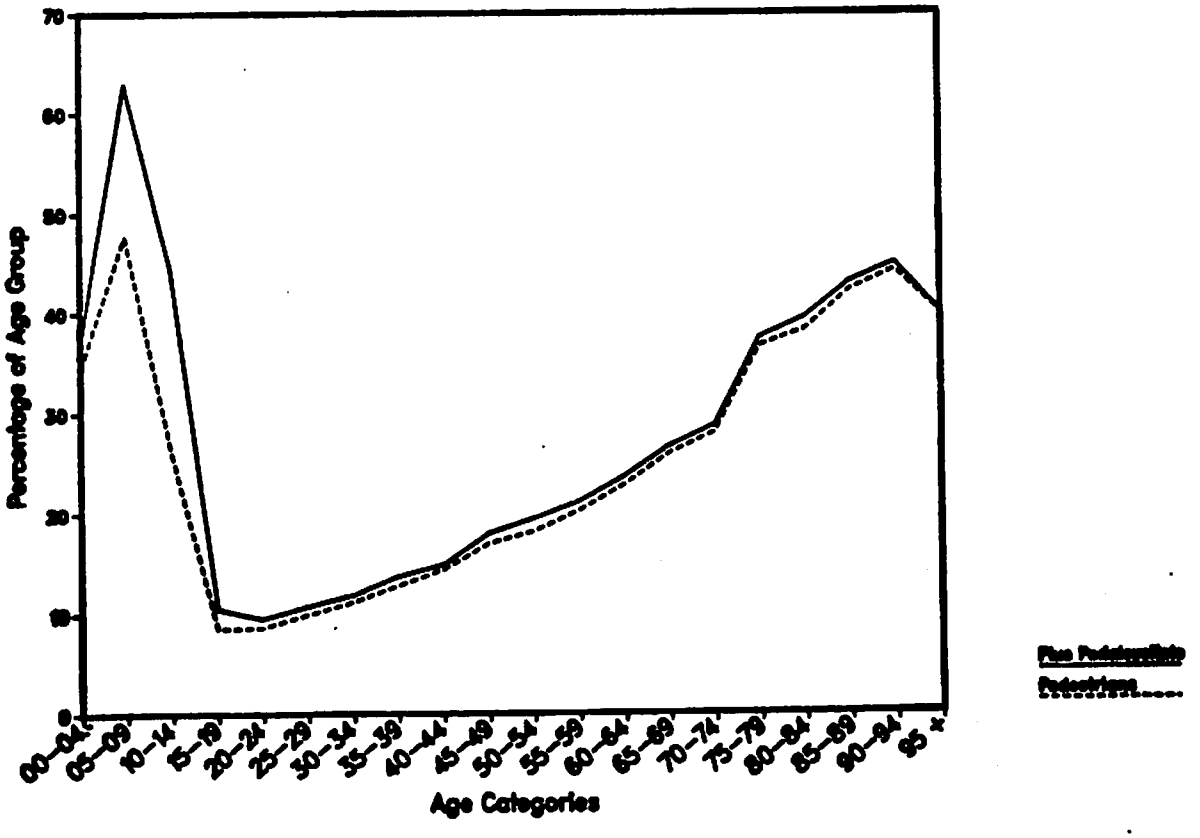
Table 3: Role of 1980 Female Fatalities

Age Group	Motorist			Non-motorist				
	Driver	Passenger	Unknown	Pedestrian	Pedalcyclist	Occupant	Other/ Unknown	Total
00-04	0	326	0	142	6	2	7	483
05-09	0	219	0	207	41	1	2	470
10-14	10	255	0	137	53	2	5	462
15-19	752	1,358	9	207	32	1	0	2,359
20-24	905	843	9	182	14	3	1	1,957
25-29	646	488	2	133	4	3	1	1,277
30-34	476	306	3	123	7	0	1	916
35-39	388	212	3	82	5	1	0	691
40-44	298	205	0	95	1	1	0	600
45-49	268	200	0	77	4	4	0	553
50-54	303	193	0	99	4	0	0	599
55-59	262	235	1	118	4	2	0	622
60-64	201	195	0	127	2	0	0	525
65-69	172	231	0	118	1	2	1	525
70-74	143	222	0	159	1	0	0	525
75-79	120	191	1	184	0	0	0	496
80-84	60	127	0	127	2	0	0	316
85-89	16	71	0	63	0	0	0	150
90-94	3	31	0	18	0	0	0	52
95 +	0	6	0	5	0	0	0	11
Unknown	6	41	0	51	2	0	0	100
Total	5,029	5,955	28	2,454	183	22	18	13,689

Table 4: Of Fatalities, Percentage Who Were Pedestrians or Pedestrians-Plus-Pedalcyclists in 1980

Age Group	Percent Pedestrians and (Pedestrians + Pedalcyclists) Total	Male	Female
00-04	35 (37)	38 (42)	29 (31)
05-09	48 (63)	50 (69)	44 (53)
10-14	26 (44)	24 (46)	30 (41)
15-19	9 (10)	8 (11)	9 (10)
20-24	9 (9)	8 (9)	9 (10)
25-29	10 (11)	10 (11)	10 (11)
30-34	11 (12)	10 (11)	13 (14)
35-39	13 (14)	13 (14)	12 (13)
40-44	14 (15)	14 (14)	16 (16)
45-49	17 (18)	18 (19)	14 (15)
50-54	18 (19)	19 (20)	17 (17)
55-59	20 (21)	21 (22)	19 (20)
60-64	23 (24)	22 (23)	24 (25)
65-69	26 (27)	28 (29)	22 (23)
70-74	28 (29)	26 (28)	30 (30)
75-79	37 (37)	36 (38)	37 (37)
80-84	38 (39)	37 (38)	40 (41)
85-89	42 (43)	42 (44)	42 (42)
90-94	44 (45)	50 (51)	35 (35)
95 +	40 (40)	36 (36)	45 (45)
Total	16 (18)	15 (17)	18 (19)

Figure 1:
Pedestrians and Pedalcyclists as a Percentage of Fatalities in 1980



Child, elderly, and female occupant fatalities are more frequently passengers (not drivers) than is the case for teenage, young adult, and middle-aged males. Children, the elderly, and females are also more frequently killed as pedestrians than is the case for teenage, young adult, and middle-aged males. The summary data are shown in Table 4 and graphed as Figure 1. Overall, 15 percent of all male fatalities in 1980 were pedestrians versus 18 percent of all female fatalities. Child fatalities are frequently pedestrians (or pedalcyclists), but the percentage of fatalities who were walking when killed drops sharply at about licensing age (to 10 percent). As people age, their relative involvement as pedestrians increases steadily to over one-third of fatalities over 64 years old.

The vehicle type for fatalities who were killed as motorists is shown in Table 5, and separately by gender in Tables 6 (males) and 7 (females). The seven motorist fatalities whose gender is unknown are included in Table 5, but not in Tables 6 and 7. Light trucks, vans, and motorcycles account for a much higher proportion of male fatalities than of female.

Table 5: Vehicle Type of 1980 Motorist Fatalities

Age Group	Car	Light Truck / Van	Motor-cycle	Other Type	Total
00-04	542	119	9	28	698
05-09	291	91	25	37	444
10-14	414	152	141	46	753
15-19	5,411	1,058	1,031	385	7,885
20-24	5,509	1,140	1,587	468	8,704
25-29	3,314	843	967	419	5,543
30-34	2,191	605	627	323	3,746
35-39	1,493	469	293	217	2,472
40-44	1,150	375	158	194	1,877
45-49	1,063	334	120	141	1,658
50-54	1,104	333	52	154	1,643
55-59	1,060	307	53	146	1,566
60-64	886	236	34	70	1,226
65-69	824	188	22	48	1,082
70-74	765	139	10	32	946
75-79	631	87	8	33	759
80-84	413	42	3	12	470
85-89	193	20	0	3	216
90-94	68	5	0	3	76
95 +	13	1	0	1	15
Unknown	114	22	4	8	148
Total	27,449	6,566	5,144	2,768	41,927

Table 6: Vehicle Type of 1980 Male Motorist Fatalities

Age Group	Car	Light Truck / Van	Motor-cycle	Other Type	Total
00-04	283	69	4	16	372
05-09	137	45	21	21	224
10-14	224	106	122	36	488
15-19	3,754	821	904	286	5,765
20-24	4,127	963	1,461	394	6,945
25-29	2,405	736	896	370	4,407
30-34	1,566	529	589	277	2,961
35-39	1,000	401	275	193	1,869
40-44	734	329	141	170	1,374
45-49	672	286	108	124	1,190
50-54	676	290	44	137	1,147
55-59	619	267	48	134	1,068
60-64	537	200	33	60	830
65-69	469	150	21	39	679
70-74	428	115	10	28	581
75-79	344	76	8	19	447
80-84	233	39	3	8	283
85-89	115	12	0	2	129
90-94	39	3	0	0	42
95 +	8	1	0	0	9
Unknown	79	14	1	4	98
Total	18,449	5,452	4,689	2,318	30,908

Table 7: Vehicle Type of 1980 Female Motorist Fatalities

Age Group	Car	Light Truck / Van	Motor-cycle	Other Type	Total
00-04	259	50	5	12	326
05-09	154	46	4	15	219
10-14	190	46	19	10	265
15-19	1,656	237	127	99	2,119
20-24	1,381	177	125	74	1,757
25-29	909	107	71	49	1,136
30-34	625	76	38	46	785
35-39	493	68	18	24	603
40-44	416	46	17	24	503
45-49	391	48	12	17	468
50-54	428	43	8	17	496
55-59	441	40	5	12	498
60-64	349	36	1	10	396
65-69	355	38	1	9	403
70-74	337	24	0	4	365
75-79	287	11	0	14	312
80-84	180	3	0	4	187
85-89	78	8	0	1	87
90-94	29	2	0	3	34
95 +	5	0	0	1	6
Unknown	32	8	3	4	47
Total	8,995	1,114	454	449	11,012

Fatality Rates Based on Population

So far in this report, all comparisons by age and gender have been made on the basis of fatality proportions. A different method uses the population data of Table 8, which were published by the Bureau of the Census in series P-25, report number 929, table 2. The results are Tables 9 (fatalities as a proportion of population), 10 (light truck, van, and car fatalities), 11 (motorcycle fatalities), and 12 (pedestrian fatalities). These four tables are graphed as Figures 2 through 5, respectively.

Table 8: Resident Population in 1980

Age Group	Population in Thousands		
	Total	Males	Females
00-04	16,457	8,417	8,039
05-09	16,598	8,489	8,109
10-14	18,229	9,309	8,920
15-19	21,074	10,716	10,358
20-24	21,407	10,717	10,690
25-29	19,659	9,781	9,878
30-34	17,759	8,782	8,978
35-39	14,085	6,924	7,161
40-44	11,735	5,743	5,992
45-49	11,043	5,367	5,676
50-54	11,687	5,613	6,074
55-59	11,620	5,482	6,138
60-64	10,136	4,691	5,444
65-69	8,807	3,916	4,891
70-74	6,845	2,873	3,972
75-79	4,833	1,862	2,971
80-84	2,958	1,027	1,930
85-89	1,541	483	1,058
90-94	575	164	411
95 +	155	42	113
Total	227,202	110,398	116,804

Table 9: Fatality Rates
per Million Population in 1980

Age Group	Fatality Rate		
	Total	Males	Females
00-04	69.15	77.82	60.08
05-09	73.56	88.35	57.96
10-14	76.14	99.47	51.79
15-19	418.76	603.30	227.75
20-24	450.04	716.06	183.07
25-29	316.19	504.96	129.28
30-34	239.88	380.78	102.03
35-39	203.48	314.12	96.49
40-44	187.98	279.64	100.13
45-49	183.74	275.01	97.43
50-54	174.90	257.44	98.62
55-59	171.17	249.36	101.34
60-64	158.35	230.23	96.44
65-69	168.05	243.87	107.34
70-74	194.30	280.19	132.18
75-79	250.78	384.53	166.95
80-84	262.68	448.88	163.73
85-89	245.94	474.12	141.78
90-94	240.00	524.39	126.52
95 +	161.29	333.33	97.35
Total	224.78	338.70	117.20

Figure 2:

Traffic Fatalities per Million Population in 1980

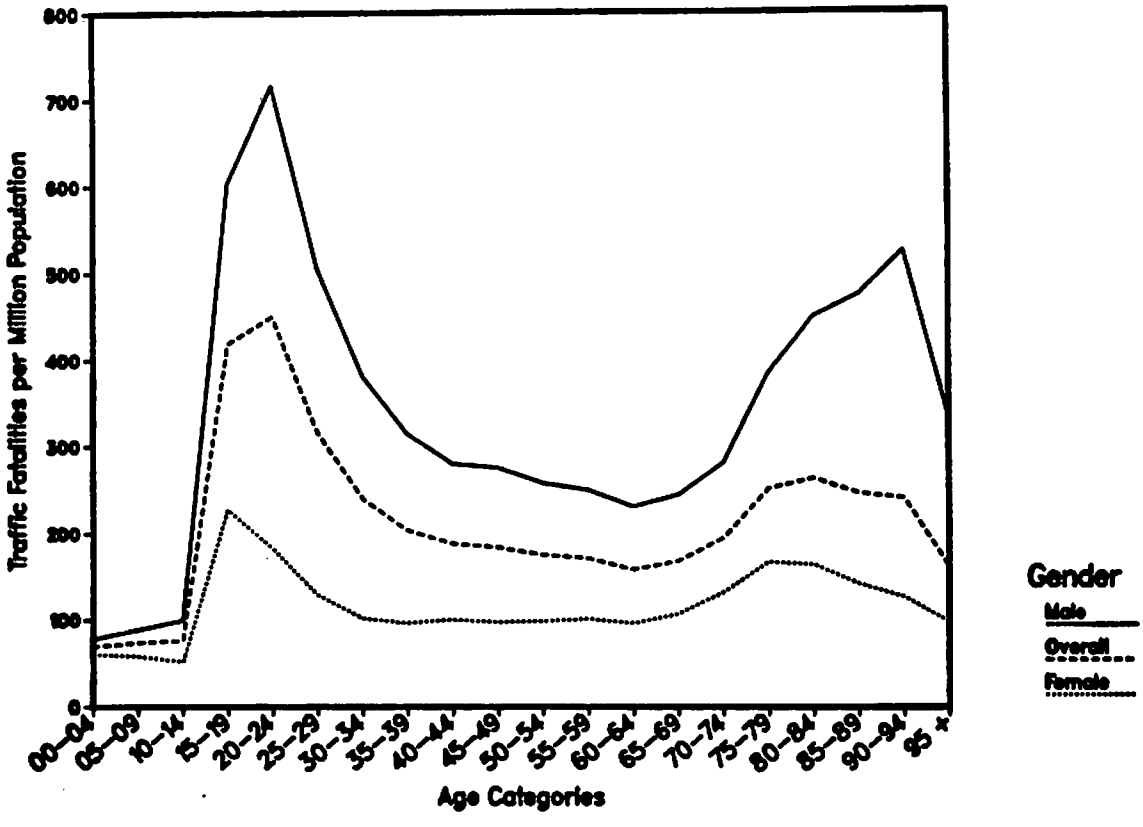


Table 10: Fatality Rates in Passenger Vehicles per Million Population in 1980

Age Group	Fatality Rate		
	Total	Males	Females
00-04	40.17	41.82	38.44
05-09	23.01	21.44	24.66
10-14	31.05	35.45	26.46
15-19	306.97	426.93	182.76
20-24	310.60	474.95	145.74
25-29	211.46	321.13	102.85
30-34	157.44	238.56	78.08
35-39	139.30	202.34	78.34
40-44	129.95	185.09	77.10
45-49	126.51	178.50	77.34
50-54	122.96	172.10	77.54
55-59	117.64	161.62	78.36
60-64	110.69	157.11	70.72
65-69	114.91	158.07	80.35
70-74	132.07	189.00	90.89
75-79	148.56	225.56	100.30
80-84	153.82	264.85	94.82
85-89	138.22	262.94	81.29
90-94	126.96	256.10	75.43
95 +	90.32	214.29	44.25
Total	149.71	216.50	86.55

Figure 3:

Passenger Vehicle Fatalities per Million Population in 1980

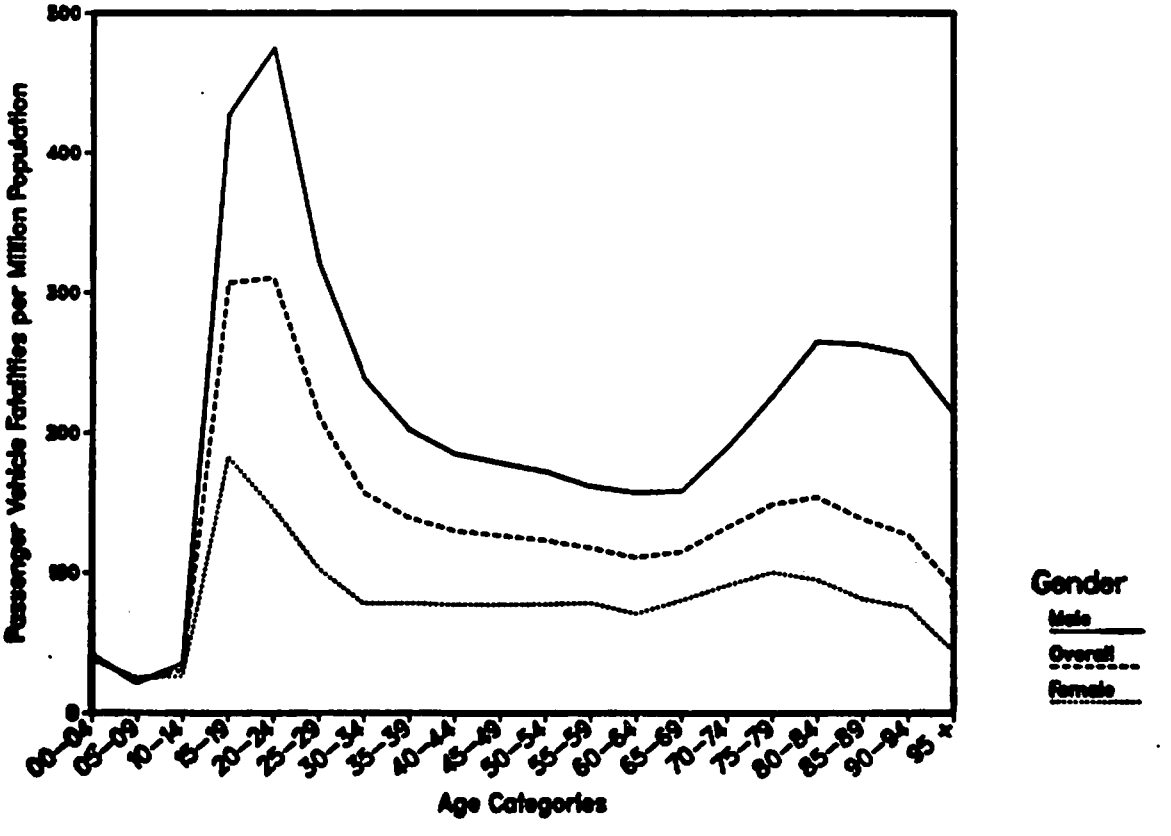


Table 11: Fatality Rates on Motorcycles per Million Population in 1980

Age Group	Fatality Rate		
	Total	Males	Females
00-04	0.55	0.48	0.62
05-09	1.51	2.47	0.49
10-14	7.73	13.11	2.13
15-19	48.92	84.36	12.26
20-24	74.13	136.33	11.69
25-29	49.19	91.61	7.19
30-34	35.31	67.07	4.23
35-39	20.80	39.72	2.51
40-44	13.46	24.55	2.84
45-49	10.87	20.12	2.11
50-54	4.45	7.84	1.32
55-59	4.56	8.76	0.81
60-64	3.35	7.03	0.18
65-69	2.50	5.36	0.20
70-74	1.46	3.48	0.00
75-79	1.66	4.30	0.00
80-84	1.01	2.92	0.00
85-89	0.00	0.00	0.00
90-94	0.00	0.00	0.00
95 +	0.00	0.00	0.00
Total	22.64	42.47	3.89

Figure 4:

Motorcyclist Fatalities per Million Population in 1980

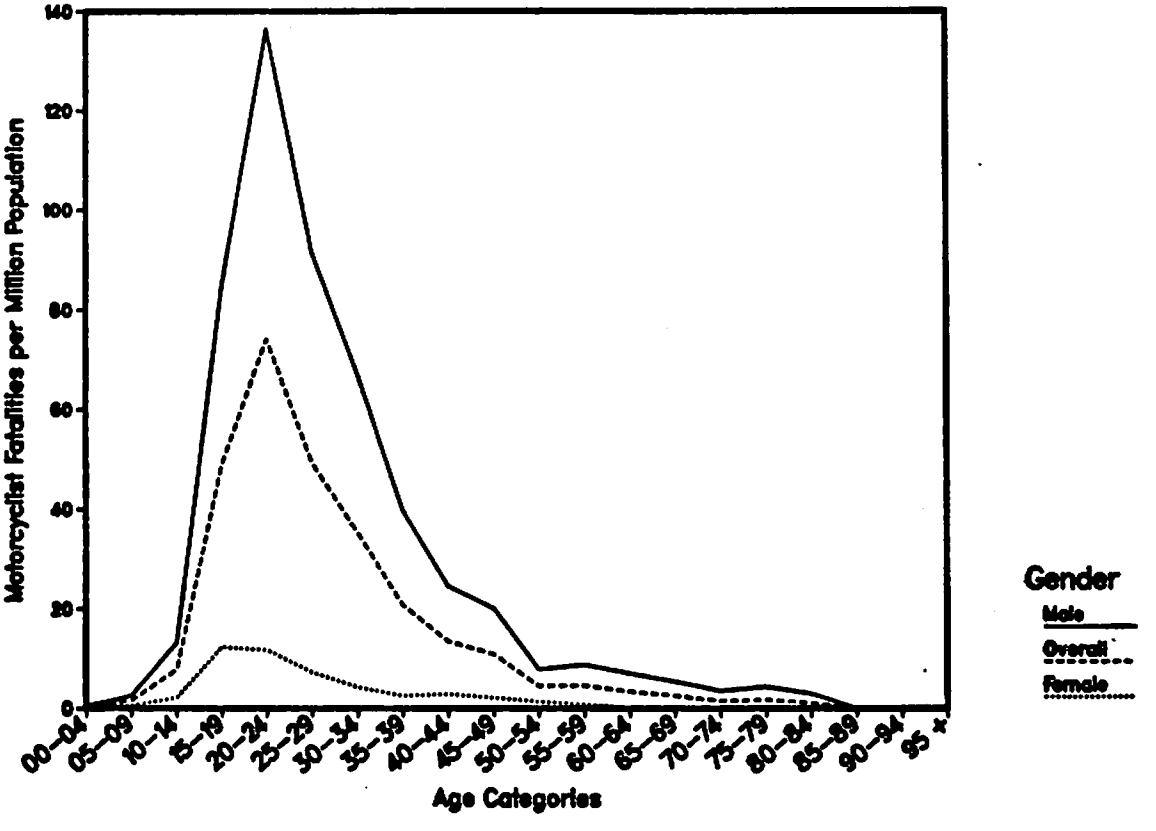
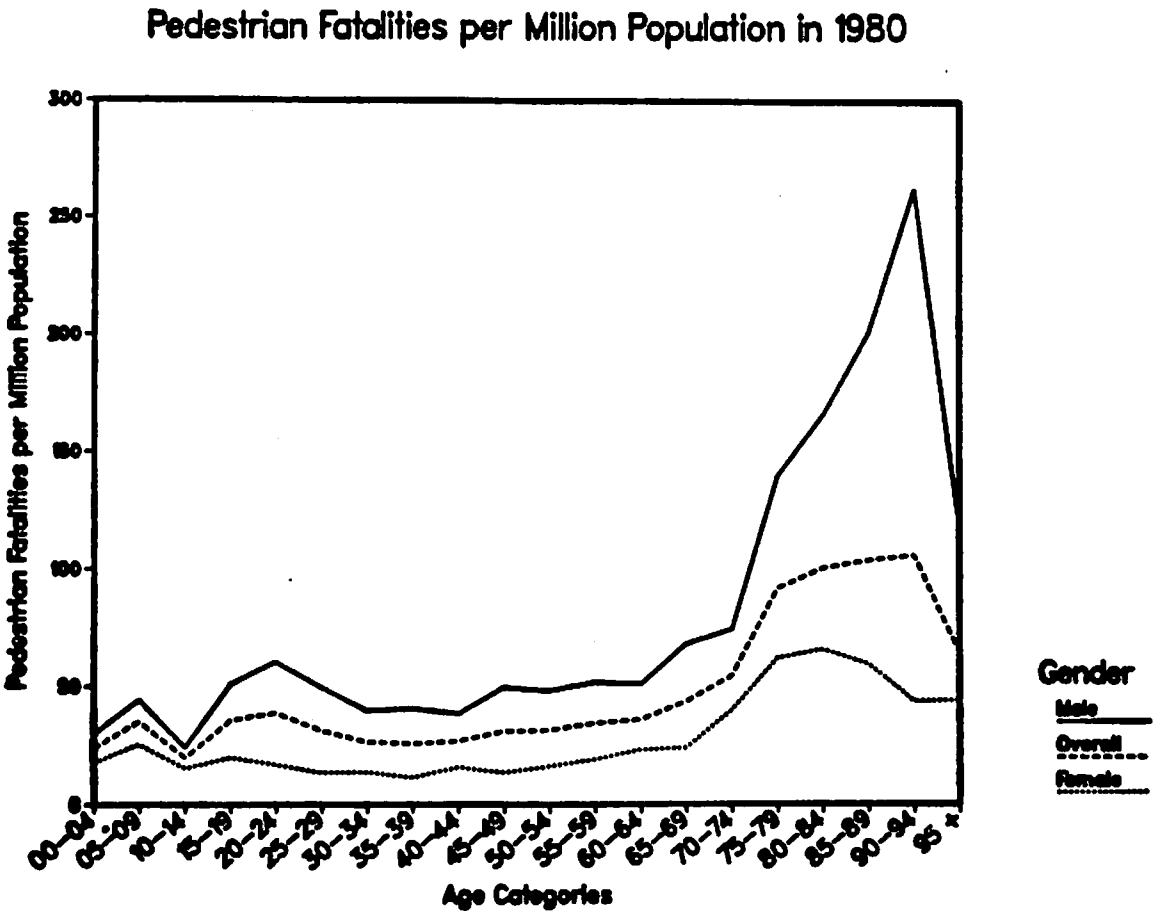


Table 12: Fatality Rates for Pedestrians per Million Population in 1980

Age Group	Fatality Rate		
	Total	Males	Females
00-04	23.88	29.82	17.66
05-09	35.06	44.17	25.53
10-14	19.91	24.28	15.36
15-19	35.64	50.77	19.98
20-24	38.77	60.37	17.03
25-29	31.39	49.48	13.46
30-34	26.58	39.74	13.70
35-39	25.77	40.58	11.45
40-44	26.93	38.48	15.85
45-49	31.06	49.56	13.57
50-54	31.57	48.10	16.30
55-59	34.51	51.62	19.22
60-64	36.11	50.95	23.33
65-69	43.60	67.93	24.13
70-74	54.35	74.14	40.03
75-79	91.87	139.63	61.93
80-84	100.41	165.53	65.80
85-89	103.83	200.83	59.55
90-94	106.09	262.20	43.80
95 +	64.52	119.05	44.25
Total	35.52	50.84	21.01

Figure 5:



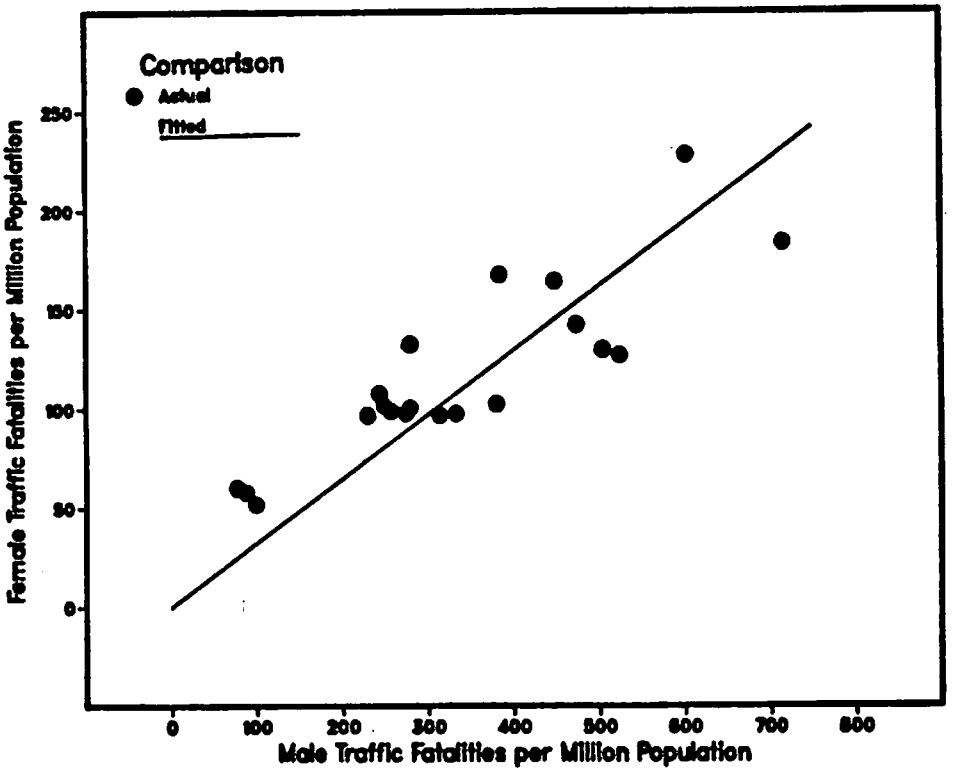
Overall (Table 8 and Figure 2) females have about one-third as many traffic fatalities per population unit as do males. The following equation explains 57 percent of the variability in the data (R-square of 0.57) using 20 five-year age categories:

$$\frac{\text{Female fatalities}}{\text{Million females}} = 0.322 \times \frac{\text{Male fatalities}}{\text{Million males}}. \qquad \text{(Equation 1)}$$

The model line and actual data are compared in Figure 6.

Figure 6:

Comparison of Fatality Rates by Gender in 1980



Fatalities and Hospitalization per Accident

Another way to define a fatality rate is fatalities per accident involvement. Table 13 shows the estimated fatality rate in towed cars from the National Crash Severity Study (NCSS). The rate generally increases with age, but the small number of fatalities on the file (909 in cars) limits the accuracy of the estimates.

Table 13: Fatality Rates in Towed Cars
(Estimates Made from Weighted NCSS Data)

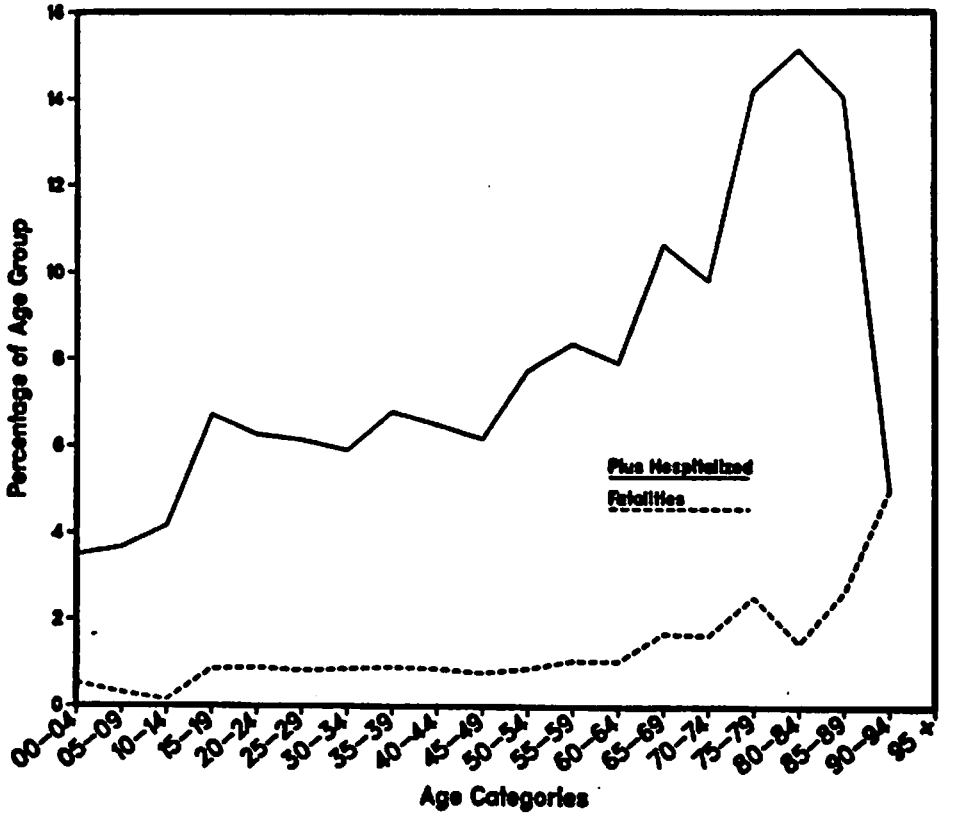
Age	Fatality Status			Fatality
Group	No	Yes	Total	Rate
00-04	3,186	17	3,203	0.531%
05-09	2,582	8	2,590	0.309%
10-14	3,383	5	3,388	0.148%
15-19	23,480	202	23,682	0.853%
20-24	20,975	188	21,163	0.888%
25-29	13,030	108	13,138	0.822%
30-34	7,909	69	7,978	0.865%
35-39	5,403	49	5,452	0.899%
40-44	4,364	38	4,402	0.863%
45-49	4,370	34	4,404	0.772%
50-54	3,775	33	3,808	0.867%
55-59	3,202	34	3,236	1.051%
60-64	2,467	26	2,493	1.043%
65-69	1,870	32	1,902	1.682%
70-74	1,616	27	1,643	1.643%
75-79	1,004	26	1,030	2.524%
80-84	541	8	549	1.457%
85-89	111	3	114	2.632%
90-94	38	2	40	5.000%
95 +	1	0	1	0.000%
Unknown	2,537	15	2,552	0.588%
Total	103,307	909	104,216	0.872%

The rate of fatality or hospitalization is shown in Table 14. The larger number of people hospitalized overnight (5,957) compared to fatalities (909) increases the accuracy of the estimates but also confuses outcome (fatality) with treatment (hospitalization). The fatality rates (from Table 13) and fatality-hospitalization rates (from Table 14) are plotted for those under 95 years old in Figure 7. The oldest group is not included in the plot because there was only one NCSS person this old.

Table 14: Fatality/Hospitalization Rates in Towed Cars
(Estimates Made from Weighted NCSS Data)

Age Group	Hospitalization/ Fatality Status			Hospital/ Fatality Rate
	No	Yes	Total	
00-04	3,091	112	3,203	3.497%
05-09	2,495	95	2,590	3.668%
10-14	3,247	141	3,388	4.162%
15-19	22,094	1,588	23,682	6.706%
20-24	19,838	1,325	21,163	6.261%
25-29	12,333	805	13,138	6.127%
30-34	7,508	470	7,978	5.891%
35-39	5,083	369	5,452	6.768%
40-44	4,117	285	4,402	6.474%
45-49	4,133	271	4,404	6.153%
50-54	3,514	294	3,808	7.721%
55-59	2,966	270	3,236	8.344%
60-64	2,296	197	2,493	7.902%
65-69	1,700	202	1,902	10.620%
70-74	1,482	161	1,643	9.799%
75-79	884	146	1,030	14.175%
80-84	466	83	549	15.118%
85-89	98	16	114	14.035%
90-94	38	2	40	5.000%
95 +	1	0	1	0.000%
Unknown	2,518	34	2,552	1.332%
Total	99,902	6,866	106,768	6.431%

Figure 7:
Fatalities and Those Hospitalized
as a Percentage of Towed Car Occupants on NCSS



The age groups are collapsed in Tables 15 (fatality rates) and 16 (rate of fatality or hospitalization) so that the data can be split by gender without low cell counts. Note that while females have lower fatality rates in car accidents, the difference in car accidents is not as great as the difference computed using population as the basis. Females tend to be in fewer and less-severe accidents than do males.

Table 15: Fatality Rates in Towed Cars, by Gender
(Estimates Made from Weighted NCSS Data)

	Involved		Fatalities		Fatality Rate	
Age Group	Males	Females	Males	Females	Males	Females
Under 15	4,393	4,752	17	13	0.39%	0.27%
15 - 39	44,329	27,013	450	166	1.02%	0.62%
40 - 64	9,899	8,419	108	57	1.09%	0.68%
Over 64	2,932	2,346	55	43	1.88%	1.83%
Unknown	1,095	393	12	2	1.11%	0.51%
Total	62,648	42,923	642	281	1.02%	0.65%

Table 16: Rates of Fatality or Hospitalization, by Gender
(Estimates Made from Weighted NCSS Data)

	Involved		Hospitalization/ Fatalities		Hospitalized/ Fatality Rate	
Age Group	Males	Females	Males	Females	Males	Females
Under 15	4,393	4,752	164	184	3.73%	3.87%
15 - 39	44,329	27,013	2,787	1,768	6.29%	6.54%
40 - 64	9,899	8,419	624	692	6.30%	8.22%
Over 64	2,932	2,346	274	336	10.30%	14.32%
Unknown	1,095	393	23	10	2.10%	2.54%
Total	62,648	42,923	3,872	2,990	6.18%	6.97%

The comparison by gender for those over 64 years old is seriously complicated by the longer life expectancy of females -- the females in this age group are, on average, much older than the males. Thus, the fatality rates are biased against elderly females. This point is especially relevant to Table 16. Males and females are probably about as likely to be hospitalized, after controlling for age.

Despite their greater age, females who are taken to a hospital are more likely to survive than are males. Table 17 shows that of those killed or hospitalized, 9 percent of the females died versus 17 percent of the males. Either females are admitted with inherently less severe injuries, or they are more resistent to death. It is not possible to determine which is the correct interpretation from the data presented here.

Table 17: Comparison of Fatality versus Hospitalization, by Age and Gender for Towed Car Occupants (Estimates Made from Weighted NCSS Data)

	Fatality as a Proportion of (Fatality plus Hospitalized)		
Age Group	Total	Males	Females
Under 15	9%	10%	7%
15 - 39	14%	16%	9%
40 - 64	13%	17%	8%
Over 64	16%	20%	13%
Total	13%	17%	9%

Injuries and Survival Times for Fatalities

As people age, it seems clear (Table 18) that they tend to die of lesser injuries. One-sixth of fatalities over 64 years old received nothing more serious than an Abbreviated Injury Scale (AIS, 1976 version) rating of 3. Very few younger people die of these injuries.

Table 18: AIS for Fatalities in NCSS Towed Cars
(Actual Numbers of People Investigated)

AIS	Under 15	15 - 39	40 - 64	Over 64
1	0	0	1	1
2	0	2	1	1
3	0	3	2	8
4	0	17	8	14
5	4	138	35	20
6	4	122	35	15
Unknown	22	334	83	39
Total	30	616	165	98
Of known,				
percent <=3	0%	2%	5%	17%
percent <=4	0%	8%	15%	41%

Table 19 shows the individual injuries and the days in hospital for the 58 people who died in NCSS with a maximum AIS of 1 through 4. The injury description used is the Occupant Injury Classification (OIC) with the associated AIS. Injuries with unknown severity were coded as "AIS 8" on NCSS. NCSS had a special code for "fatality" listed as an option of the variable "Days in Hospital". Some people who died in the hospital may have been coded as "fatality" rather than with the number of days that they were hospitalized. Even so, it is clear that many people who die from low-severity injuries first spend days or weeks under hospital care. Notice also the large number of fractured ribs (code C_FS), especially among the older women.

Table 20 clarifies the findings from NCSS on injury severity with data on the interval between the accident and death from FARS. "Zero days" means the death occurred on the day of the accident; "one day" means death occurred the next day. Note that, for example, only 7 percent of 35 to 44 year old fatalities survived till the third day following the accident versus 27 percent of those aged 90 to 94 years old. Even two weeks after the accident, many eventual older fatalities are still alive. Thus, they are available for, by not amenable to, medical treatment. Also, there are probably many older people who die as the result of an accident, but beyond the 30-day definition of death used by FARS.

Table 19: NCSS Fatalities With No AIS Greater Than Four
(Actual Numbers of People Investigated)

Age	Gender	Data Source	Individual Injuries OIC1	OIC2	OIC3	Days in Hospital
16	male	medical	CROP3	CLHP3	MSRR3	fatality
17	male	autopsy	HPCB4	CBCP3	HSLI2	fatality
17	female	medical	HPLB4	CBCP3	FIFS2	2 days
17	male	autopsy	HWCB4	HSFS3	TRFS3	fatality
18	male	medical	MRLL4	MLRQ4	MILD4	16 days
18	male	autopsy	HIFS4	HWCB4	CBCP3	fatality
19	male	medical	HPLI2	FIFS1	MRAI1	fatality
19	male	medical	MLLQ4	ARFS2	SRFS2	7 days
20	male	medical	ARFS3	FSAI1	CLAI1	unknown
20	male	medical	HLFS4	CLCP3	CLFS2	fatality
21	female	medical	CLFS4			fatality
22	male	medical	HIFS2	QLFJ2	FSAI1	fatality
23	male	autopsy	HRCB4	HIFS4	FIFS2	fatality
24	male	medical	HPCB4	RLFS2	PLFS2	1 day
27	male	autopsy	MLLQ4	CLFS3	LRFS3	1 day
27	female	medical	HUFS4	CUFS3	KULI1	fatality
28	female	medical	HLFS4	CLFS3	CLCP3	fatality
30	female	medical	FSFS3	YRFS3	HSVI3	fatality
36	male	autopsy	CBFS4	CBOP4	FSFS3	fatality
36	male	autopsy	HRLB4	FIFS3	NRLI2	fatality
37	female	medical	HUFS4	QRFJ2	FRLI2	fatality
38	male	medical	HWFS4	LRFS2	UUUU8	fatality
43	male	medical	HPFS2	FSFS2	FCFR1	fatality
44	male	medical	LLFS3	HIFS2	FIFS2	fatality
44	male	medical	MRLL4	MILD4	CLHP3	14 days
48	female	medical	HWKB4	HRLI1		7 days
50	female	autopsy	MLLQ4	CCCH4	CLFS3	4 days
51	male	medical	CRFS3	CUCP3	PUFS2	13 days
56	female	autopsy	CBHP4	CBFS3	WLDJ3	fatality
57	male	autopsy	CBOP4	HRLI1	FILI1	1 day
59	male	autopsy	CUFS4	SRLI2	KRLI1	fatality
62	male	autopsy	FSCI1			fatality
64	female	autopsy	HLFS4	CLFS3	CLCP3	fatality
65	female	autopsy	CBFS3	CCFS2	TRFS2	unknown
66	female	medical	CRFS3	CROP3	HRLI1	18 days
66	male	medical	TBFS4	CRCP3	CRFS3	8 days
67	female	autopsy	MSRR3	CBFS3	HWCI2	27 days
67	male	autopsy	MLRQ4	MWHA3	LBFS3	25 days
69	female	autopsy	YBFS4	CBFS3	PWFS3	1 day
69	male	medical	CBFS4	SRDJ3	SRBI1	fatality
70	male	medical	TRFS2	SRFS2	FSLI1	unknown
70	female	medical	MWHA3	MUCK3	MIRG3	fatality
70	female	autopsy	FSFS4	HWCB4	FBFS4	fatality
70	male	medical	CBFS4	HLLI1	WLLI1	14 days
72	male	medical	CROP3	CRCP3		27 days
72	male	medical	CLFS4	HUKB3	FSLI2	1 day
73	male	medical	NAFR4	FBFS4	FIVI3	4 days
73	male	autopsy	CBCP4		CRFS3	fatality
76	female	medical	CRFS4	QLFJ3	FLLE2	4 days
77	female	medical	HWKB1	CWCI1	HULI1	12 days
77	female	medical	CRFS3	QLFJ2	FILI1	fatality
77	male	medical	HPFS4	CUFS4	WBLI2	fatality
77	female	medical	TBFS4	KRFS3	KLFS2	unknown
79	female	medical	WRDJ3	MWCI1	HWKB1	2 days
82	female	medical	CRFS3	PRFS2	HRLI1	15 days
86	female	medical	CLFS4	CLOP3	FCFR2	fatality
88	male	autopsy	CCCH4	CBFS3	MWHA3	fatality

Table 20: Interval Between Accident and Death in 1980 FARS

Age Group	Days Between Accident and Death						
	Unknown	00-02	03-06	07-13	14-20	21 +	Total
00-04	10	1,027	54	32	9	6	1,128
	-	91.05%	4.79%	2.84%	0.80%	0.53%	100.00%
05-09	4	1,059	87	48	18	5	1,217
	-	87.02%	7.15%	3.94%	1.48%	0.41%	100.00%
10-14	3	1,211	94	51	18	11	1,385
	-	87.44%	6.79%	3.68%	1.30%	0.79%	100.00%
15-19	43	7,943	388	321	87	43	8,782
	-	90.45%	4.42%	3.66%	0.99%	0.49%	100.00%
20-24	39	8,784	386	277	94	54	9,595
	-	91.55%	4.02%	2.89%	0.98%	0.56%	100.00%
25-29	24	5,701	232	156	58	45	6,192
	-	92.07%	3.75%	2.52%	0.94%	0.73%	100.00%
30-34	16	3,916	144	115	39	30	4,244
	-	92.27%	3.39%	2.71%	0.92%	0.71%	100.00%
35-39	18	2,640	76	78	29	25	2,848
	-	92.70%	2.67%	2.74%	1.02%	0.88%	100.00%
40-44	12	2,047	52	48	26	21	2,194
	-	93.30%	2.37%	2.19%	1.19%	0.96%	100.00%
45-49	8	1,869	60	48	24	20	2,021
	-	92.48%	2.97%	2.38%	1.19%	0.99%	100.00%
50-54	9	1,845	71	66	27	26	2,035
	-	90.66%	3.49%	3.24%	1.33%	1.28%	100.00%
55-59	7	1,789	62	64	42	25	1,982
	-	90.26%	3.13%	3.23%	2.12%	1.26%	100.00%
60-64	16	1,406	63	55	38	27	1,589
	-	88.48%	3.96%	3.46%	2.39%	1.70%	100.00%
65-69	8	1,281	69	48	41	33	1,472
	-	87.02%	4.69%	3.26%	2.79%	2.24%	100.00%
70-74	5	1,127	72	62	35	29	1,325
	-	85.06%	5.43%	4.68%	2.64%	2.19%	100.00%
75-79	15	1,008	57	58	43	31	1,197
	-	84.21%	4.76%	4.85%	3.59%	2.59%	100.00%
80-84	6	603	66	45	32	25	771
	-	78.21%	8.56%	5.84%	4.15%	3.24%	100.00%
85-89	3	294	21	20	20	21	376
	-	78.19%	5.59%	5.32%	5.32%	5.59%	100.00%
90-94	2	99	9	14	6	8	136
	-	72.79%	6.62%	10.29%	4.41%	5.88%	100.00%
95 +	1	21	1	1	0	1	24
	-	87.50%	4.17%	4.17%	0.00%	4.17%	100.00%
Unknown	4	298	7	13	5	2	325
	-	91.69%	2.15%	4.00%	1.54%	0.62%	100.00%
Total	253	45,968	2,071	1,620	691	488	51,091
	-	90.42%	4.07%	3.19%	1.36%	0.96%	100.00%

Table 21 presents the information as average days till death by gender and travel mode categories. After controlling for age, fatally-injured females appear to have a shorter average interval between the accident and death.

Table 21: Average Days Till Death in 1980 FARS

Age	Any Travel Mode		Passenger Vehicles		Pedestrians	
Group	Males	Females	Males	Females	Males	Females
00-04	0.955	0.740	0.957	0.784	1.108	0.771
05-09	1.154	1.160	0.817	1.211	1.219	1.053
10-14	1.109	1.308	0.788	1.169	1.538	1.839
15-19	0.909	1.036	0.823	0.927	0.864	1.106
20-24	0.845	0.873	0.733	0.829	0.781	0.896
25-29	0.811	0.848	0.708	0.845	1.129	0.833
30-34	0.859	0.758	0.753	0.661	0.997	1.303
35-39	0.870	0.760	0.771	0.712	1.200	0.815
40-44	0.856	0.741	0.896	0.674	0.729	0.526
45-49	0.961	0.713	0.853	0.606	1.204	1.597
50-54	1.185	0.834	1.128	0.741	1.212	0.990
55-59	1.189	1.230	1.108	1.241	1.429	1.356
60-64	1.550	1.227	1.554	1.194	1.585	1.456
65-69	1.707	1.446	1.596	1.427	1.722	1.359
70-74	1.909	1.498	1.837	1.528	2.000	1.478
75-79	2.156	2.029	2.249	2.230	2.113	1.657
80-84	3.002	2.025	3.164	1.928	2.606	2.110
85-89	3.396	2.839	3.476	3.424	3.186	2.095
90-94	3.964	2.865	4.619	4.129	3.366	1.056
95 +	0.214	3.700	0.000	5.400	0.600	2.000
Total	1.039	1.070	0.944	1.004	1.312	1.275

The data in Table 21 can be summarized by a no-intercept model fit through the pairs of male versus female average lingering times for each five-year age category. Those over 94 years old have been excluded from the model of overall (over all travel modes) lingering times because of the small number of people included in computing these averages -- see Tables 2 and 3 for the actual numbers of people used for the computations. The result is

Female lingering = 0.821 * Male lingering. (Equation 2)

At any age, males linger an average of 22 percent longer (1/0.821 - 1) than females. The model has an R-square of 0.89.

Similar results are obtained for passenger vehicle fatalities under 95 years old:

Female lingering = 0.880 * Male lingering, (Equation 3)

which has an R-square of 0.89. For pedestrian fatalities under 90 years old,

Female lingering = 0.829 * Male lingering, (Equation 4)

with an R-square of 0.55. All three equations show longer lingering times for males, so this result is not simply a reflection of the different injuries received by fatalities using different travel modes.

Data from the National Accident Sampling System (NASS) show similar tendencies. Tables 22 (rates of survival past two days) and 23 (rates of survival till the next week) are raw data from the 1979 through 1983 NASS files. Detailed injury data on fatalities who were hospitalized at least three days are shown in Table 24. The 1979 accidents were coded with the 1976 version of the AIS; 1980 through 1983 accidents used the 1980 version of the AIS. Injuries with unknown severity are coded as "AIS 7" on NASS. "Days till Death" was added as a variable in 1982: it is usually the same as (or one day less than) "Days in Hospital". Most younger lingerers have some major brain injury, but many older lingerers do not.

Table 22: NASS Fatalities
Who Survived the Second Day after an Accident
(Actual Numbers of People Investigated)

	Survived Second Day After Accident?		
Victim Age	No	Yes	Total
Under 15	66 (97%)	2 (3%)	68 (100%)
15 - 39	507 (94%)	31 (6%)	538 (100%)
40 - 64	158 (93%)	11 (7%)	169 (100%)
Over 64	71 (83%)	15 (17%)	86 (100%)
Unknown	2	0	2
Total	804 (93%)	59 (7%)	863 (100%)

Table 23: NASS Fatalities
Who Survived the Sixth Day after an Accident
(Actual Numbers of People Investigated)

	Survived Sixth Day After Accident?		
Victim Age	No	Yes	Total
Under 15	66 (97%)	2 (3%)	68 (100%)
15 - 39	517 (96%)	21 (4%)	538 (100%)
40 - 64	162 (96%)	7 (4%)	169 (100%)
Over 64	75 (87%)	11 (13%)	86 (100%)
Unknown	2	0	2
Total	822 (95%)	41 (5%)	863 (100%)

Table 24: NASS Fatalities Who Were Hospitalized at Least Three Days

(Actual Numbers of People Investigated)

Year	Person Type	Age	Gender	Days in Hospital	Days till Death	Individual Injuries					
						OIC1	OIC2	OIC3	OIC4	OIC5	OIC6
1983	passenger	0	female	7 days	7 days	HIUB5*	HPUB3*	HPCB3*	HPCB3*	HPFS2*	HPFS2*
1983	pedestrian	7	male	12 days	12 days	HLUB4*	HLUB4*	HLUB3*	HLFS2*	QLAI1*	HLCI1*
1982	passenger	15	female	8 days	8 days	HICB5*	HCLB4*	CLFS4*	HIFS3*	LLFS3*	PPZJ3*
1983	passenger	15	male	3 days	3 days	HUCB5*	TLFS3*	PAFS2*	QLFS2*	MLCI1*	FLLI1*
1983	passenger	16	female	8 days	8 days	CLCP4*	CRCP3*	MILD3*	MICD3*	PAGJ3*	PPFS3*
1980	driver	17	female	19 days	--	MIRG3*	TLLA3*	OWLI2*			
1980	passenger	17	female	14 days	--	HIUB5*	NPZV3*	HPFS2*	HPCI1*		
1981	passenger	17	female	5 days	--	HRUB4*	HRCB3*	CLCP3*	HLFS2*	TLFS3*	PRFS2*
1982	driver	17	male	13 days	unknown	YLFS2					
1979	passenger	18	male	8 days	--	HLFS5*	MWCB2*	HLLI1*	HRCI1*	FLCI1*	
1981	driver	18	female	3 days	--	HWKD5*	MLRQ4*	CDFS4*	HRUB4*	CRCP3*	TRFS3*
1982	passenger	18	male	7 days	7 days	HUUB4*	HUUB3*	HUCD3*	FUFS1*	FCFS1*	ERAI1*
1982	pedestrian	18	male	4 days	4 days	HLUB3*	HRUB3*	HIFS3*	FSAI1*	PPAI1*	HSAI1*
1983	passenger	18	male	6 days	6 days	HLLB4*	MLRQ4*	HLFS4*	HUUB4*	TLFS3*	CUCP3*
1983	driver	20	male	3 days	unknown	UUUU7					
1982	driver	21	male	15 days	15 days	HWKB4*	WLLI1*	WRFS1*	WRLI1*	CUUU7*	RLFS2
1983	pedestrian	21	male	28 days	28 days	HRUB4*	HRUB4*	HLUB4*	HRFS3*	HLCB3*	HRCB3*
1981	passenger	22	male	11 days	--	HLLB5*	HLFS4*	HLLI2*	CWCI1*	SRCI1*	SLCI1*
1981	passenger	22	female	17 days	--	HPCB3*	CCCH3*	TRFS3*	PAGJ3*	TLFS3*	CBCP3*
1983	driver	22	male	7 days	7 days	UUFS7	UUUU7				
1983	pedestrian	23	male	6 days	unknown	LRFS3*	LLFS3*				
1983	passenger	25	male	15 days	15 days	FCFS4*	RRFS2*	HUUU7*			
1981	driver	27	male	16 days	--	HRUD4*	CUUU3*	CUUU3*	HWUB3*	UUUU7*	
1980	driver	28	male	3 days	--	PUFS2*	CRAI1*	CCUA7*	CWNW6		
1982	passenger	29	female	4 days	4 days	HWXB7	UUUU7	YUUU7			
1982	pedestrian	31	female	12 days	11 days	MILD4*	MILG3*	TRFS3*	PPDJ3*	RRFS2*	PRFS2*
1983	passenger	31	male	7 days	7 days	HLUB5*	HLUB3*	HLFS2*	PRFS2*	HPLI1*	HLCI1*
1979	driver	32	male	30 days	--	HWKB5*	TLLI2*	FCFR1*	FILI1*		
1980	passenger	32	male	11 days	--	HUUB4*	HUCB3*	QRCI1*	QLCI1*		
1981	passenger	33	female	15 days	--	HIUB5*	HUUB4*	HWUB3*	MILD3*	QRCI1*	FICI1*
1981	pedestrian	33	male	10 days	--	HRUB4*	HRUB3*	HUUB3*	HIFS3*	LRFS3*	LRFS3*
1979	driver	37	male	22 days	--	HWKB5*	CDFS3*	HRLI2*			
1981	passenger	37	male	6 days	--	HSCB3*	HRCB3*	HRFS2*	FCAI1*	HRCI1*	
1979	driver	42	male	5 days	--	HIKB5*	MLLQ4*	MILD3*	LLFS3*	CLFS3*	PAFS3*
1983	driver	45	male	26 days	25 days	NPUU7*					
1981	pedestrian	47	male	11 days	--	UUUU7					
1982	pedestrian	47	female	3 days	2 days	HIFS3*	HIFS3*	HUCB3*	HUUB3*	HPLI1*	OWAI1*
1983	driver	50	male	9 days	9 days	MRCL3*	BIFS2*	TRCI1*	KLLI1*	KRAI1*	KLAI1*
1981	driver	51	female	15 days	--	HUUB5*	MRLL4*	PAGJ3*	MICD3*	PRFS2*	FIFS2*
1983	passenger	52	female	20 days	20 days	HLUB5*	TLFS3*	NPFS3*	NPFS3*		
1981	driver	53	male	6 days	--	MLLQ3*	PAFS2*	PLFS2*	BIFS2*	CLFS1*	FSCI1*
1983	driver	57	male	11 days	11 days	UUUU7					
1983	pedestrian	59	male	17 days	17 days	HUUB4*	LLFS3*	LLFS3*	YRFS2*	CLFS1*	OWCI1*
1982	driver	63	female	3 days	3 days	HLUB5*	FILI1*	FIFS1			
1983	pedestrian	68	male	4 days	4 days	HUUB5*	CRFS4*	HUFS2*	HRCI1*	HRLE1*	KRCI1*
1982	driver	70	male	3 days	unknown	UUUU7					
1983	driver	72	male	4 days	unknown	OWCI1*	OWAI1*	OWLI1*	MSRD5	QRFS2	WLFS2
1983	pedestrian	73	male	27 days	27 days	HLUB4*	LLFS3*	LLFS3*	HLLI1*	HSLI1*	HSCI1*
1983	driver	75	male	20 days	24 days	CLFS4*	CCCH3*	CLCP3*	CCFS2*	CRFS2*	FILI1*
1983	pedestrian	75	female	6 days	6 days	MRLL4*	MICD3*	TRFS3*	HLCB3*	MUCD3*	MICD3*
1983	passenger	79	female	15 days	15 days	CCLA5*	MRLL4*	HRUB4*	PAZJ2*	PPZJ2*	CRFS2*
1982	pedestrian	80	male	16 days	16 days	ALFS3*	PRFS2*	RLFS2*	CRFS1*		
1983	pedestrian	80	male	10 days	unknown	HPUB4*	HPUB3*	CRFS3*	TLFS3*	CLFS2*	HLLI1*
1981	pedestrian	81	male	11 days	--	HUUB5*	PAFS3*	MICG1*	FSCI1*	LLCI1*	ELAI1*
1982	driver	82	male	15 days	15 days	CRCP3*	FIFS3*	MLCQ3*	CRFS2*	OWAI1*	FSLI1*
1979	driver	83	female	11 days	--	ABFS4*	LBFS4*	CUCP3*	QRFS3*	CRFS3*	QLFS2*
1979	pedestrian	85	male	13 days	--	MIRG4*	CCCH4*	PUFS3*	CUOP3*	CUFS3*	XBAI1*
1982	driver	87	male	8 days	8 days	MUCK3*	CRFS3*	SRFS2*	CRFS1*	HRLI1*	HRLI1*
1981	driver	90	male	13 days	--	CLFS3*	ARFS2*	ALFS2*	FSCI2*	CLAI1*	CLCI1*

* Indicates that the injury data were coded from official medical sources (autopsy, hospital, or physician's report); other injury data were coded from less reliable sources.

Traffic Deaths of Older Teenagers

From 1975 Through 1986

(June 1987)

Conclusion

Fatalities increased 5 percent from 1985 to 1986. The increase was particularly large among young people just learning to drive and their friends.

Among occupants of all vehicles,
16 and 17 year-old driver fatalities increased 22 percent,
15 and 16 year-old passenger fatalities increased 36 percent.

Among passenger vehicle occupants,
16 and 17 year-old driver fatalities increased 26 percent,
15 and 16 year-old passenger fatalities increased 43 percent.

Fatalities increased 57 percent among 15 and 16 year-old passengers driven by 16 and 17 year-olds in passenger vehicles.

These increases are not accounted for by minor population changes. They may result from the lower unemployment among teenagers and their parents. Teenage unemployment dropped to 18 percent in 1986; overall unemployment dropped to 7 percent in 1986. However, unemployment declined the previous year, and was accompanied by a fatality decrease. The 1985 decrease needs to be explored.

In 1986, there were large increases across month, day, time, speed limit, and urbanization. This suggests that there was a large increase in the level of driving done by new drivers, frequently accompanied by friends. It appears that passenger vehicles were more available to young drivers in 1986 than they had been in 1985.

New drivers (and their passengers) may need special protection to develop their skills during more-prosperous times.

Fatalities and Unemployment Changes

There were 46,056 traffic fatalities in 1986, according to the Fatal Accident Reporting System (FARS). This is 5 percent more than the 43,795 fatalities that occurred in 1985. The resident population, civilian labor force, and the number of employed civilians also increased between 1985 and 1986. The number unemployed declined. The 1975 through 1986 data are shown in Table 1.

The size of the population and the labor force have increased each year since 1975. The number of employed civilians increased each year except 1982. That year there was a 29 percent increase in the number unemployed. The number unemployed and the number of traffic fatalities have varied over these twelve years. But in all cases except one, a change in the number unemployed has been associated with a fatality change in the opposite direction. The one exception was 1985, when both the number unemployed and the number of traffic fatalities decreased. Historically, 1985 was an unusual year in this respect. And it is against this unusual year that 1986 will be most frequently compared.

Some calculations from Table 1 are presented as Table 2. In 1986, the number unemployed declined as a proportion of population and of labor force, as compared to 1985. Traffic fatalities increased as a proportion of population and of those employed. All four rates declined from 1984 to 1985, which affects the 1985 to 1986 comparison.

The number of 15 through 19 year-old fatalities increased 12 percent from 1985 to 1986. There were 6,080 of these young people killed in 1985 and 6,839 killed in 1986 (Table 3).

In contrast to total population, the number of 15 through 19 year-olds varies from year to year, reflecting the birth rates of earlier years. In 1986 the number of these young people increased slightly (by 0.3 percent). This was the first increase in this age group since 1976. The annual change in traffic fatalities among this group is usually in the opposite direction from the change in the number unemployed (as was the case for all ages combined). There have been two exceptions (1983 and 1985) in the past twelve years. In both cases a decline in the number unemployed was associated with a decline in traffic fatalities in this age group.

Unemployment and fatality rates are shown as Table 4 for those 15 through 19 years old. All people aged 15 are considered to be not in the labor force in this table. There have been rapid shifts in teenage unemployment since 1982. This may disturb the relationship between unemployment and fatalities by introducing uncertainty among those affected by the shifts.

Tables 5 and 6 show the same data for those aged 16 through 19, only. The five-year age grouping used in Tables 3 and 4 is standard. But those aged 15 are not in the labor force estimates. The data for the four-year age group show the same anomoly in 1983 and 1985 noted for the five-year age group.

Table 1: Labor Force, Population, and Fatality Data
All Ages

Year	Thousands of People: Resident Population	Labor Force	Civilian Employed	Civilian Unemployed	Traffic Fatalities
1975	215,465	93,775	85,846	7,929	44,525
1976	217,563	96,158	88,752	7,406	45,523
1977	219,760	99,009	92,018	6,991	47,878
1978	222,095	102,251	96,049	6,202	50,331
1979	224,567	104,962	98,825	6,137	51,093
1980	227,255	106,940	99,303	7,637	51,091
1981	229,637	108,670	100,397	8,273	49,301
1982	231,996	110,204	99,526	10,678	43,945
1983	234,284	111,550	100,833	10,717	42,589
1984	236,477	113,544	105,005	8,539	44,257
1985	238,741	115,461	107,150	8,312	43,795
1986	241,078	117,834	109,597	8,237	46,056

Table 2: Unemployment and Fatality Rates
All Ages

Year	Unemployed per Hundred: Population	Labor Force	Fatalities per Million: Population	Employed
1975	3.7	8.5	207	519
1976	3.4	7.7	209	513
1977	3.2	7.1	218	520
1978	2.8	6.1	227	524
1979	2.7	5.8	228	517
1980	3.4	7.1	225	514
1981	3.6	7.6	215	491
1982	4.6	9.7	189	442
1983	4.6	9.6	182	422
1984	3.6	7.5	187	421
1985	3.5	7.2	183	409
1986	3.4	7.0	191	420

Table 3: Labor Force, Population, and Fatality Data
Those Fifteen through Nineteen, Only

	Thousands of People				
Year	Resident Population	Labor Force	Civilian Employed	Civilian Unemployed	Traffic Fatalities
1975	21,223	8,870	7,103	1,767	7,896
1976	21,478	9,056	7,337	1,719	8,461
1977	21,477	9,351	7,688	1,663	8,773
1978	21,435	9,652	8,069	1,583	9,098
1979	21,348	9,638	8,083	1,555	9,138
1980	21,104	9,378	7,709	1,669	8,825
1981	20,501	8,988	7,225	1,763	7,662
1982	19,887	8,526	6,549	1,977	6,714
1983	19,274	8,171	6,342	1,829	6,237
1984	18,785	7,943	6,444	1,499	6,323
1985	18,552	7,901	6,434	1,468	6,080
1986	18,610	7,926	6,472	1,454	6,839

Table 4: Unemployment and Fatality Rates
Those Fifteen through Nineteen, Only

	Unemployed per Hundred:		Fatalities per Million:	
Year	Population	Labor Force	Population	Employed
1975	8.3	19.9	372	1112
1976	8.0	19.0	394	1153
1977	7.7	17.8	408	1141
1978	7.4	16.4	424	1128
1979	7.3	16.1	428	1131
1980	7.9	17.8	418	1145
1981	8.6	19.6	374	1060
1982	9.9	23.2	338	1025
1983	9.5	22.4	324	983
1984	8.0	18.9	337	981
1985	7.9	18.6	328	945
1986	7.8	18.3	367	1057

Table 5: Labor Force, Population, and Fatality Data
Those Sixteen through Nineteen, Only

	Thousands of People				
Year	Resident Population	Labor Force	Civilian Employed	Civilian Unemployed	Traffic Fatalities
1975	16,955	8,870	7,103	1,767	7,156
1976	17,138	9,056	7,337	1,719	7,675
1977	17,213	9,351	7,688	1,663	7,948
1978	17,227	9,652	8,069	1,583	8,289
1979	17,188	9,638	8,083	1,555	8,359
1980	17,105	9,378	7,709	1,669	8,069
1981	16,716	8,988	7,225	1,763	7,067
1982	16,203	8,526	6,549	1,977	6,188
1983	15,665	8,171	6,342	1,829	5,736
1984	15,103	7,943	6,444	1,499	5,749
1985	14,784	7,901	6,434	1,468	5,494
1986	14,764	7,926	6,472	1,454	6,158

Table 6: Unemployment and Fatality Rates
Those Sixteen through Nineteen, Only

	Unemployed per Hundred:		Fatalities per Million:	
Year	Population	Labor Force	Population	Employed
1975	10.4	19.9	422	1007
1976	10.0	19.0	448	1046
1977	9.7	17.8	462	1034
1978	9.2	16.4	481	1027
1979	9.0	16.1	486	1034
1980	9.8	17.8	472	1047
1981	10.5	19.6	423	978
1982	12.2	23.2	382	945
1983	11.7	22.4	366	904
1984	9.9	18.9	381	892
1985	9.9	18.6	372	854
1986	9.8	18.3	417	951

Age and Role Among Fatalities 15 through 19 Years Old

The teenage fatality increase was concentrated among four groups: 15 and 16 year-old passengers, and 16 and 17 year-old drivers. The fatality counts are shown in Table 7. The four groups experienced the following changes.

Fifteen year-old passenger fatalities increased from 291 to 405.
Sixteen year-old passenger fatalities increased from 377 to 506.
Sixteen year-old driver fatalities increased from 503 to 606.
Seventeen year-old driver fatalities increased from 632 to 775.

Fatalities were standardized by population to produce Table 8. The same concentrations of fatality increase appear in the standardized data. The annual changes in the standardized fatalities are presented in Table 9. The four groups experienced the following standardized percentage changes.

The fifteen year-old passenger fatality rate increased 36 percent.
The sixteen year-old passenger fatality rate increased 31 percent.
The sixteen year-old driver fatality rate increased 18 percent.
The seventeen year-old driver fatality rate increased 20 percent.

Two-thirds of the fatality increase among 15 through 19 year-olds (from 6,080 to 6,839 -- an increase of 759 fatalities) occurred among these four groups (from 1,803 to 2,292 -- an increase of 489 fatalities). These are people who have just learned to drive and their young friends. Because the increase was particularly large in these four groups, it should be easier to identify factors associated with the increase by a closer look at just these groups.

Table 7: Fatality and Population Data

Age	Year	Traffic Fatalities				Population in Thousands
		Driver	Passenger	Nonocc	Total	
15 Years	1975	154	422	163	740	4,268
	1976	156	445	178	786	4,340
	1977	182	460	180	825	4,264
	1978	166	467	173	809	4,208
	1979	167	438	173	779	4,160
	1980	151	420	175	756	3,999
	1981	138	329	125	595	3,785
	1982	115	278	130	526	3,684
	1983	108	285	107	501	3,609
	1984	141	304	123	574	3,682
	1985	149	291	144	586	3,768
	1986	131	405	142	681	3,846
16 Years	1975	493	561	162	1,223	4,263
	1976	536	665	161	1,367	4,260
	1977	641	680	160	1,486	4,333
	1978	668	636	163	1,470	4,266
	1979	690	664	174	1,536	4,215
	1980	652	608	158	1,424	4,170
	1981	518	485	139	1,149	4,000
	1982	404	413	127	946	3,785
	1983	426	395	115	942	3,683
	1984	492	418	96	1,009	3,609
	1985	503	377	111	996	3,681
	1986	606	506	130	1,246	3,767
17 Years	1975	853	721	149	1,728	4,272
	1976	906	751	170	1,831	4,274
	1977	948	773	148	1,880	4,266
	1978	1,032	786	178	2,007	4,344
	1979	976	738	190	1,915	4,276
	1980	947	719	154	1,831	4,222
	1981	841	645	187	1,688	4,163
	1982	724	546	160	1,434	3,993
	1983	658	511	131	1,305	3,778
	1984	666	503	112	1,286	3,677
	1985	632	493	124	1,252	3,603
	1986	775	570	124	1,474	3,675

Table 7 (continued): Fatality and Population Data

Age	Year	Traffic Fatalities				Population in Thousands
		Driver	Passenger	Nonocc	Total	
18 Years	1975	1,130	768	169	2,074	4,237
	1976	1,273	829	154	2,264	4,250
	1977	1,316	797	172	2,297	4,238
	1978	1,364	815	183	2,374	4,230
	1979	1,442	835	189	2,470	4,303
	1980	1,324	842	224	2,399	4,228
	1981	1,192	727	173	2,112	4,160
	1982	1,046	625	190	1,870	4,103
	1983	902	569	173	1,654	3,938
	1984	956	491	158	1,612	3,726
	1985	952	496	110	1,566	3,628
	1986	1,012	555	114	1,688	3,554
19 Years	1975	1,243	715	159	2,131	4,181
	1976	1,312	722	164	2,213	4,354
	1977	1,360	730	188	2,285	4,375
	1978	1,471	775	180	2,438	4,387
	1979	1,505	702	218	2,438	4,395
	1980	1,416	758	229	2,415	4,485
	1981	1,235	666	207	2,118	4,393
	1982	1,131	589	211	1,938	4,322
	1983	1,118	527	177	1,835	4,266
	1984	1,163	525	147	1,842	4,092
	1985	1,043	494	137	1,680	3,872
	1986	1,054	552	136	1,750	3,768
15-19 Years	1975	3,873	3,187	802	7,896	21,221
	1976	4,183	3,412	827	8,461	21,478
	1977	4,447	3,440	848	8,773	21,476
	1978	4,701	3,479	877	9,098	21,435
	1979	4,780	3,377	944	9,138	21,349
	1980	4,490	3,347	940	8,825	21,104
	1981	3,924	2,852	831	7,662	20,501
	1982	3,420	2,451	818	6,714	19,887
	1983	3,212	2,287	703	6,237	19,274
	1984	3,418	2,241	636	6,323	18,786
	1985	3,279	2,151	626	6,080	18,552
	1986	3,578	2,588	646	6,839	18,610

Table 8: Fatalities Standardized by Population

Age	Year	Fatalities per Million Population			
		Driver	Passenger	Nonocc	Total
15 Years	1975	36.1	98.9	38.2	173.4
	1976	35.9	102.5	41.0	181.1
	1977	42.7	107.9	42.2	193.5
	1978	39.4	111.0	41.1	192.3
	1979	40.1	105.3	41.6	187.3
	1980	37.8	105.0	43.8	189.0
	1981	36.5	86.9	33.0	157.2
	1982	31.2	75.5	35.3	142.8
	1983	29.9	79.0	29.6	138.8
	1984	38.3	82.6	33.4	155.9
	1985	39.5	77.2	38.2	155.5
	1986	34.1	105.3	36.9	177.1
16 Years	1975	115.6	131.6	38.0	286.9
	1976	125.8	156.1	37.8	320.9
	1977	147.9	156.9	36.9	342.9
	1978	156.6	149.1	38.2	344.6
	1979	163.7	157.5	41.3	364.4
	1980	156.4	145.8	37.9	341.5
	1981	129.5	121.3	34.8	287.3
	1982	106.7	109.1	33.6	249.9
	1983	115.7	107.2	31.2	255.8
	1984	136.3	115.8	26.6	279.6
	1985	136.6	102.4	30.2	270.6
	1986	160.9	134.3	34.5	330.8
17 Years	1975	199.7	168.8	34.9	404.5
	1976	212.0	175.7	39.8	428.4
	1977	222.2	181.2	34.7	440.7
	1978	237.6	180.9	41.0	462.0
	1979	228.3	172.6	44.4	447.8
	1980	224.3	170.3	36.5	433.7
	1981	202.0	154.9	44.9	405.5
	1982	181.3	136.7	40.1	359.1
	1983	174.2	135.3	34.7	345.4
	1984	181.1	136.8	30.5	349.7
	1985	175.4	136.8	34.4	347.5
	1986	210.9	155.1	33.7	401.1

Table 8 (continued): Fatalities Standardized by Population

Age	Year	Fatalities per Million Population			
		Driver	Passenger	Nonocc	Total
18 Years	1975	266.7	181.3	39.9	489.5
	1976	299.5	195.1	36.2	532.7
	1977	310.5	188.1	40.6	542.0
	1978	322.5	192.7	43.3	561.2
	1979	335.1	194.1	43.9	574.0
	1980	313.2	199.1	53.0	567.4
	1981	286.5	174.8	41.6	507.7
	1982	254.9	152.3	46.3	455.8
	1983	229.1	144.5	43.9	420.0
	1984	256.6	131.8	42.4	432.6
	1985	262.4	136.7	30.3	431.6
	1986	284.7	156.2	32.1	475.0
19 Years	1975	297.3	171.0	38.0	509.7
	1976	301.3	165.8	37.7	508.3
	1977	310.9	166.9	43.0	522.3
	1978	335.3	176.7	41.0	555.7
	1979	342.4	159.7	49.6	554.7
	1980	315.7	169.0	51.1	538.5
	1981	281.1	151.6	47.1	482.1
	1982	261.7	136.3	48.8	448.4
	1983	262.1	123.5	41.5	430.1
	1984	284.2	128.3	35.9	450.1
	1985	269.4	127.6	35.4	433.9
	1986	279.7	146.5	36.1	464.4
15-19 Years	1975	182.5	150.2	37.8	372.1
	1976	194.8	158.9	38.5	393.9
	1977	207.1	160.2	39.5	408.5
	1978	219.3	162.3	40.9	424.4
	1979	223.9	158.2	44.2	428.0
	1980	212.8	158.6	44.5	418.2
	1981	191.4	139.1	40.5	373.7
	1982	172.0	123.2	41.1	337.6
	1983	166.6	118.7	36.5	323.6
	1984	181.9	119.3	33.9	336.6
	1985	176.7	115.9	33.7	327.7
	1986	192.3	139.1	34.7	367.5

Table 9: Annual Changes in Standardized Fatalities

Age	Year	Percentage Change from Previous Year			
		Driver	Passenger	Nonocc	Total
15 Years	1976	-0.4	3.7	7.4	4.5
	1977	18.7	5.2	2.9	6.8
	1978	-7.6	2.9	-2.6	-0.6
	1979	1.8	-5.1	1.2	-2.6
	1980	-5.9	-0.2	5.2	1.0
	1981	-3.4	-17.2	-24.5	-16.8
	1982	-14.4	-13.2	6.9	-9.2
	1983	-4.1	4.6	-16.0	-2.8
	1984	28.0	4.6	12.7	12.3
	1985	3.3	-6.5	14.4	-0.2
	1986	-13.9	36.4	-3.4	13.9
16 Years	1976	8.8	18.6	-0.5	11.9
	1977	17.6	0.5	-2.3	6.9
	1978	5.8	-5.0	3.5	0.5
	1979	4.5	5.7	8.0	5.8
	1980	-4.5	-7.4	-8.2	-6.3
	1981	-17.2	-16.8	-8.3	-15.9
	1982	-17.6	-10.0	-3.4	-13.0
	1983	8.4	-1.7	-6.9	2.3
	1984	17.9	8.0	-14.8	9.3
	1985	0.2	-11.6	13.4	-3.2
	1986	17.7	31.2	14.4	22.2
17 Years	1976	6.2	4.1	14.0	5.9
	1977	4.8	3.1	-12.8	2.9
	1978	6.9	-0.1	18.1	4.8
	1979	-3.9	-4.6	8.4	-3.1
	1980	-1.7	-1.3	-17.9	-3.2
	1981	-9.9	-9.0	23.1	-6.5
	1982	-10.2	-11.7	-10.8	-11.4
	1983	-3.9	-1.1	-13.5	-3.8
	1984	4.0	1.1	-12.2	1.3
	1985	-3.2	0.0	13.0	-0.6
	1986	20.2	13.4	-2.0	15.4

Table 9 (continued): Annual Changes in Standardized Fatalities

Age	Year	Percentage Change from Previous Year			
		Driver	Passenger	Nonocc	Total
18 Years	1976	12.3	7.6	-9.2	8.8
	1977	3.7	-3.6	12.0	1.7
	1978	3.8	2.5	6.6	3.5
	1979	3.9	0.7	1.5	2.3
	1980	-6.6	2.6	20.6	-1.2
	1981	-8.5	-12.2	-21.5	-10.5
	1982	-11.0	-12.8	11.4	-10.2
	1983	-10.2	-5.1	-5.1	-7.8
	1984	12.0	-8.8	-3.5	3.0
	1985	2.3	3.7	-28.5	-0.2
	1986	8.5	14.2	5.8	10.0
19 Years	1976	1.4	-3.0	-1.0	-0.3
	1977	3.2	0.6	14.1	2.8
	1978	7.9	5.9	-4.5	6.4
	1979	2.1	-9.6	20.9	-0.2
	1980	-7.8	5.8	2.9	-2.9
	1981	-11.0	-10.3	-7.7	-10.5
	1982	-6.9	-10.1	3.6	-7.0
	1983	0.1	-9.4	-15.0	-4.1
	1984	8.4	3.9	-13.4	4.6
	1985	-5.2	-0.6	-1.5	-3.6
	1986	3.8	14.8	2.0	7.0
15-19 Years	1976	6.7	5.8	1.9	5.9
	1977	6.3	0.8	2.5	3.7
	1978	5.9	1.3	3.6	3.9
	1979	2.1	-2.5	8.1	0.8
	1980	-5.0	0.3	0.7	-2.3
	1981	-10.0	-12.3	-9.0	-10.6
	1982	-10.2	-11.4	1.5	-9.7
	1983	-3.1	-3.7	-11.3	-4.2
	1984	9.2	0.5	-7.2	4.0
	1985	-2.9	-2.8	-0.3	-2.6
	1986	8.8	19.9	2.9	12.1

Fatality Factors for Young Drivers and Passengers

Fatalities increased substantially in most months (Table 10), with December showing the largest increase for both young drivers (aged 16 and 17) and young passengers (aged 15 and 16). The increase was spread across all days of the week (Table 11), with no clear weekday versus weekend pattern. The lowest increase for young drivers was on Tuesdays (8 percent); the lowest increase for young passengers was on Wednesdays (6 percent). However, the highest increase for young passengers was on Tuesdays (76 percent). For drivers, the increase was slightly greater during the night; for passengers, the increase was greater during the day (Table 12).

The increase on rural roads was a little greater than the increase on urban roads (Table 13). The increase occurred on roads of all speed limits (Table 14). Most of the fatality increase occurred among occupants of cars and pickups (Table 15).

The increase was greater among occupants of older vehicles than in newer vehicles (Table 16). Motorcycles were excluded from this comparison. The data are consistent with a suggestion that families may have purchased new cars with the improving economy, and handed down their older cars to their children. Older vehicles are defined here as pre-1980 in 1985 and pre-1981 in 1986. Both rollovers and nonrollovers increased substantially (Table 17).

The fatality increase was larger among boys than girls (Table 18), for both drivers and passengers. The fatality increase occurred among ejectees and nonejectees (Table 19). For young passengers, nonejected fatalities increased more (49 percent) than did totally ejected fatalities (18 percent). This may reflect increases in belt use, particularly in belt-law states.

Table 10: Changes in Teenage Fatalities by Month

Month	16 and 17 Year old Drivers				15 and 16 Year Old Passengers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
	1985	1986	Number	Percent	1985	1986	Number	Percent
January	63	76	13	21	42	42	0	0
February	42	68	26	62	40	56	16	40
March	68	86	18	26	57	65	8	14
April	109	103	-6	-6	52	60	8	15
May	105	140	35	33	57	75	18	32
June	137	135	-2	-1	74	100	26	35
July	128	172	44	34	70	115	45	64
August	128	154	26	20	76	96	20	26
September	105	105	0	0	49	86	37	76
October	82	124	42	51	59	83	24	41
November	104	111	7	7	56	62	6	11
December	64	107	43	67	36	71	35	97
Total	1,135	1,381	246	22	668	911	243	36

Table 11: Changes in Teenage Fatalities by Day of Week

Week Day	16 and 17 Year Old Drivers				15 and 16 Year Old Passengers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
	1985	1986	Number	Percent	1985	1986	Number	Percent
Sunday	174	211	37	21	110	157	47	43
Monday	134	167	33	25	62	94	32	52
Tuesday	130	141	11	8	50	88	38	76
Wednesday	132	154	22	17	79	84	5	6
Thursday	117	147	30	26	65	86	21	32
Friday	201	265	64	32	147	186	39	27
Saturday	247	296	49	20	155	216	61	39
Total	1,135	1,381	246	22	668	911	243	36

Table 12: Changes in Teenage Fatalities by Light Condition

Lighting	16 and 17 Year Old Drivers				15 and 16 Year Old Passengers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
	1985	1986	Number	Percent	1985	1986	Number	Percent
Daylight	504	602	98	19	258	365	107	41
Other	625	777	152	24	408	545	137	34
Unknown	6	2	-4	.	2	1	-1	.
Total	1,135	1,381	246	22	668	911	243	36

Table 13: Changes in Teenage Fatalities by Urbanization

Area	16 and 17 Year Old Drivers				15 and 16 Year Old Passengers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
	1985	1986	Number	Percent	1985	1986	Number	Percent
Urban	401	459	58	14	227	306	79	35
Rural	731	918	187	26	441	603	162	37
Unknown	3	4	1	.	0	2	2	.
Total	1,135	1,381	246	22	668	911	243	36

Table 14: Changes in Teenage Fatalities by Speed Limit

Speed Limit	16 and 17 Year Old Drivers				15 and 16 Year Old Passengers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
	1985	1986	Number	Percent	1985	1986	Number	Percent
Up to 30 mph	125	178	53	42	101	123	22	22
35 mph	135	146	11	8	70	93	23	33
40 mph	85	96	11	13	54	83	29	54
45 mph	133	145	12	9	67	67	0	0
50 mph	57	70	13	23	36	49	13	36
55 mph	577	709	132	23	327	456	129	39
Unknown	23	37	14	.	13	40	27	.
Total	1,135	1,381	246	22	668	911	243	36

Table 15: Changes in Teenage Fatalities by Vehicle Type

	16 and 17 Year Old Drivers				15 and 16 Year Old Passengers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
Vehicle Type	1985	1986	Number	Percent	1985	1986	Number	Percent
Car	778	995	217	28	481	685	204	42
Motorcycle	173	188	15	9	42	34	-8	-19
Van	11	11	0	0	7	12	5	71
Utility	23	20	-3	-13	25	29	4	16
Pickup	118	143	25	21	92	137	45	49
Other	25	13	-12	-48	16	10	-6	-38
Unknown	7	11	4	.	5	4	-1	.
Total	1,135	1,381	246	22	668	911	243	36

Table 16: Changes in Teenage Fatalities by Vehicle Model Year

	16 and 17 Year Old Drivers				15 and 16 Year Old Passengers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
Model Year	1985	1986	Number	Percent	1985	1986	Number	Percent
Motorcycle	173	188	15	9	42	34	-8	-19
Up to six years old	397	476	79	20	258	338	80	31
Seven years and older	552	702	150	27	362	532	170	47
Unknown	13	15	2	.	6	7	1	.
Total	1,135	1,381	246	22	668	911	243	36

Table 17: Changes in Teenage Fatalities by Rollover

	16 and 17 Year Old Drivers				15 and 16 Year Old Passengers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
Rollover	1985	1986	Number	Percent	1985	1986	Number	Percent
Motorcycle	173	188	15	9	42	34	-8	-19
No rollover	603	744	142	24	403	571	168	42
Rollover:								
Initial	141	173	32	23	88	123	35	40
Later	218	275	57	26	135	183	48	36
Total	1,135	1,381	246	22	668	911	243	36

Table 18: Changes in Teenage Fatalities by Gender

	16 and 17 Year Old Drivers				15 and 16 Year Old Passengers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
Gender	1985	1986	Number	Percent	1985	1986	Number	Percent
Male	853	1,058	205	24	354	513	159	45
Female	282	323	41	15	314	398	84	27
Total	1,135	1,381	246	22	668	911	243	36

Table 19: Changes in Teenage Fatalities by Ejection

	16 and 17 Year Old Drivers				15 and 16 Year Old Passengers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
Ejection	1985	1986	Number	Percent	1985	1986	Number	Percent
Motorcycle	173	188	15	9	42	34	-8	-19
No ejection	635	777	142	22	391	590	199	51
Ejection:								
Total	274	336	62	23	207	247	40	19
Partial	47	73	26	55	21	35	14	67
Unknown	6	7	1	.	7	5	-2	.
Total	1,135	1,381	246	22	668	911	243	36

Passenger Vehicle Occupancy

Tables 20 and 21 show passenger fatalities in passenger vehicles (cars, pickups, vans, and utility vehicles) for 1985 and 1986, respectively. Among those 15 through 19, the driver and passenger are likely to be the same age. The same-age pairs appear along the diagonal of each table.

The fatality increases are shown in Table 22 (counts) and Table 23 (percentages). The largest percentage increases occurred among the youngest drivers and the youngest passengers among the 15 through 19 age group. The overall increase in these passenger fatalities was 29 percent. However, among driver-passenger pairs with a combined age of 33 years or less (the upper left half of the tables), the passenger fatality increase was 65 percent (from 359 in 1985 to 591 in 1986). Newly-licensed drivers and their agemates appear to have been at especially high risk in 1986. Some measure of driving and accidents risk for this age group would be very useful if available.

Most of the passenger fatalities were boys driven by other boys. But all combinations of boys and girls increased substantially (Tables 24 and 25).

Driver and passenger fatalities increased among all levels of passenger vehicle occupancy (Tables 26 and 27, respectively). Among passengers, fatalities increased 29 percent for those whose driver was also in the 15 through 19 year-old age group. These fatalities increased by about half as much (15 percent) for those whose driver was 20 years or older (Tables 28 and 29).

Table 20: Teenage Passenger Fatalities
in Passenger Vehicles Driven by Teenagers in 1985

Age of Passenger Fatality	Driver Age					
	15 years	16 years	17 years	18 years	19 years	Total
15 years	15	94	27	25	16	177
16 years	6	85	63	46	34	234
17 years	3	38	116	74	62	293
18 years	3	21	66	108	68	266
19 years	3	13	26	72	111	225
Total 15-19	30	251	298	325	291	1,195

Table 21: Teenage Passenger Fatalities
in Passenger Vehicles Driven by Teenagers in 1986

Age of Passenger Fatality	Driver Age					
	15 years	16 years	17 years	18 years	19 years	Total
15 yrs	24	109	80	43	21	277
16 yrs	21	129	105	59	44	358
17 yrs	9	66	156	102	44	377
18 yrs	5	23	74	136	66	304
19 yrs	4	13	29	84	101	231
Total 15-19	63	340	444	424	276	1,547

Table 22: Changes in Teenage Passenger Fatalities in Passenger Vehicles Driven by Teenagers, from 1985 to 1986

Age of Passenger Fatality	Driver Age					
	15 years	16 years	17 years	18 years	19 years	Total
15 yrs	9	15	53	18	5	100
16 yrs	15	44	42	13	10	124
17 yrs	6	28	40	28	-18	84
18 yrs	2	2	8	28	-2	38
19 yrs	1	0	3	12	-10	6
Total 15-19	33	89	146	99	-15	352

Table 23: Percentage Changes in Teenage Passenger Fatalities in Passenger Vehicles Driven by Teenagers, from 1985 to 1986

Age of Passenger Fatality	Driver Age					
	15 years	16 years	17 years	18 years	19 years	Total
15 yrs	60	16	196	72	31	56
16 yrs	250	52	67	28	29	53
17 yrs	200	74	34	38	-29	29
18 yrs	67	10	12	26	-3	14
19 yrs	33	0	12	17	-9	3
Total 15-19	110	35	49	30	-5	29

Table 24: Passenger Fatalities Aged 15 through 19
in Passenger Vehicles Driven by Someone Aged 15 through 19

Passenger Fatality	Drivers, in 1985			Drivers, in 1986		
	Male	Female	Total	Male	Female	Total
Male	679	62	741	892	99	991
Female	271	183	454	336	219	555
Unknown	0	0	0	1	0	1
Total	950	245	1,195	1,229	318	1,547

Table 25: Changes in Passenger Fatalities Aged 15 through 19
in Passenger Vehicles Driven by Someone Aged 15 through 19, from 1985 to 1986

Passenger Fatality	Change in Numbers			Change in Percentages		
	Driver			Driver		
	Male	Female	Total	Male	Female	Total
Male	213	37	250	31	60	34
Female	65	36	101	24	20	22
Unknown	1	0	1	.	.	.
Total	279	73	352	29	30	29

Table 26: Driver Fatalities by Passenger Vehicle Occupancy

	15 through 19 Year Old Drivers				16 and 17 Year Old Drivers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
Occupancy	1985	1986	Number	Percent	1985	1986	Number	Percent
Driver only	1,309	1,482	173	13	426	536	110	26
Two people	709	799	90	13	269	346	77	29
Three people	293	326	33	11	124	150	26	21
Four people	144	164	20	14	61	73	12	20
More people	78	91	13	17	42	52	10	24
Unknown	33	32	-1	.	9	12	3	.
Total	2,566	2,894	328	13	931	1,169	238	26

Table 27: Passenger Fatalities by Passenger Vehicle Occupancy

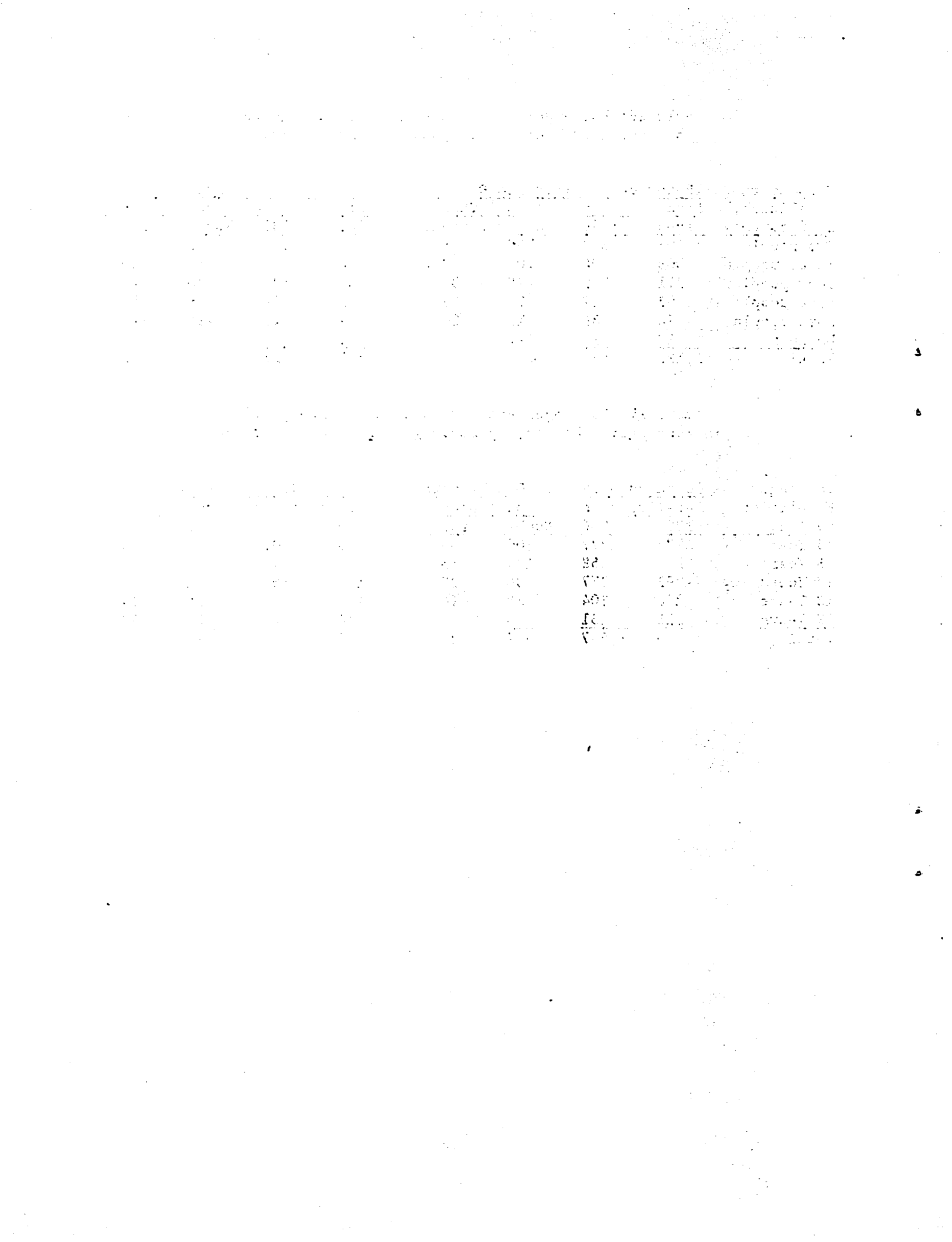
	15 through 19 Year Old Passengers				15 and 16 Year Old Passengers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
Occupancy	1985	1986	Number	Percent	1985	1986	Number	Percent
One person	1	1	0	0	0	0	0	.
Two people	784	915	131	17	191	286	95	50
Three people	474	640	166	35	158	229	71	45
Four people	358	474	116	32	132	179	47	36
Five people	146	207	61	42	58	102	44	76
More people	136	135	-1	-1	51	81	30	59
Unknown	31	21	-10	.	11	7	-4	.
Total	1,930	2,393	463	24	605	863	258	43

Table 28: Passenger Fatalities Aged 15 through 19
by Passenger Vehicle Occupancy and Driver Age

Passenger Fatalities, by Occupancy	15 through 19 Year Old Drivers				Older Drivers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
	1985	1986	Number	Percent	1985	1986	Number	Percent
Two people	493	623	130	26	283	285	2	1
Three people	306	408	102	33	164	230	66	40
Four people	211	289	78	37	145	181	36	25
Five people	93	127	34	37	52	78	26	50
More people	74	89	15	20	61	45	-16	-26
Unknown	18	11	-7	.	12	9	-3	.
Total	1,195	1,547	352	29	717	828	111	15

Table 29: Passenger Fatalities Aged 15 through 19
in Passenger Vehicles, by Passenger Age and Driver Age

Passenger Fatalities, by Age	15 through 19 Year Old Drivers				Older Drivers			
	Fatalities in		Annual Change		Fatalities in		Annual Change	
	1985	1986	Number	Percent	1985	1986	Number	Percent
15 Years	177	277	100	56	85	100	15	18
16 Years	234	358	124	53	103	117	14	14
17 Years	293	377	84	29	140	151	11	8
18 Years	266	304	38	14	173	197	24	14
19 Years	225	231	6	3	216	263	47	22
Total	1,195	1,547	352	29	717	828	111	15



Traffic Deaths of Young Children

From 1975 Through 1986

(October 1987)

Findings

The number of young children killed in traffic accidents declined between 1975 and 1986. In 1975 there were 1,313 children under five years old killed. In 1986 there were 954, a drop of 27 percent.

During these twelve years, the young resident population increased. The population-based fatality rate declined more than did the fatality count. In 1975 there were 81.4 fatalities per million children under five years old. In 1986 there were 52.6, a drop of 35 percent.

Most child fatalities were either passenger car occupants or pedestrians. For children under two years old, the greater decreases were among car occupants. For children ages two through four, the greater decreases were among pedestrians. The decreases in fatalities per million children were as follows:

	Age					
Category	Zero	One	Two	Three	Four	Total
Overall	40	30	28	42	33	35
Car Occupants	47	38	17	14	8	28
Pedestrians	6	28	43	58	55	51

In 1975 restraint use by children was a rare event. But even in 1986, only 18 percent of the child fatalities were reported to have been in a child seat. An additional 12 percent were reported to have been using an adult seat belt. Overall, 29 percent of the child fatalities under five years old were reported to have been using some kind of restraint. Child seat use decreased with age; child use of adult belts increased with age.

	Car Occupant Restraint in 1986					Percent Restrained by:		
Age	None Used	Adult Belt	Child Seat	Not Known	Total	Seats	Belts	Either
0	69	5	24	9	107	24	5	30
1	63	4	23	7	97	26	4	30
2	68	11	18	9	106	19	11	30
3	63	10	8	6	87	10	12	22
4	49	22	5	8	84	7	29	36
All	312	52	78	39	481	18	12	29

Correctly used safety seats are estimated to prevent 71 percent of child fatalities; adult belts are estimated to prevent 31 percent of child fatalities ("An Evaluation of Child Passenger Safety: The Effectiveness and Benefits of Safety Seats", Charles J. Kahane, NHTSA, February 1986). These estimates can be used to describe the potentially-fatal child population -- those who were saved by their restraints plus those who were killed.

If children identified as using a child seat in 1986 used it correctly, then the 78 child-seated fatalities are the 29 percent of the potentially-fatal children who were killed. So there were 78/0.29, or 269 potentially-fatal children in child seats. Similarly, the 52 seat-belted fatalities represent the 69 percent of the potentially-fatal children who were killed. So there were 52/0.69, or 75 potentially-fatal children in seat belts. There were also 312 children killed unrestrained. So, if all restraints were used correctly, the potentially-fatal child population was restrained as follows:

Seats = 78 = 0.29x x = 268,966, so 41.1 % were in child seats
Belts = 52 = 0.69y y = 75.362, so 11.5 % were in adult belts
None = 312 = 1.00z z = 312.000, so 47.5 % were unrestrained

Kahane's study estimated that there was so much child seat misuse in 1984 that child seats-as-used were only 46 percent effective. Continued monitoring of restraints-in-use, from the 19-Cities data, indicates that child seat misuse has declined steadily over the last few years ("Use of Child Safety Seats", Peter N. Ziegler, NHTSA Research Note, March 1987). Ziegler reports that in cars, between 1984 and 1986,

Children in a child seat went from 46.1 percent to 72.2 percent,
Children who appeared to be correctly buckled into a child seat went from 34.2 percent to 63.2 percent, and
Children who were fully protected in a child seat (based on observations of correct installation and harness use) went from 13.4 percent to 47.6 percent.

Child seats were much closer to achieving their fatality-reducing potential in 1986 than they were in 1984.

The number of fatally-injured children reported to have been using adult belts appears high. Ziegler reported that only 5.9 percent of toddlers were observed in adult belts in 1986. The difference may reflect restraint use misreporting in the fatality data. Some of these children actually may have been using child seats or have been unrestrained.

The restraint use reported for fatalities appears consistent with the estimates of child restraint effectiveness and child seat use in the general population, if it is correct use that was reported in the fatality data. For those under two, increased restraint use has led directly to fewer car occupant fatalities per million children.

For those aged two through four, fatalities per million children have not declined as much as would have been expected. The large pedestrian fatality decrease observed for all children up through thirteen years old, for all times and places, suggests that child accident risk is changing. Children are being exposed to accident risk less as pedestrians and more as car occupants. This may reflect larger societal changes, such as where we live, where we have to go, where our children have to go, and how they get there.

Overall Fatalities

The number of young children (under five years old) who died in traffic accidents decreased fairly steadily from 1,313 in 1975 to 954 in 1986. There were 27 percent fewer fatalities in 1986 than in 1985. The decline was larger among nonoccupants (42 percent) than among occupants (15 percent). The twelve years of Fatal Accident Reporting System data are shown in Table 1.

Fatalities in each of the five single-year age groups declined (Table 2), despite population increases (Table 3). Fatalities per million young children declined 35 percent (Table 4).

Table 1: Traffic Fatalities Under Five Years Old

Year	Vehicle Occupant	Non-Occupant	Total
1975	726	587	1,313
1976	702	549	1,251
1977	728	466	1,194
1978	726	494	1,220
1979	698	461	1,159
1980	698	440	1,138
1981	634	362	996
1982	633	370	1,003
1983	623	357	980
1984	554	340	894
1985	568	365	933
1986	615	339	954

Table 2: Traffic Fatalities

	Age					
Year	Zero	One	Two	Three	Four	Total
1975	207	203	261	322	320	1,313
1976	189	207	279	293	283	1,251
1977	201	180	292	263	258	1,194
1978	208	209	278	259	266	1,220
1979	183	185	267	259	265	1,159
1980	208	198	270	266	196	1,138
1981	186	159	225	206	220	996
1982	177	172	218	221	215	1,003
1983	169	175	217	225	194	980
1984	148	142	209	190	205	894
1985	143	146	224	209	211	933
1986	146	172	215	207	214	954

Table 3: Resident Population in Thousands

	Age					
Year	Zero	One	Two	Three	Four	Total
1975	3,152	3,006	3,052	3,277	3,635	16,121
1976	3,115	3,079	2,986	3,101	3,336	15,617
1977	3,279	3,031	3,063	3,035	3,155	15,564
1978	3,326	3,179	3,022	3,117	3,091	15,735
1979	3,426	3,211	3,174	3,077	3,175	16,063
1980	3,561	3,317	3,211	3,240	3,129	16,458
1981	3,620	3,442	3,318	3,270	3,281	16,931
1982	3,670	3,495	3,443	3,378	3,311	17,298
1983	3,684	3,548	3,495	3,505	3,419	17,650
1984	3,617	3,561	3,548	3,558	3,546	17,830
1985	3,749	3,496	3,561	3,612	3,599	18,017
1986	3,728	3,623	3,497	3,625	3,654	18,128

Table 4: Fatalities per Million Children

	Age					
Year	Zero	One	Two	Three	Four	Total
1975	65.7	67.5	85.5	98.3	88.0	81.4
1976	60.7	67.2	93.4	94.5	84.8	80.1
1977	61.3	59.4	95.3	86.7	81.8	76.7
1978	62.5	65.7	92.0	83.1	86.1	77.5
1979	53.4	57.6	84.1	84.2	83.5	72.2
1980	58.4	59.7	84.1	82.1	62.6	69.1
1981	51.4	46.2	67.8	63.0	67.1	58.8
1982	48.2	49.2	63.3	65.4	64.9	58.0
1983	45.9	49.3	62.1	64.2	56.7	55.5
1984	40.9	39.9	58.9	53.4	57.8	50.1
1985	38.1	41.8	62.9	57.9	58.6	51.8
1986	39.2	47.5	61.5	57.1	58.6	52.6

Car Occupant Fatalities

About four-fifths of young child occupant fatalities occurred in cars. The number of fatalities in utility vehicles increased, from 9 in 1975 to 29 in 1986. Van, pickup, and other vehicle occupant fatalities were at about the same level in 1986 as in 1975. Young child occupant fatality decreases were essentially decreases in the number of car occupant fatalities. The twelve years of vehicle occupant fatality data are shown in Table 5.

Despite large increases in child seat use in the general population, only 18 percent of child car occupant fatalities were reported to have been in a child seat in 1986 (Table 6). Another 12 percent were reported to have been using an adult seat belt. Seventy-one (71) percent of the children who died were reported to have been using no restraint.

Table 5: Occupant Fatalities Under Five Years Old

	Vehicle Type						
Year	Car	Van	Pickup	Utility	Other	Unknown	Total
1975	595	21	74	9	13	14	726
1976	564	16	75	11	25	11	702
1977	596	19	73	16	15	9	728
1978	586	19	90	5	20	6	726
1979	538	25	93	16	25	1	698
1980	542	22	97	9	25	3	698
1981	511	31	58	9	22	3	634
1982	515	22	64	12	19	1	633
1983	505	20	72	5	19	2	623
1984	424	22	82	8	13	5	554
1985	448	21	69	15	13	2	568
1986	481	18	73	29	12	2	615

Table 6: Car Occupant Fatalities by Restraint Use

	Car Occupant Restraint Use				
Year	None Used	Adult Belt	Child Seat	Unknown if Used	Total
1975	419	7	9	160	595
1976	403	7	5	149	564
1977	428	6	10	152	596
1978	438	6	9	133	586
1979	410	8	21	99	538
1980	429	14	16	83	542
1981	384	11	28	88	511
1982	405	13	35	62	515
1983	387	20	56	42	505
1984	297	23	61	43	424
1985	303	29	77	39	448
1986	312	52	78	39	481

Young child car occupant fatality decreases were largest among infants and one-year olds (Table 7). Fatalities aged two through four also decreased, but by a smaller amount. Because the number of children has increased, fatalities per million children decreased more than did absolute fatalities (Table 8).

Table 7: Number of Car Occupant Fatalities by Age

	Age					
Year	Zero	One	Two	Three	Four	Total
1975	171	130	112	91	91	595
1976	151	115	120	96	82	564
1977	172	106	131	101	86	596
1978	157	138	122	84	85	586
1979	145	98	121	87	87	538
1980	153	117	109	101	62	542
1981	152	88	108	84	79	511
1982	142	95	103	93	82	515
1983	138	102	102	98	65	505
1984	113	64	78	78	91	424
1985	103	83	103	82	77	448
1986	107	97	106	87	84	481

Table 8: Car Occupant Fatalities per Million Children

	Age					
Year	Zero	One	Two	Three	Four	Total
1975	54.3	43.2	36.7	27.8	25.0	36.9
1976	48.5	37.3	40.2	31.0	24.6	36.1
1977	52.5	35.0	42.8	33.3	27.3	38.3
1978	47.2	43.4	40.4	26.9	27.5	37.2
1979	42.3	30.5	38.1	28.3	27.4	33.5
1980	43.0	35.3	33.9	31.2	19.8	32.9
1981	42.0	25.6	32.5	25.7	24.1	30.2
1982	38.7	27.2	29.9	27.5	24.8	29.8
1983	37.5	28.7	29.2	28.0	19.0	28.6
1984	31.2	18.0	22.0	21.9	25.7	23.8
1985	27.5	23.7	28.9	22.7	21.4	24.9
1986	28.7	26.8	30.3	24.0	23.0	26.5

Traffic fatalities vary from year to year. Table 9 shows the number of people, the number of car occupant fatalities, and the fatality rate of people over four years old. This fatality rate can be used to standardize the child car occupant fatality rate (Table 10). Each child fatality rate of Table 8 was divided by the older fatality rate in Table 9 to produce the standardized young child fatality rate of Table 10.

Table 9: Car Occcupant Fatalities
per Million People Over Four Years Old

	People Over Four Years Old		
Year	Population	Fatalities	Rate
1975	199,344	25,334	127
1976	201,946	25,602	127
1977	204,196	26,186	128
1978	206,360	27,567	134
1979	208,504	27,270	131
1980	210,797	26,913	128
1981	212,706	26,139	123
1982	214,698	22,815	106
1983	216,634	22,474	104
1984	218,647	23,196	106
1985	220,724	22,764	103
1986	222,950	24,441	110

Table 10: Car Occupant Fatalities per Million Children
Standardized by the Annual Fatality Rate of Older People

	Age					
Year	Zero	One	Two	Three	Four	Total
1975	0.427	0.340	0.289	0.219	0.197	0.290
1976	0.382	0.295	0.317	0.244	0.194	0.285
1977	0.409	0.273	0.334	0.260	0.213	0.299
1978	0.353	0.325	0.302	0.202	0.206	0.279
1979	0.324	0.233	0.291	0.216	0.210	0.256
1980	0.337	0.276	0.266	0.244	0.155	0.258
1981	0.342	0.208	0.265	0.209	0.196	0.246
1982	0.364	0.256	0.282	0.259	0.233	0.280
1983	0.361	0.277	0.281	0.270	0.183	0.276
1984	0.294	0.169	0.207	0.207	0.242	0.224
1985	0.266	0.230	0.280	0.220	0.207	0.241
1986	0.262	0.244	0.277	0.219	0.210	0.242

The annual standardized child fatality rates of Table 10 can be indexed to 1975, for an easier understanding of the changes that have occurred in the past twelve years. Table 11 shows that the standardized fatality rate of infants (children under one year old) in 1986 was 61 percent of the 1975 fatality rate. Traffic fatalities per million infants, standardized to reflect general fatality trends, was 39 percent lower in 1986 than it had been in 1975. The standardized fatality rate of one-year olds decreased 28 percent. There were only small changes in the fatality rates of children two through four years old.

Table 11: Car Occupant Fatalities per Million Children Standardized by the Annual Fatality Rate of Older People and Indexed to 1975

	Age					
Year	Zero	One	Two	Three	Four	Total
1975	100	100	100	100	100	100
1976	90	87	110	112	98	98
1977	96	80	115	119	108	103
1978	83	95	105	92	105	96
1979	76	69	101	99	106	88
1980	79	81	92	112	79	89
1981	80	61	92	96	99	85
1982	85	75	97	119	118	96
1983	85	81	97	123	93	95
1984	69	50	72	95	123	77
1985	62	68	97	101	105	83
1986	61	72	96	100	106	83

Young Child Pedestrian Fatalities

Most young children who died as nonoccupants were pedestrians (Table 12). Very few young children died as pedalcyclists. The 42 percent decline in the number of young child nonoccupant fatalities was mostly a pedestrian fatality decline.

A small number of infants died as pedestrians each year (possibly while being carried by an older person). The number of children killed as pedestrians increased with the age of the child (Table 13). The number of pedestrian fatalities decreased for each one-year age group except infants (who infrequently die as pedestrians).

Table 12: Nonoccupant Fatalities Under Five Years Old

Year	Pedestrian	Cyclist	Other	Total
1975	548	30	9	587
1976	510	35	4	549
1977	433	32	1	466
1978	459	30	5	494
1979	423	23	15	461
1980	393	29	18	440
1981	330	28	4	362
1982	344	20	6	370
1983	332	19	6	357
1984	311	20	9	340
1985	345	15	5	365
1986	302	21	16	339

Table 13: Pedestrian Fatalities

	Age					
Year	Zero	One	Two	Three	Four	Total
1975	9	52	120	182	185	548
1976	12	59	125	161	153	510
1977	8	45	127	124	129	433
1978	12	53	122	134	138	459
1979	7	49	110	134	123	423
1980	9	52	113	125	94	393
1981	8	44	84	97	97	330
1982	10	55	81	97	101	344
1983	9	44	94	97	88	332
1984	13	52	90	71	85	311
1985	9	48	92	98	98	345
1986	10	45	79	84	84	302

The number of pedestrian fatalities (Table 13) per million children (Table 3) are shown in Table 14. The decline in the population-based fatality rate was greater than the decline in the number of child pedestrian fatalities because the number of children in the population increased.

The fatality rates of Table 14 indexed to the 1975 values are shown in Table 15. Pedestrian fatalities per million children declined 28 percent among one-year olds, 43 percent among two-year olds, 58 percent among three-year olds, and 55 percent among four-year olds.

Table 14: Pedestrian Fatalities per Million Children

	Age					
Year	Zero	One	Two	Three	Four	Total
1975	2.9	17.3	39.3	55.5	50.9	34.0
1976	3.9	19.2	41.9	51.9	45.9	32.7
1977	2.4	14.8	41.5	40.9	40.9	27.8
1978	3.6	16.7	40.4	43.0	44.6	29.2
1979	2.0	15.3	34.7	43.5	38.7	26.3
1980	2.5	15.7	35.2	38.6	30.0	23.9
1981	2.2	12.8	25.3	29.7	29.6	19.5
1982	2.7	15.7	23.5	28.7	30.5	19.9
1983	2.4	12.4	26.9	27.7	25.7	18.8
1984	3.6	14.6	25.4	20.0	24.0	17.4
1985	2.4	13.7	25.8	27.1	27.2	19.1
1986	2.7	12.4	22.6	23.2	23.0	16.7

Table 15: Pedestrian Fatalities per Million Children
Indexed to 1975 Fatalities

	Age					
Year	Zero	One	Two	Three	Four	Total
1975	100	100	100	100	100	100
1976	135	111	106	93	90	96
1977	85	86	105	74	80	82
1978	126	96	103	77	88	86
1979	72	88	88	78	76	77
1980	89	91	90	69	59	70
1981	77	74	64	53	58	57
1982	95	91	60	52	60	59
1983	86	72	68	50	51	55
1984	126	84	65	36	47	51
1985	84	79	66	49	54	56
1986	94	72	57	42	45	49

Older Child Pedestrian Fatalities

The young child pedestrian fatality decrease was part of a larger decrease among all children. Pedestrian fatalities decreased in each one-year age group (Table 16). The population between the ages of five and fourteen decreased overall (Table 17). So the older child pedestrian fatality rate decreases (Table 18) were not as large as the decreases in the numbers of older child fatalities.

Table 16: Older Child Pedestrian Fatalities

	Age					
Year	Five	Six	Seven	Eight	Nine	Total
1975	224	178	173	122	118	815
1976	207	184	168	141	82	782
1977	174	181	142	136	96	729
1978	153	194	161	126	88	722
1979	140	167	145	134	85	671
1980	134	129	120	105	94	582
1981	121	139	100	109	80	549
1982	115	110	99	89	59	472
1983	99	123	92	60	67	441
1984	97	118	91	74	70	450
1985	105	105	85	81	78	454
1986	106	117	102	75	59	459

	Age					
Year	Ten	Eleven	Twelve	Thirteen	Fourteen	Total
1975	102	78	89	82	98	449
1976	79	69	82	87	104	421
1977	78	68	82	73	82	383
1978	96	61	81	80	83	401
1979	67	70	60	66	91	354
1980	73	55	80	67	88	363
1981	78	51	56	81	63	329
1982	42	62	66	56	75	301
1983	60	61	50	68	65	304
1984	56	59	59	52	77	303
1985	40	46	40	53	63	242
1986	56	48	48	44	66	262

Table 17: Older Child Population in Thousands

	Age					
Year	Five	Six	Seven	Eight	Nine	Total
1975	3,546	3,468	3,467	3,464	3,649	17,594
1976	3,634	3,560	3,527	3,388	3,562	17,671
1977	3,334	3,644	3,626	3,436	3,491	17,530
1978	3,156	3,343	3,721	3,527	3,552	17,300
1979	3,092	3,164	3,421	3,613	3,656	16,947
1980	3,181	3,112	3,250	3,331	3,735	16,609
1981	3,135	3,192	3,177	3,154	3,435	16,093
1982	3,285	3,144	3,257	3,082	3,252	16,020
1983	3,313	3,293	3,207	3,158	3,176	16,147
1984	3,421	3,321	3,358	3,109	3,254	16,464
1985	3,548	3,428	3,387	3,256	3,204	16,822
1986	3,601	3,555	3,496	3,283	3,355	17,291

	Age					
Year	Ten	Eleven	Twelve	Thirteen	Fourteen	Total
1975	3,972	4,056	4,107	4,189	4,321	20,646
1976	3,756	3,900	4,056	4,132	4,243	20,088
1977	3,657	3,696	3,891	4,081	4,179	19,504
1978	3,579	3,609	3,684	3,921	4,126	18,920
1979	3,634	3,542	3,593	3,715	3,960	18,445
1980	3,729	3,605	3,527	3,626	3,749	18,236
1981	3,810	3,695	3,602	3,555	3,651	18,312
1982	3,503	3,773	3,689	3,628	3,578	18,172
1983	3,315	3,468	3,765	3,714	3,650	17,912
1984	3,238	3,283	3,462	3,791	3,737	17,511
1985	3,317	3,207	3,277	3,487	3,813	17,101
1986	3,267	3,285	3,202	3,302	3,508	16,564

Table 18: Older Child Pedestrian Fatalities per Million Children

	Age					
Year	Five	Six	Seven	Eight	Nine	Total
1975	63.2	51.3	49.9	35.2	32.3	46.3
1976	57.0	51.7	47.6	41.6	23.0	44.3
1977	52.2	49.7	39.2	39.6	27.5	41.6
1978	48.5	58.0	43.3	35.7	24.8	41.7
1979	45.3	52.8	42.4	37.1	23.2	39.6
1980	42.1	41.5	36.9	31.5	25.2	35.0
1981	38.6	43.5	31.5	34.6	23.3	34.1
1982	35.0	35.0	30.4	28.9	18.1	29.5
1983	29.9	37.4	28.7	19.0	21.1	27.3
1984	28.4	35.5	27.1	23.8	21.5	27.3
1985	29.6	30.6	25.1	24.9	24.3	27.0
1986	29.4	32.9	29.2	22.8	17.6	26.5

	Age					
Year	Ten	Eleven	Twelve	Thirteen	Fourteen	Total
1975	25.7	19.2	21.7	19.6	22.7	21.7
1976	21.0	17.7	20.2	21.1	24.5	21.0
1977	21.3	18.4	21.1	17.9	19.6	19.6
1978	26.8	16.9	22.0	20.4	20.1	21.2
1979	18.4	19.8	16.7	17.8	23.0	19.2
1980	19.6	15.3	22.7	18.5	23.5	19.9
1981	20.5	13.8	15.5	22.8	17.3	18.0
1982	12.0	16.4	17.9	15.4	21.0	16.6
1983	18.1	17.6	13.3	18.3	17.8	17.0
1984	17.3	18.0	17.0	13.7	20.6	17.3
1985	12.1	14.3	12.2	15.2	16.5	14.2
1986	17.1	14.6	15.0	13.3	18.8	15.8

When the child fatality rates are indexed to 1975 (Table 19), it becomes clear that the largest fatality rate decreases occurred among the youngest children, with the exception of infants (Table 20).

Table 19: Older Child Pedestrian Fatalities per Million Children Indexed to 1975

	Age					
Year	Five	Six	Seven	Eight	Nine	Total
1975	100	100	100	100	100	100
1976	90	101	95	118	71	96
1977	83	97	78	112	85	90
1978	77	113	87	101	77	90
1979	72	103	85	105	72	85
1980	67	81	74	90	78	76
1981	61	85	63	98	72	74
1982	55	68	61	82	56	64
1983	47	73	57	54	65	59
1984	45	69	54	68	67	59
1985	47	60	50	71	75	58
1986	47	64	58	65	54	57

	Age					
Year	Ten	Eleven	Twelve	Thirteen	Fourteen	Total
1975	100	100	100	100	100	100
1976	82	92	93	108	108	96
1977	83	96	97	91	87	90
1978	104	88	101	104	89	97
1979	72	103	77	91	101	88
1980	76	79	105	94	103	92
1981	80	72	72	116	76	83
1982	47	85	83	79	92	76
1983	70	91	61	94	79	78
1984	67	93	79	70	91	80
1985	47	75	56	78	73	65
1986	67	76	69	68	83	73

Table 20: Pedestrian Fatalities per Million Children -- Percentage Decrease from 1975 to 1986

Zero	One	Two	Three	Four
6	28	43	58	55

Five	Six	Seven	Eight	Nine
53	36	42	35	46

Ten	Eleven	Twelve	Thirteen	Fourteen
33	24	31	32	17

Pedestrian Fatality Factors

The pedestrian fatality counts for 1975 and 1986 are shown for three age groups (those under five, those five through fourteen, and those over fourteen years old) in the next six tables. The fatality counts for month (Table 21), day of week (Table 22), light condition (Table 23), urbanization (Table 24), speed limit (Table 25), and roadway location (Table 26) are shown.

Table 21: Pedestrian Fatalities by Month

	Age of 1975 Fatalities				Age of 1986 Fatalities			
Month	0-4	5-14	Older	Total	0-4	5-14	Older	Total
January	19	91	512	622	9	60	525	594
February	22	90	439	551	11	48	386	445
March	28	104	410	542	23	70	423	516
April	55	106	333	494	24	62	398	484
May	72	128	398	598	36	78	442	556
June	72	119	391	582	34	58	448	540
July	55	106	464	625	38	53	438	529
August	66	111	467	644	33	62	477	572
September	54	99	497	650	32	66	497	595
October	57	126	567	750	20	73	573	666
November	29	86	610	725	24	40	560	624
December	19	98	616	733	18	51	581	650
Total	548	1,264	5,704	7,516	302	721	5,748	6,771

Table 22: Pedestrian Fatalities by Day of Week

	Age of 1975 Fatalities				Age of 1986 Fatalities			
Weekday	0-4	5-14	Older	Total	0-4	5-14	Older	Total
Sunday	78	122	803	1,003	40	71	830	941
Monday	68	167	607	842	51	115	703	869
Tuesday	58	169	675	902	33	96	627	756
Wednesday	85	193	760	1,038	35	92	704	831
Thursday	70	184	702	956	35	109	777	921
Friday	106	220	1,015	1,341	56	122	954	1,132
Saturday	83	209	1,142	1,434	52	116	1,153	1,321
Total	548	1,264	5,704	7,516	302	721	5,748	6,771

Table 23: Pedestrian Fatalities by Light Condition

	Age of 1975 Fatalities				Age of 1986 Fatalities			
Lighting	0-4	5-14	Older	Total	0-4	5-14	Older	Total
Daylight	422	878	1,476	2,776	232	488	1,440	2,160
Darker	111	341	4,011	4,463	70	233	4,295	4,598
Unknown	15	45	217	277	0	0	13	13
Total	548	1,264	5,704	7,516	302	721	5,748	6,771

Table 24: Pedestrian Fatalities by Urbanization

	Age of 1975 Fatalities				Age of 1986 Fatalities			
Land Use	0-4	5-14	Older	Total	0-4	5-14	Older	Total
Urban	369	705	3,327	4,401	210	466	3,898	4,574
Rural	179	559	2,377	3,115	91	255	1,847	2,193
Unknown	0	0	0	0	1	0	3	4
Total	548	1,264	5,704	7,516	302	721	5,748	6,771

Table 25: Pedestrian Fatalities by Speed Limit

Speed	Age of 1975 Fatalities				Age of 1986 Fatalities			
Limit	0-4	5-14	Older	Total	0-4	5-14	Older	Total
Up to 20	15	24	36	75	10	10	74	94
25 mph	144	175	555	874	84	105	407	596
30 mph	100	160	669	929	62	131	826	1,019
35 mph	52	151	701	904	55	141	1,000	1,196
40 mph	12	52	295	359	12	56	510	578
45 mph	18	79	424	521	16	71	653	740
50 mph	6	52	275	333	5	25	296	326
55 mph	74	225	1,469	1,768	43	152	1,764	1,959
Unknown	127	346	1,280	1,753	15	30	218	263
Total	548	1,264	5,704	7,516	302	721	5,748	6,771

Table 26: Pedestrian Fatalities by Location

	Age of 1975 Fatalities				Age of 1986 Fatalities			
Location	0-4	5-14	Older	Total	0-4	5-14	Older	Total
On roadway:								
Intersection	38	156	675	869	13	66	509	588
Other	451	938	3,763	5,152	258	539	4,179	4,976
Crosswalk	10	41	512	563	10	48	458	516
Off roadway	39	101	607	747	20	63	524	607
Unknown	10	28	147	185	1	5	78	84
Total	548	1,264	5,704	7,516	302	721	5,748	6,771

In 1986, young child fatalities were 55 percent of their 1975 value; older child fatalities were 57 percent of their 1975 value; and the number of fatalities over fourteen years old was 101 percent of what it had been in 1975 (Table 28). The child fatality decreases occurred in all months (Table 27) and all days of the week (Table 28). The decrease was slightly larger during daylight hours than after dark (Table 29).

Table 27: 1986 Pedestrian Fatalities by Month as a Percentage of 1975 Fatalities

	Age			
Month	0-4	5-14	Older	Total
January	47	66	103	95
February	50	53	88	81
March	82	67	103	95
April	44	58	120	98
May	50	61	111	93
June	47	49	115	93
July	69	50	94	85
August	50	56	102	89
September	59	67	100	92
October	35	58	101	89
November	83	47	92	86
December	95	52	94	89
Total	55	57	101	90

Table 28: 1986 Pedestrian Fatalities by Day of Week as a Percentage of 1975 Fatalities

	Age			
Weekday	0-4	5-14	Older	Total
Sunday	51	58	103	94
Monday	75	69	116	103
Tuesday	57	57	93	84
Wednesday	41	48	93	80
Thursday	50	59	111	96
Friday	53	55	94	84
Saturday	63	56	101	92
Total	55	57	101	90

Table 29: 1986 Pedestrian Fatalities by Light Condition as a Percentage of 1975 Fatalities

	Age			
Lighting	0-4	5-14	Older	Total
Daylight	55	56	98	78
Darker	63	68	107	103
Total	55	57	101	90

Pedestrian fatalities decreased more in rural areas (Table 30). A complicating factor in comparing fatalities by speed limit is that speed limit reporting improved between 1975 and 1986. Thus, the changes in fatalities by speed limit reflect changes in reporting as well as changes in fatalities. However, it appears than young child fatalities decreased more on low-speed and high-speed roads than they did on mid-speed roads (Table 31). Most young child pedestrians were killed on the roadway, but not at an intersection (Table 32). These fatalities decreased 43 percent between 1975 and 1986. The number of young children killed in crosswalks did not change, but there were only ten of them in each year.

Table 30: 1986 Pedestrian Fatalities by Land Use as a Percentage of 1975 Fatalities

	Age			
Land Use	0-4	5-14	Older	Total
Urban	57	66	117	104
Rural	51	46	78	70
Total	55	57	101	90

Table 31: 1986 Pedestrian Fatalities by Speed Limit as a Percentage of 1975 Fatalities

Speed	Age			
Limit	0-4	5-14	Older	Total
Up to 20	67	42	206	125
25 mph	58	60	73	68
30 mph	62	82	123	110
35 mph	106	93	143	132
40 mph	100	108	173	161
45 mph	89	90	154	142
50 mph	83	48	108	98
55 mph	58	68	120	111
Unknown	12	9	17	15
Total	55	57	101	90

Table 32: 1986 Pedestrian Fatalities by Location as a Percentage of 1975 Fatalities

	Age			
Location	0-4	5-14	Older	Total
On roadway:				
Intersection	34	42	75	68
Other	57	57	111	97
Crosswalk	100	117	89	92
Off roadw	51	62	86	81
Unknown	10	18	53	45
Total	55	57	101	90

Pedestrian Fatalities by Victim Age

and Striking Vehicle Type

From 1975 Through 1986

(May 1988)

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Findings

From 1975 through 1986, pedestrian fatalities steadily declined. For people under 15 years old, pedestrian fatalities per million people declined from 33.3 (in 1975) to 19.7 (in 1986). For people 15 through 49 years old, pedestrian fatalities per million people were fairly constant (26.1 in 1975 and 26.2 in 1986). For people over 49 years old, pedestrian fatalities per million people declined as much as for the young group: from 51.9 (in 1975) to 37.2 (in 1986). The largest decreases were among the youngest (especially ages 5 through 9) and oldest (particularly over age 64) people.

This report concentrates on changes in the types of vehicles that struck and killed pedestrians. In general, these changes mirror changes in vehicle sales and registrations. From 1975 through 1986,

- Light truck (including van) involvements increased while car involvements decreased,
- Small car involvements increased while large car involvements decreased, and
- Foreign car involvements increased while domestic car involvements decreased.

On average, younger people were hit by larger cars. Fatally-injured pedestrians under 15 years old were involved with cars with an average weight of 3,407 pounds. This was a hundred pounds heavier than the average weight of cars involved with pedestrians over 49 years old (3,308 pounds).

There is no clear relationship between car size and pedestrian fatality, using as a measure either fatalities per registered vehicle or fatalities per pedestrian-involved (not necessarily fatally-involved) vehicle.

Detailed exposure data (describing where and when vehicles are driven) are not currently available. Using driver fatalities as a normalizing factor produces interesting results, but presents serious problems of interpretation. Using national nonfatal pedestrian involvements is hampered by sampling errors and the lack of reported noninjury pedestrian involvements. Using registered vehicles reveals no pattern across six car size categories, suggesting that vehicle mass is not the key factor in pedestrian fatality causation. Understanding pedestrian fatality trends (especially those of young children) seems to depend data on road use by pedestrians and vehicles.

Data

There were 89,242 pedestrians killed during the twelve years from 1975 through 1986. The data were extracted from the Fatal Accident Reporting System (FARS) computer files in late-March 1988. At that time, the following versions of the FARS data were available as analysis files.

1986 data = version 248 (last updated February 15, 1988).
1985 data = version 228 (last updated March 10, 1987).

The 1975 through 1984 FARS data were last updated during 1985 and earlier.

Most pedestrians (about 94 percent over the twelve years described here) died in accidents involving only one vehicle. An accident was defined as single-vehicle based on available data elements (Vehicle Forms, Hit-and-Run, Most Harmful Event, and Vehicles Involved) and on coding conventions that differ across accident years.

Data Year	Single-Vehicle Accident Definition
1975	(Vehicle Forms equal 0 or 1) and (Hit-and-Run not equal 1) and (Most Harmful Event not equal 12 or 13)
1976-1981	Vehicles Involved equals 1
1982-1986	Vehicle Forms equals 1

For single-vehicle pedestrian fatal accidents, the striking vehicle was categorized into vehicle types using the FARS Body Type.

Vehicle Type	1975-1981 Data	1982-1986 Data
Car	1-9, 39	1-11, 67
Motorcycle	15-18	20-29
Light truck	50-52	40-41, 48-51, 53-55, 58-59, 69
Heavy truck	53-59	70-72, 74-76, 78
Other vehicle	all other known	all other known
Unknown vehicle	99	99

For single-car pedestrian fatal accidents, the striking car was categorized into size groups using the FARS Curb Weight variable.

Car Size	Curb Weight Range
Minicompact	950-1,949 pounds
Subcompact	1,950-2,449 pounds
Compact	2,450-2,949 pounds
Intermediate	2,950-3,449 pounds
Fullsized	3,450-3,949 pounds
Largest	3,950-9,049 pounds
Unknown size	all other

Deaths per Population

There were 7,516 pedestrians killed in 1975 and 10 percent fewer (6,779) killed in 1986. This overall decrease was composed of large decreases among the young (under 21 years old) and the old (over 43 years old). In between (those 21 through 43 years old) fatalities increased. The data are shown in Table 1.

To make investigation more manageable, ages were collapsed into five-year categories. Appendix Table A shows that the 1975 to 1986 fatality decrease resulted from a twelve-year series of fatality increases and decreases. The youngest fatalities experienced the steadiest decline.

The overall population increased steadily, but population by age group varied with the birth rate. Over these twelve years, there were both increases and decreases in the number of children (Appendix Table B).

The data from Appendix Tables A and B were combined to calculate deaths per million people (Appendix Table C). These data were subject to changes in travel (amounts, types, and risks), but population changes have been removed from the comparison.

The twelve annual death rates (deaths per million people) were averaged for each age group to produce an average of averages (Table 2). The lowest death rate was 18.5 for pedestrians aged 10 through 14. The highest death rate was 97.7 for pedestrians aged 80 through 84. The death rate increased and decreased across age, reflecting differences in travel patterns and risk.

For some age groups (the youngest and the oldest) the death rate decreased steadily. Table 3 shows the results of fitting a line through each of the eighteen age groups, using the form:

Annual Death Rate = Intercept + Coefficient * (Accident Year - 1975).

The lines for each of the three age groups under 15 years old and the lines for each of the four age groups 65 through 84 years old explain more than 80 percent of the annual variation in the number of pedestrian deaths among those people.

Based on these results, pedestrians were grouped into three categories for the remainder of this report: those under 15 years old, those 15 through 49 years old, and those over 49 years old. The division between the two oldest age groups (made here at 49 years) could be made at other points (for example, at 64 years). There is a trade-off between two analytical considerations: making the oldest age group large and making it homogeneous.

The bottom of Table 3 shows that the youngest and oldest of these three groups experienced similar decreases over the last twelve years. In contrast, the middle age group experienced a small, non-statistically significant decrease. The use of these three groups simplifies the presentation of characteristics of the striking vehicle.

Table 1: Pedestrian Death Counts in Single-Year Age Categories

Age	1975	1986	Change	Age	1975	1986	Change
0	9	10	11%	50	87	63	-28%
1	52	45	-13%	51	71	60	-15%
2	120	79	-34%	52	77	56	-27%
3	182	84	-54%	53	78	55	-29%
4	185	84	-55%	54	74	57	-23%
5	224	106	-53%	55	95	63	-34%
6	178	117	-34%	56	80	66	-18%
7	173	102	-41%	57	68	57	-16%
8	122	75	-39%	58	76	64	-16%
9	118	59	-50%	59	59	65	10%
10	102	56	-45%	60	72	51	-29%
11	78	48	-38%	61	65	53	-18%
12	89	48	-46%	62	59	63	7%
13	82	44	-46%	63	65	57	-12%
14	98	66	-33%	64	69	55	-20%
15	100	89	-11%	65	87	60	-31%
16	115	84	-27%	66	74	66	-11%
17	120	92	-23%	67	84	51	-39%
18	142	95	-33%	68	79	41	-48%
19	139	114	-18%	69	72	55	-24%
20	143	122	-15%	70	84	66	-21%
21	100	139	39%	71	79	60	-24%
22	113	123	9%	72	87	64	-26%
23	96	130	35%	73	82	61	-26%
24	98	127	30%	74	92	64	-30%
25	79	158	100%	75	91	67	-26%
26	84	128	52%	76	92	79	-14%
27	81	136	68%	77	84	73	-13%
28	75	129	72%	78	79	66	-16%
29	69	89	29%	79	85	61	-28%
30	66	114	73%	80	86	68	-21%
31	63	91	44%	81	58	59	2%
32	52	86	65%	82	61	56	-8%
33	63	99	57%	83	71	59	-17%
34	54	80	48%	84	49	43	-12%
35	68	86	26%	85	36	46	28%
36	50	88	76%	86	23	45	96%
37	55	80	45%	87	28	31	11%
38	56	91	63%	88	22	17	-23%
39	63	94	49%	89	26	14	-46%
40	55	76	38%	90	15	22	47%
41	49	67	37%	91	3	13	333%
42	60	65	8%	92	2	4	100%
43	60	61	2%	93	6	9	50%
44	77	55	-29%	94	2	3	50%
45	70	71	1%	95	2	3	50%
46	59	90	53%	96	3	3	0%
47	73	65	-11%	97+	0	1	-
48	68	59	-13%	Unknown	84	120	43%
				Total	7,516	6,779	-10%

Table 2: Average Annual Deaths per Million People

Age Group	Average of Averages
0-4	23.8
5-9	35.0
10-14	18.5
15-19	30.5
20-24	33.4
25-29	28.0
30-34	24.8
35-39	24.7
40-44	26.3
45-49	28.0
50-54	30.9
55-59	31.1
60-64	34.9
65-69	39.6
70-74	55.2
75-79	77.3
80-84	97.7
85 +	87.2
Total	32.7

Table 3: Summary of Regression Models of Annual Death Rates

Age	Intercept		Coefficient		
Group	Estimate	Std Err	Estimate	Std Err	R-Square
0-4	32.629	1.870	-1.610	0.156	0.914
5-9	46.103	1.684	-2.014	0.141	0.953
10-14	21.792	0.932	-0.608	0.078	0.859
15-19	33.642	3.226	-0.571	0.270	0.310
20-24	31.953	3.777	0.254	0.316	0.061
25-29	25.714	2.957	0.416	0.247	0.221
30-34	24.112	2.217	0.122	0.185	0.042
35-39	24.836	2.324	-0.033	0.194	0.003
40-44	28.704	1.559	-0.429	0.130	0.520
45-49	29.586	2.117	-0.297	0.177	0.220
50-54	35.078	1.797	-0.760	0.150	0.719
55-59	34.133	2.237	-0.548	0.187	0.462
60-64	41.253	3.524	-1.146	0.295	0.602
65-69	50.271	2.176	-1.941	0.182	0.919
70-74	71.301	3.394	-2.928	0.284	0.914
75-79	98.151	6.650	-3.782	0.556	0.822
80-84	117.233	6.138	-3.552	0.513	0.827
85 +	100.022	8.547	-2.330	0.715	0.515
Under 15	32.991	1.163	-1.365	0.097	0.952
15-49	28.837	2.444	-0.086	0.204	0.017
Over 49	53.201	2.042	-1.475	0.171	0.882

Tables 4 through 6 presents the data of Appendix Tables A through C in these three age groups. The average of the annual averages are:

25.5 pedestrian deaths per million people under 15 years old,
28.4 pedestrian deaths per million people aged 15 through 49, and
45.1 pedestrian deaths per million people over 49 years old.

Table 4: Pedestrian Deaths in Three Age Groups

Age	1975	1976	1977	1978	1979	1980
Under 15	1,812	1,713	1,545	1,582	1,448	1,338
15-49	2,781	2,853	3,070	3,296	3,626	3,692
Over 49	2,839	2,780	2,985	2,783	2,854	2,864

Age	1981	1982	1983	1984	1985	1986
Under 15	1,208	1,117	1,077	1,064	1,041	1,023
15-49	3,690	3,694	3,289	3,344	3,194	3,321
Over 49	2,698	2,385	2,356	2,486	2,445	2,315

Table 5: Population in Thousands in Three Age Groups

Age	1975	1976	1977	1978	1979	1980
Under 15	54,361	53,376	52,598	51,955	51,455	51,303
15-49	106,392	108,553	110,624	112,711	114,808	116,789
Over 49	54,712	55,633	56,539	57,429	58,306	59,164

Age	1981	1982	1983	1984	1985	1986
Under 15	51,336	51,490	51,709	51,805	51,940	51,983
15-49	118,493	120,111	121,701	123,352	124,988	126,807
Over 49	59,808	60,395	60,874	61,321	61,814	62,289

Table 6: Pedestrian Deaths per Million People in Three Age Groups

Age	1975	1976	1977	1978	1979	1980
Under 15	33.3	32.1	29.4	30.4	28.1	26.1
15-49	26.1	26.3	27.8	29.2	31.6	31.6
Over 49	51.9	50.0	52.8	48.5	48.9	48.4

Age	1981	1982	1983	1984	1985	1986
Under 15	23.5	21.7	20.8	20.5	20.0	19.7
15-49	31.1	30.8	27.0	27.1	25.6	26.2
Over 49	45.1	39.5	38.7	40.5	39.6	37.2

Types of Vehicles Involved

Tables 7 through 10 present fatality counts by striking vehicle type for those under 15 years old, those 15 through 49 years old, those over 49 years old, and all ages combined. If there were two or more vehicles involved, the fatality was classified as occurring in a multi-vehicle accident; no attempt was made to identify which of the involved vehicles struck the pedestrian. Many pedestrians with unknown striking vehicle type died in hit-and-run accidents.

Table 7: Body Types of Vehicles that Struck Pedestrians -- Those Under 15 Years Old

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Unknown	Multi-vehicle	Total
1975	1,330	17	232	48	74	73	38	1,812
1976	1,202	23	238	70	60	85	35	1,713
1977	1,059	23	236	52	65	84	26	1,545
1978	1,046	26	270	66	75	67	32	1,582
1979	948	14	242	76	72	61	35	1,448
1980	851	23	259	56	60	51	38	1,338
1981	786	20	203	55	54	51	39	1,208
1982	739	9	218	40	59	32	20	1,117
1983	700	10	216	38	65	24	24	1,077
1984	692	18	217	34	50	17	36	1,064
1985	647	13	250	39	55	12	25	1,041
1986	641	7	224	42	48	25	36	1,023

Table 8: Body Types of Vehicles that Struck Pedestrians -- Those 15 through 49 Years Old

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Unknown	Multi-vehicle	Total
1975	1,680	18	338	129	70	343	203	2,781
1976	1,680	21	333	171	64	383	201	2,853
1977	1,744	17	435	158	70	391	255	3,070
1978	1,827	26	461	212	69	427	274	3,296
1979	1,929	25	588	228	74	521	261	3,626
1980	1,947	40	544	228	76	550	307	3,692
1981	1,959	26	528	208	88	563	318	3,690
1982	2,130	39	579	194	74	358	320	3,694
1983	1,796	26	536	230	86	359	256	3,289
1984	1,859	34	555	171	89	326	310	3,344
1985	1,634	27	582	212	90	354	295	3,194
1986	1,803	39	556	207	88	305	323	3,321

Table 9: Body Types of Vehicles that Struck Pedestrians
-- Those Over 49 Years Old

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Unknown	Multi-vehicle	Total
1975	1,898	34	379	105	81	220	122	2,839
1976	1,773	26	416	127	97	228	113	2,780
1977	1,848	35	459	163	89	240	151	2,985
1978	1,693	28	450	173	83	211	145	2,783
1979	1,705	26	508	147	90	258	120	2,854
1980	1,670	35	534	160	95	236	134	2,864
1981	1,603	37	455	140	94	237	132	2,698
1982	1,492	39	424	111	75	119	125	2,385
1983	1,470	24	413	133	71	122	123	2,356
1984	1,568	24	425	149	89	101	130	2,486
1985	1,474	33	458	130	95	121	134	2,445
1986	1,377	19	442	126	101	95	155	2,315

Table 10: Body Types of Vehicles that Struck Pedestrians
-- All Ages, Including Unknown Age

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Unknown	Multi-vehicle	Total
1975	4,955	69	956	290	228	651	367	7,516
1976	4,703	70	996	369	224	711	354	7,427
1977	4,728	75	1,150	376	229	738	436	7,732
1978	4,632	81	1,198	460	230	737	457	7,795
1979	4,672	66	1,365	461	238	868	426	8,096
1980	4,558	99	1,365	457	232	872	487	8,070
1981	4,453	84	1,214	414	243	890	539	7,837
1982	4,442	88	1,240	350	210	527	474	7,331
1983	4,019	60	1,180	410	225	523	409	6,826
1984	4,184	77	1,218	359	230	470	487	7,025
1985	3,819	75	1,311	385	243	508	467	6,808
1986	3,877	65	1,243	385	241	445	523	6,779

Fewer pedestrian fatalities were struck by cars in 1986 than in 1975. This partly reflects the shift towards the use of light trucks (pickups and vans) as passenger vehicles. The number of deaths involving light trucks and heavy trucks increased. The involvements of motorcycles and other vehicles were essentially unchanged. Later years of FARS include more pedestrians involved in multi-vehicle accidents and fewer involved in single-vehicle accidents with unknown vehicle type. The significance of these two results is not known.

The fatality counts in Tables 7 through 10 were combined with the population counts in Table 5, to produce deaths per million people by striking vehicle type (Tables 11 through 14).

Table 11: Body Types of Vehicles that Struck Pedestrians
-- per Million People Under 15 Years Old

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Unknown	Multi-vehicle	Total
1975	24.5	0.3	4.3	0.9	1.4	1.3	0.7	33.3
1976	22.5	0.4	4.5	1.3	1.1	1.6	0.7	32.1
1977	20.1	0.4	4.5	1.0	1.2	1.6	0.5	29.4
1978	20.1	0.5	5.2	1.3	1.4	1.3	0.6	30.4
1979	18.4	0.3	4.7	1.5	1.4	1.2	0.7	28.1
1980	16.6	0.4	5.0	1.1	1.2	1.0	0.7	26.1
1981	15.3	0.4	4.0	1.1	1.1	1.0	0.8	23.5
1982	14.4	0.2	4.2	0.8	1.1	0.6	0.4	21.7
1983	13.5	0.2	4.2	0.7	1.3	0.5	0.5	20.8
1984	13.4	0.3	4.2	0.7	1.0	0.3	0.7	20.5
1985	12.5	0.3	4.8	0.8	1.1	0.2	0.5	20.0
1986	12.3	0.1	4.3	0.8	0.9	0.5	0.7	19.7

Table 12: Body Types of Vehicles that Struck Pedestrians
-- per Million People 15 through 49 Years Old

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Unknown	Multi-vehicle	Total
1975	15.8	0.2	3.2	1.2	0.7	3.2	1.9	26.1
1976	15.5	0.2	3.1	1.6	0.6	3.5	1.9	26.3
1977	15.8	0.2	3.9	1.4	0.6	3.5	2.3	27.8
1978	16.2	0.2	4.1	1.9	0.6	3.8	2.4	29.2
1979	16.8	0.2	5.1	2.0	0.6	4.5	2.3	31.6
1980	16.7	0.3	4.7	2.0	0.7	4.7	2.6	31.6
1981	16.5	0.2	4.5	1.8	0.7	4.8	2.7	31.1
1982	17.7	0.3	4.8	1.6	0.6	3.0	2.7	30.8
1983	14.8	0.2	4.4	1.9	0.7	2.9	2.1	27.0
1984	15.1	0.3	4.5	1.4	0.7	2.6	2.5	27.1
1985	:13.1	0.2	4.7	1.7	0.7	2.8	2.4	25.6
1986	14.2	0.3	4.4	1.6	0.7	2.4	2.5	26.2

Table 13: Body Types of Vehicles that Struck Pedestrians -- per Million People Over 49 Years Old

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Unknown	Multi-vehicle	Total
1975	34.7	0.6	6.9	1.9	1.5	4.0	2.2	51.9
1976	31.9	0.5	7.5	2.3	1.7	4.1	2.0	50.0
1977	32.7	0.6	8.1	2.9	1.6	4.2	2.7	52.8
1978	29.5	0.5	7.8	3.0	1.4	3.7	2.5	48.5
1979	29.2	0.4	8.7	2.5	1.5	4.4	2.1	48.9
1980	28.2	0.6	9.0	2.7	1.6	4.0	2.3	48.4
1981	26.8	0.6	7.6	2.3	1.6	4.0	2.2	45.1
1982	24.7	0.6	7.0	1.8	1.2	2.0	2.1	39.5
1983	24.1	0.4	6.8	2.2	1.2	2.0	2.0	38.7
1984	25.6	0.4	6.9	2.4	1.5	1.6	2.1	40.5
1985	23.8	0.5	7.4	2.1	1.5	2.0	2.2	39.6
1986	22.1	0.3	7.1	2.0	1.6	1.5	2.5	37.2

Table 14: Body Types of Vehicles that Struck Pedestrians -- per Million People of All Ages, Including Unknown Age

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Unknown	Multi-vehicle	Total
1975	23.0	0.3	4.4	1.3	1.1	3.0	1.7	34.9
1976	21.6	0.3	4.6	1.7	1.0	3.3	1.6	34.1
1977	21.5	0.3	5.2	1.7	1.0	3.4	2.0	35.2
1978	20.9	0.4	5.4	2.1	1.0	3.3	2.1	35.1
1979	20.8	0.3	6.1	2.1	1.1	3.9	1.9	36.1
1980	20.1	0.4	6.0	2.0	1.0	3.8	2.1	35.5
1981	19.4	0.4	5.3	1.8	1.1	3.9	2.3	34.1
1982	19.1	0.4	5.3	1.5	0.9	2.3	2.0	31.6
1983	17.2	0.3	5.0	1.8	1.0	2.2	1.7	29.1
1984	17.7	0.3	5.2	1.5	1.0	2.0	2.1	29.7
1985	16.0	0.3	5.5	1.6	1.0	2.1	2.0	28.5
1986	16.1	0.3	5.2	1.6	1.0	1.8	2.2	28.1

In 1986, only half as many fatalities under 15 were struck by cars as in 1975, after adjusting for population changes in that age group. The population-based death rates were essentially unchanged for other vehicle types, despite the increased popularity of light trucks. Car-pedestrian death rates decreased 28 percent for those 15 through 49 years old. Motorcycle, light truck, and heavy truck involvement rates increased. Among those over 49 years old, there were 42 percent fewer car-involved pedestrian deaths per million people.

The shift from cars to light trucks as passenger vehicles and general fatality trends are reflected in driver deaths in single-vehicle accidents (Table 15). The restriction to single-vehicle accidents eliminates the complication of vehicle size mix in multi-vehicle accidents. The restriction to drivers eliminates the complication of changes in vehicle occupancy.

Table 15: Body Types of Single-Vehicle Driver Deaths

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Unknown	Total
1975	8,024	1,109	1,658	481	419	210	11,901
1976	8,189	1,152	1,898	599	412	220	12,470
1977	8,050	1,464	2,026	706	447	208	12,901
1978	8,505	1,588	2,391	739	447	86	13,756
1979	8,618	1,777	2,494	754	456	88	14,187
1980	9,064	1,902	2,652	692	562	98	14,970
1981	8,551	1,801	2,524	627	572	65	14,140
1982	7,356	1,718	2,265	494	483	105	12,421
1983	7,226	1,693	2,154	534	513	40	12,160
1984	7,467	1,794	2,340	619	510	60	12,790
1985	7,006	1,814	2,302	512	549	74	12,257
1986	7,625	1,808	2,576	474	536	77	13,096

Table 15 suggests one possible basis for controlling for general accident trends and vehicle use changes. Some controls are needed for understanding the changes in fatality counts presented here because population shifts alone do not explain the large pedestrian fatality changes. Several available control series are discussed in a later section of this report.

Because cars are the most frequent striking vehicle, they are considered separately in more detail in the next section. Cars (and light trucks) have become smaller, on average, over these twelve years.

Sizes of Cars Involved

Tables 16 through 19 present fatality counts by the size of the striking car in single-vehicle accidents for those under 15 years old, those aged 15 through 49 years old, those over 49 years old, and all ages combined. The average car has become smaller over time, and this is reflected in pedestrian death counts. The number of cars of unknown weight has decreased as older vehicles (not included in the weight-decoding algorithm) have been replaced by new vehicles (which are covered by this algorithm).

Table 16: Size of Cars that Struck Pedestrians
-- Those Under 15 Years Old

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	21	37	111	212	268	276	405	1,330
1976	29	39	94	198	274	240	328	1,202
1977	15	35	102	180	239	234	254	1,059
1978	21	59	90	182	215	282	197	1,046
1979	23	57	96	180	221	228	143	948
1980	21	45	97	182	202	207	97	851
1981	14	70	89	193	188	166	66	786
1982	34	77	91	130	185	147	75	739
1983	38	59	81	155	135	145	87	700
1984	27	74	90	144	169	118	70	692
1985	22	93	77	160	131	101	63	647
1986	32	95	99	138	132	92	53	641

Table 17: Size of Cars that Struck Pedestrians
-- Those 15 through 49 Years Old

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	51	74	141	307	329	302	476	1,680
1976	39	74	138	281	331	366	451	1,680
1977	59	85	157	292	384	350	417	1,744
1978	57	93	176	329	410	427	335	1,827
1979	62	99	189	389	470	438	282	1,929
1980	67	169	238	377	424	428	244	1,947
1981	93	184	253	395	423	415	196	1,959
1982	98	199	238	439	422	371	363	2,130
1983	97	202	247	395	365	276	214	1,796
1984	75	249	275	380	339	326	215	1,859
1985	95	256	241	362	291	181	208	1,634
1986	96	303	273	355	355	206	215	1,803

Table 18: Size of Cars that Struck Pedestrians
-- Those Over 49 Years Old

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	62	93	176	284	360	357	566	1,898
1976	64	101	150	278	336	370	474	1,773
1977	61	109	153	286	346	409	484	1,848
1978	64	108	169	286	368	383	315	1,693
1979	72	119	200	340	358	367	249	1,705
1980	89	149	174	333	347	351	227	1,670
1981	58	158	186	348	361	333	159	1,603
1982	64	175	161	322	311	246	213	1,492
1983	96	163	185	324	258	265	179	1,470
1984	97	228	227	345	280	232	159	1,568
1985	81	224	236	315	242	211	165	1,474
1986	81	253	260	268	230	152	133	1,377

Table 19: Size of Cars that Struck Pedestrians
-- All Ages, Including Unknown Age

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	138	206	433	806	967	945	1,460	4,955
1976	134	215	384	765	951	987	1,267	4,703
1977	136	231	419	770	986	1,016	1,170	4,728
1978	144	262	443	810	1,002	1,108	863	4,632
1979	159	283	494	928	1,063	1,058	687	4,672
1980	179	370	519	914	992	1,003	581	4,558
1981	169	419	538	959	999	935	434	4,453
1982	202	461	498	910	935	776	660	4,442
1983	234	425	520	891	768	693	488	4,019
1984	202	561	602	881	800	685	453	4,184
1985	201	582	568	849	678	495	446	3,819
1986	211	658	643	771	730	454	410	3,877

The pedestrian death counts were combined with the population data in Table 5 to produce car-involved pedestrian deaths per million people (Tables 20 through 23). As the number of small cars increased, the number of pedestrians struck by small cars also increased.

Table 20: Size of Cars that Struck Pedestrians
-- per Million People Under 15 Years Old

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	0.4	0.7	2.0	3.9	4.9	5.1	7.5	24.5
1976	0.5	0.7	1.8	3.7	5.1	4.5	6.1	22.5
1977	0.3	0.7	1.9	3.4	4.5	4.4	4.8	20.1
1978	0.4	1.1	1.7	3.5	4.1	5.4	3.8	20.1
1979	0.4	1.1	1.9	3.5	4.3	4.4	2.8	18.4
1980	0.4	0.9	1.9	3.5	3.9	4.0	1.9	16.6
1981	0.3	1.4	1.7	3.8	3.7	3.2	1.3	15.3
1982	0.7	1.5	1.8	2.5	3.6	2.9	1.5	14.4
1983	0.7	1.1	1.6	3.0	2.6	2.8	1.7	13.5
1984	0.5	1.4	1.7	2.8	3.3	2.3	1.4	13.4
1985	0.4	1.8	1.5	3.1	2.5	1.9	1.2	12.5
1986	0.6	1.8	1.9	2.7	2.5	1.8	1.0	12.3

Table 21: Size of Cars that Struck Pedestrians
-- per Million People Under 15 through 49 Years Old

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	0.5	0.7	1.3	2.9	3.1	2.8	4.5	15.8
1976	0.4	0.7	1.3	2.6	3.0	3.4	4.2	15.5
1977	0.5	0.8	1.4	2.6	3.5	3.2	3.8	15.8
1978	0.5	0.8	1.6	2.9	3.6	3.8	3.0	16.2
1979	0.5	0.9	1.6	3.4	4.1	3.8	2.5	16.8
1980	0.6	1.4	2.0	3.2	3.6	3.7	2.1	16.7
1981	0.8	1.6	2.1	3.3	3.6	3.5	1.7	16.5
1982	0.8	1.7	2.0	3.7	3.5	3.1	3.0	17.7
1983	0.8	1.7	2.0	3.2	3.0	2.3	1.8	14.8
1984	0.6	2.0	2.2	3.1	2.7	2.6	1.7	15.1
1985	0.8	2.0	1.9	2.9	2.3	1.4	1.7	13.1
1986	0.8	2.4	2.2	2.8	2.8	1.6	1.7	14.2

Table 22: Size of Cars that Struck Pedestrians
-- per Million People Over 49 Years Old

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	1.1	1.7	3.2	5.2	6.6	6.5	10.3	34.7
1976	1.2	1.8	2.7	5.0	6.0	6.7	8.5	31.9
1977	1.1	1.9	2.7	5.1	6.1	7.2	8.6	32.7
1978	1.1	1.9	2.9	5.0	6.4	6.7	5.5	29.5
1979	1.2	2.0	3.4	5.8	6.1	6.3	4.3	29.2
1980	1.5	2.5	2.9	5.6	5.9	5.9	3.8	28.2
1981	1.0	2.6	3.1	5.8	6.0	5.6	2.7	26.8
1982	1.1	2.9	2.7	5.3	5.1	4.1	3.5	24.7
1983	1.6	2.7	3.0	5.3	4.2	4.4	2.9	24.1
1984	1.6	3.7	3.7	5.6	4.6	3.8	2.6	25.6
1985	1.3	3.6	3.8	5.1	3.9	3.4	2.7	23.8
1986	1.3	4.1	4.2	4.3	3.7	2.4	2.1	22.1

Table 23: Size of Cars that Struck Pedestrians
-- per Million People of All Ages, Including Unknown Age

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	0.6	1.0	2.0	3.7	4.5	4.4	6.8	23.0
1976	0.6	1.0	1.8	3.5	4.4	4.5	5.8	21.6
1977	0.6	1.1	1.9	3.5	4.5	4.6	5.3	21.5
1978	0.6	1.2	2.0	3.6	4.5	5.0	3.9	20.9
1979	0.7	1.3	2.2	4.1	4.7	4.7	3.1	20.8
1980	0.8	1.6	2.3	4.0	4.4	4.4	2.6	20.1
1981	0.7	1.8	2.3	4.2	4.4	4.1	1.9	19.4
1982	0.9	2.0	2.1	3.9	4.0	3.3	2.8	19.1
1983	1.0	1.8	2.2	3.8	3.3	3.0	2.1	17.2
1984	0.9	2.4	2.5	3.7	3.4	2.9	1.9	17.7
1985	0.8	2.4	2.4	3.6	2.8	2.1	1.9	16.0
1986	0.9	2.7	2.7	3.2	3.0	1.9	1.7	16.1

Table 24 reflects the increased use of small cars with counts of car driver deaths in single-vehicle accidents. Between 1975 and 1986, subcompact driver deaths in single-vehicle accidents increased from 546 to 1,692 known cases. Some of this increase resulted from the decreased number of fatalities with unknown car size.

Table 24: Car Sizes of Single-Vehicle Driver Deaths

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	347	546	844	1,342	1,268	900	2,777	8,024
1976	389	533	975	1,420	1,313	992	2,567	8,189
1977	433	603	900	1,355	1,410	1,038	2,311	8,050
1978	445	733	998	1,599	1,475	1,120	2,135	8,505
1979	515	934	1,114	1,727	1,508	1,181	1,639	8,618
1980	565	1,094	1,319	1,931	1,610	1,243	1,302	9,064
1981	593	1,219	1,278	1,838	1,445	1,070	1,108	8,551
1982	534	1,174	1,212	1,561	1,179	829	867	7,356
1983	573	1,164	1,255	1,517	1,133	766	818	7,226
1984	569	1,304	1,397	1,655	1,074	734	734	7,467
1985	526	1,488	1,371	1,463	897	604	657	7,006
1986	589	1,692	1,649	1,593	966	618	518	7,625

The use of driver fatality counts as a control for changes in vehicle use and general accident trends is explored in a later section.

Average Weight of Cars Involved

Over the past twelve years, the average weight of cars involved with pedestrians decreased steadily (Table 25). The car weight for driver deaths in single-vehicle car accidents decreased similarly (Table 26), so that the ratio of the pedestrian fatality car weight to the driver fatality car weight remained at about 1.08. Lines fit through the data (Table 27) show how steady the decrease has been.

Table 25: Average Weight of Cars that Struck Pedestrians in Three Age Groups

Age	1975	1976	1977	1978	1979	1980
Under 15	3,551	3,529	3,541	3,541	3,493	3,500
15-49	3,442	3,525	3,457	3,489	3,472	3,389
Over 49	3,440	3,472	3,474	3,447	3,390	3,352

Age	1981	1982	1983	1984	1985	1986
Under 15	3,403	3,336	3,321	3,284	3,228	3,157
15-49	3,330	3,297	3,225	3,219	3,084	3,084
Over 49	3,348	3,265	3,221	3,142	3,118	3,023

Table 26: Average Weight of Cars in Single-Vehicle Car Accidents

Victim	1975	1976	1977	1978	1979	1980
Pedestrian	3,471	3,508	3,486	3,486	3,446	3,396
Driver	3,223	3,224	3,230	3,216	3,172	3,145
Ratio	1.08	1.09	1.08	1.08	1.09	1.08

Victim	1981	1982	1983	1984	1985	1986
Pedestrian	3,354	3,291	3,241	3,199	3,121	3,075
Driver	3,087	3,035	3,009	2,976	2,906	2,882
Ratio	1.09	1.08	1.08	1.08	1.07	1.07

Table 27: Summary of Regression Models of Average Striking Car Weight

	Intercept		Coefficient		
Fatality	Estimate	Std Err	Estimate	Std Err	R-Square
Pedestrians	3,561.71	43.21	-40.44	3.61	0.926
Drivers	3,282.39	30.67	-34.60	2.57	0.948

The average weight of cars that struck pedestrians under 15 years old was 3,407 pounds. This was 100 pounds heavier than the average for cars that struck people over 49 years old (3,308 pounds). Appendix Table D shows average car weight for pedestrian fatalities in five-year age groups, for each year from 1975 through 1986. The average of the twelve annual averages is shown in Table 28. The youngest people tended to be hit by larger cars. The average was 3,467 pounds for children under five years old and 3,415 pounds for children aged five through nine.

The reasons for these differences are not obvious from these data. It may mean that children tend to be where there are larger cars, that larger car drivers have more difficulty seeing smaller pedestrians, that larger car drivers have more difficulty avoiding younger or smaller people, or that larger cars are more dangerous to younger and smaller pedestrians when they strike them.

Table 28: Average of Yearly Average Striking Car Weights in Five-Year Age Groups

Age	Average of Averages
0-4	3,467
5-9	3,415
10-14	3,324
15-19	3,332
20-24	3,313
25-29	3,337
30-34	3,361
35-39	3,344
40-44	3,340
45-49	3,345
50-54	3,314
55-59	3,299
60-64	3,315
65-69	3,311
70-74	3,290
75-79	3,303
80-84	3,320
85 +	3,318
Unknown	3,356
Total	3,340
Under 15	3,407
15-49	3,334
Over 49	3,308

Manufacturers of Cars Involved

American car manufacturers were consistently coded across the twelve years of FARS data. In contrast, foreign car manufacturers were coded in much more detail in 1986 than they had been in 1975. Smaller and newer manufacturers were added over the years. The tables in this section reflect this development. In the early years, many foreign cars were coded as having an unspecified (unknown whether foreign or domestic) country of origin.

Table 29 shows the number of cars by whether manufactured here or abroad for each single-car pedestrian fatality. The tables show the increased popularity of foreign makes. This same trend appears in Table 30, which shows single-car driver deaths. Tables 29 and 30 were combined to produce the fatality ratio -- the number of pedestrian deaths divided by the number of driver deaths in single-vehicle accidents for each car make and each accident year (Table 31).

Table 29: Country of Origin of Cars that Struck Pedestrians -- All Ages, Including Unknown Age

Origin	1975	1976	1977	1978	1979	1980
Domestic Make	4,531	4,290	4,265	4,168	4,191	3,993
Foreign Make	348	348	407	432	456	544
Unknown Make	76	65	56	32	25	21
Total	4,955	4,703	4,728	4,632	4,672	4,558

Origin	1981	1982	1983	1984	1985	1986
Domestic Make	3,906	3,631	3,289	3,409	3,065	3,081
Foreign Make	541	604	663	667	664	675
Unknown Make	6	207	67	108	90	121
Total	4,453	4,442	4,019	4,184	3,819	3,877

Table 30: Country of Origin of Car Driver Deaths

Origin	1975	1976	1977	1978	1979	1980
Domestic Make	6,812	6,881	6,701	6,980	7,039	7,284
Foreign Make	995	1,109	1,243	1,409	1,484	1,755
Unknown Make	217	199	106	116	95	25
Total	8,024	8,189	8,050	8,505	8,618	9,064

Origin	1981	1982	1983	1984	1985	1986
Domestic Make	6,726	5,701	5,570	5,767	5,204	5,775
Foreign Make	1,798	1,642	1,650	1,696	1,788	1,847
Unknown Make	27	13	6	4	14	3
Total	8,551	7,356	7,226	7,467	7,006	7,625

Table 31: Ratio of Pedestrian and Driver Deaths by Country of Origin -- All Ages, Including Unknown Age

Origin	1975	1976	1977	1978	1979	1980
Domestic Make	0.665	0.623	0.636	0.597	0.595	0.548
Foreign Make	0.350	0.314	0.327	0.307	0.307	0.310
Unknown Make	0.350	0.327	0.528	0.276	0.263	0.840
Total	0.618	0.574	0.587	0.545	0.542	0.503

Origin	1981	1982	1983	1984	1985	1986
Domestic Make	0.581	0.637	0.590	0.591	0.589	0.534
Foreign Make	0.301	0.368	0.402	0.393	0.371	0.365
Unknown Make	0.222	15.923	11.167	27.000	6.429	40.333
Total	0.521	0.604	0.556	0.560	0.545	0.508

The fatality ratios are consistently larger for domestic than for foreign manufacturers. This may be, at least in part, because domestic cars tend to be larger than foreign cars. The higher fatality ratios for larger cars are discussed in a later section of this report.

Tables 32 through 34 present pedestrian fatality counts by victim age. They show that younger pedestrians were more frequently struck by a domestic car than were the two older age groups. This is consistent with the finding that younger people were struck by larger cars.

Table 32: Country of Origin of Cars that Struck Pedestrians
-- Those Under 15 Years Old

Origin	1975	1976	1977	1978	1979	1980
Domestic Make	1,273	1,122	1,004	958	868	797
Foreign Make	47	71	46	83	75	51
Unknown Make	10	9	9	5	5	3
Total	1,330	1,202	1,059	1,046	948	851

Origin	1981	1982	1983	1984	1985	1986
Domestic Make	727	640	595	595	550	549
Foreign Make	59	86	95	85	87	84
Unknown Make	0	13	10	12	10	8
Total	786	739	700	692	647	641

Table 33: Country of Origin of Cars that Struck Pedestrians
-- Those 15 through 49 Years Old

Origin	1975	1976	1977	1978	1979	1980
Domestic Make	1,521	1,534	1,557	1,642	1,744	1,688
Foreign Make	130	116	170	172	179	248
Unknown Make	29	30	17	13	6	11
Total	1,680	1,680	1,744	1,827	1,929	1,947

Origin	1981	1982	1983	1984	1985	1986
Domestic Make	1,692	1,698	1,452	1,509	1,262	1,401
Foreign Make	263	291	303	293	316	325
Unknown Make	4	141	41	57	56	77
Total	1,959	2,130	1,796	1,859	1,634	1,803

Table 34: Country of Origin of Cars that Struck Pedestrians
-- Those Over 49 Years Old

Origin	1975	1976	1977	1978	1979	1980
Domestic Make	1,696	1,590	1,635	1,508	1,497	1,429
Foreign Make	165	159	185	172	194	234
Unknown Make	37	24	28	13	14	7
Total	1,898	1,773	1,848	1,693	1,705	1,670

Origin	1981	1982	1983	1984	1985	1986
Domestic Make	1,395	1,226	1,197	1,254	1,201	1,087
Foreign Make	206	218	257	278	250	259
Unknown Make	2	48	16	36	23	31
Total	1,603	1,492	1,470	1,568	1,474	1,377

Available Exposure Measures

The preceding sections describe changes in numbers of pedestrians killed, types of striking vehicles, and sizes of striking cars. These, coupled with observed differences in vehicle type and car size distributions by pedestrian age, suggest many questions about which vehicles are most likely to strike and kill which pedestrians. Unfortunately, the data that would be most useful for answering these questions do not exist.

Fatality counts measure unsuccessful vehicle-pedestrian interactions. They do not, by themselves, explain why some vehicles kill more pedestrians than do others. Some vehicles are more common, some are driven more miles, some are more often driven near pedestrians, some are driven by less-experienced or less-careful drivers, some are less able to avoid pedestrians, and some are more harmful to pedestrians they hit. In addition, pedestrians may be better able to avoid collisions with some vehicles than with others.

Three attempts to put pedestrian fatalities by vehicle type and car size in a wider perspective are described here. None is entirely satisfactory. None can do what detailed data on vehicle use (exposure data) could do if they were available.

Single-Vehicle Driver Deaths:

Because there are substantially more cars than heavy trucks, there should be both more car driver fatalities and more pedestrians killed by cars. This example suggests the possibility that the number of driver deaths in a particular vehicle type (or size car) might usefully control for large differences in numbers of vehicles in use (annual registrations by type), amounts of use (vehicle miles traveled by type), and riskiness of use (potential vehicle-pedestrian interactions by type). It is not known how accurately differences in vehicle registrations, travel, and risk to pedestrians are reflected in the number of driver fatalities. The idea makes some sense, but may not be sensitive enough for understanding changes and differences in pedestrian fatal involvements.

The method is as follows. Pedestrian deaths per population (Tables 11 through 14) were combined with single-vehicle driver fatalities (Table 15) and total annual population (Table 5) to in an effort to reduce the effect of general accident, vehicle use, and demographic trends (Tables 35 through 38). The implicit assumptions (which may or may not be reasonable ones) are that driver fatalities are a good surrogate for vehicle use, that vehicles are equally protective of their drivers in single-vehicle accidents, and that the observed differences reflect how well different vehicles avoid pedestrians or how aggressive they are to pedestrians they do not avoid.

The procedure is illustrated using pedestrians under 15 years old struck by cars in 1976. In the example, figures have been rounded for clarity. The actual calculations retained several decimal places for greater accuracy.

1) The number of single-vehicle car driver deaths was
   8,189 in 1976.

2) The population, all ages, was
   215,465 in 1975 and
   217,563 in 1976.

3) The population-adjusted number of single-vehicle car driver deaths was
   8,189 * (215,465/217,563)
   = 8,189 * 0.990
   = 8,110 in 1976, standardized to 1975.

4) Pedestrian fatalities per million population under 15 years old struck by cars was
   1,000 * 1,202 / 53,376
   = 22.5 in 1976.

5) Pedestrian fatalities per million population under 15 years old struck by cars, per thousand single-vehicle car driver deaths (standardized to the 1975 total population) was
   1000 * 22.5 / 8,110
   = 2.78 in 1976.

In effect, pedestrian fatalities per population were standardized by driver fatalities in the same vehicle type. Standardized pedestrian deaths decreased among people under 15 years old struck by cars, motorcycles, and light trucks. Deaths of pedestrians involved with heavy trucks changed from year to year, but not with the trend apparent among smaller vehicle types. Among pedestrians aged 15 through 49, standardized fatalities were fairly stable over the twelve years. The older pedestrians (over 49 years old) showed the same tendencies observed among the young group. Whatever has caused the standardized pedestrian fatality decrease, it does not seem to have affected the middle age group.

Table 35: Body Types of Vehicles that Struck Pedestrians
-- per Million People Under 15 Years Old
-- and per Thousand Single-Vehicle Driver Deaths
(Standardized to 1975 Population)

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Total
1975	3.05	0.28	2.57	1.84	3.25	2.80
1976	2.78	0.38	2.37	2.21	2.75	2.60
1977	2.55	0.30	2.26	1.43	2.82	2.32
1978	2.44	0.32	2.24	1.77	3.33	2.28
1979	2.23	0.16	1.97	2.04	3.20	2.07
1980	1.93	0.25	2.01	1.66	2.19	1.84
1981	1.91	0.23	1.67	1.82	1.96	1.77
1982	2.10	0.11	2.01	1.69	2.55	1.88
1983	2.04	0.12	2.11	1.50	2.66	1.86
1984	1.96	0.21	1.96	1.16	2.08	1.76
1985	1.97	0.15	2.32	1.62	2.14	1.81
1986	1.81	0.08	1.87	1.91	1.93	1.68

Table 36: Body Types of Vehicles that Struck Pedestrians
-- per Million People 15 through 49 Years Old
-- and per Thousand Single-Vehicle Driver Deaths
(Standardized to 1975 Population)

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Total
1975	1.97	0.15	1.92	2.52	1.57	2.20
1976	1.91	0.17	1.63	2.66	1.44	2.13
1977	2.00	0.11	1.98	2.06	1.44	2.19
1978	1.96	0.15	1.76	2.62	1.41	2.19
1979	2.03	0.13	2.14	2.75	1.47	2.32
1980	1.94	0.19	1.85	2.98	1.22	2.23
1981	2.06	0.13	1.88	2.98	1.38	2.35
1982	2.60	0.20	2.29	3.52	1.37	2.67
1983	2.22	0.14	2.22	3.85	1.50	2.42
1984	2.22	0.17	2.11	2.46	1.55	2.33
1985	2.07	0.13	2.24	3.67	1.45	2.31
1986	2.09	0.19	1.90	3.85	1.45	2.24

Table 37: Body Types of Vehicles that Struck Pedestrians
-- per Million People Over 49 Years Old
-- and per Thousand Single-Vehicle Driver Deaths
(Standardized to 1975 Population)

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Total
1975	4.32	0.56	4.18	3.99	3.53	4.36
1976	3.93	0.41	3.98	3.85	4.27	4.05
1977	4.14	0.43	4.09	4.16	3.59	4.17
1978	3.57	0.32	3.38	4.20	3.33	3.63
1979	3.54	0.26	3.64	3.48	3.53	3.60
1980	3.28	0.33	3.59	4.12	3.01	3.41
1981	3.34	0.37	3.21	3.98	2.93	3.40
1982	3.62	0.40	3.34	4.01	2.77	3.42
1983	3.63	0.25	3.42	4.45	2.47	3.46
1984	3.76	0.24	3.25	4.31	3.12	3.48
1985	3.77	0.33	3.57	4.55	3.10	3.58
1986	3.24	0.19	3.08	4.77	3.38	3.18

Table 38: Body Types of Vehicles that Struck Pedestrians
-- per Million People of All Ages, Including Unknown Age
-- and per Thousand Single-Vehicle Driver Deaths
(Standardized to 1975 Population)

Year	Car	Motor cycle	Light truck	Heavy truck	Other	Total
1975	2.87	0.29	2.68	2.80	2.53	2.93
1976	2.67	0.28	2.44	2.86	2.52	2.76
1977	2.73	0.24	2.63	2.47	2.38	2.78
1978	2.53	0.24	2.33	2.89	2.39	2.63
1979	2.52	0.17	2.54	2.84	2.42	2.65
1980	2.33	0.24	2.39	3.07	1.92	2.50
1981	2.42	0.22	2.23	3.06	1.97	2.57
1982	2.80	0.24	2.54	3.29	2.02	2.74
1983	2.58	0.16	2.54	3.56	2.04	2.61
1984	2.60	0.20	2.42	2.69	2.09	2.55
1985	2.53	0.19	2.64	3.49	2.05	2.58
1986	2.36	0.17	2.24	3.77	2.09	2.40

A similar procedure was used to standardize pedestrian fatalities by car size. The pedestrian fatalities struck by cars per population (Tables 20 through 23) were combined with the single-vehicle car driver deaths (Table 24) and total annual population (Table 5) to adjust for general accident, car use, and demographic trends (Tables 39 through 42). The procedure is similar to that used to produce Tables 35 through 38.

Table 39: Size of Cars that Struck Pedestrians
-- per Million People Under 15 Years Old
-- and per Thousand Single-Vehicle Driver Deaths
(Standardized to 1975 Population)

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	1.11	1.25	2.42	2.91	3.89	5.64	2.68	3.05
1976	1.41	1.38	1.82	2.64	3.95	4.58	2.42	2.78
1977	0.67	1.13	2.20	2.58	3.29	4.37	2.13	2.55
1978	0.94	1.60	1.79	2.26	2.89	5.00	1.83	2.44
1979	0.90	1.24	1.75	2.11	2.97	3.91	1.77	2.23
1980	0.76	0.85	1.51	1.94	2.58	3.42	1.53	1.93
1981	0.49	1.19	1.45	2.18	2.70	3.22	1.24	1.91
1982	1.33	1.37	1.57	1.74	3.28	3.71	1.81	2.10
1983	1.39	1.07	1.36	2.15	2.51	3.98	2.24	2.04
1984	1.01	1.20	1.36	1.84	3.33	3.41	2.02	1.96
1985	0.89	1.33	1.20	2.33	3.12	3.57	2.05	1.97
1986	1.17	1.21	1.29	1.86	2.94	3.20	2.20	1.81

Table 40: Size of Cars that Struck Pedestrians
-- per Million People 15 through 49 Years Old
-- and per Thousand Single-Vehicle Driver Deaths
(Standardized to 1975 Population)

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	1.38	1.27	1.57	2.15	2.44	3.15	1.61	1.97
1976	0.93	1.29	1.32	1.84	2.34	3.43	1.63	1.91
1977	1.26	1.30	1.61	1.99	2.51	3.11	1.66	2.00
1978	1.17	1.16	1.61	1.88	2.54	3.49	1.43	1.96
1979	1.09	0.96	1.54	2.04	2.83	3.37	1.56	2.03
1980	1.07	1.40	1.63	1.76	2.38	3.11	1.69	1.94
1981	1.41	1.36	1.78	1.93	2.63	3.49	1.59	2.06
1982	1.65	1.52	1.76	2.52	3.21	4.01	3.75	2.60
1983	1.51	1.55	1.76	2.33	2.88	3.22	2.34	2.22
1984	1.17	1.70	1.75	2.04	2.81	3.95	2.61	2.22
1985	1.60	1.53	1.56	2.19	2.88	2.66	2.81	2.07
1986	1.44	1.58	1.46	1.97	3.24	2.94	3.66	2.09

Table 41: Size of Cars that Struck Pedestrians
-- per Million People Over 49 Years Old
-- and per Thousand Single-Vehicle Driver Deaths
(Standardized to 1975 Population)

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	3.27	3.11	3.81	3.87	5.19	7.25	3.73	4.32
1976	2.99	3.44	2.79	3.55	4.64	6.77	3.35	3.93
1977	2.54	3.26	3.07	3.81	4.43	7.11	3.78	4.14
1978	2.58	2.64	3.04	3.21	4.48	6.14	2.65	3.57
1979	2.50	2.28	3.21	3.52	4.24	5.55	2.72	3.54
1980	2.81	2.43	2.35	3.07	3.84	5.03	3.11	3.28
1981	1.74	2.31	2.59	3.37	4.45	5.55	2.56	3.34
1982	2.14	2.66	2.37	3.68	4.70	5.29	4.38	3.62
1983	2.99	2.50	2.63	3.81	4.07	6.18	3.91	3.63
1984	3.05	3.13	2.91	3.73	4.67	5.66	3.88	3.76
1985	2.76	2.70	3.09	3.86	4.84	6.26	4.50	3.77
1986	2.47	2.69	2.83	3.02	4.28	4.42	4.61	3.24

Table 42: Size of Cars that Struck Pedestrians
-- per Million People of All Ages, Including Unknown Age
-- and per Thousand Single-Vehicle Driver Deaths
(Standardized to 1975 Population)

Year	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
1975	1.85	1.75	2.38	2.79	3.54	4.87	2.44	2.87
1976	1.60	1.87	1.83	2.50	3.36	4.62	2.29	2.67
1977	1.46	1.78	2.16	2.64	3.25	4.54	2.35	2.73
1978	1.50	1.66	2.06	2.35	3.15	4.59	1.88	2.53
1979	1.43	1.41	2.06	2.49	3.27	4.16	1.95	2.52
1980	1.47	1.57	1.83	2.20	2.86	3.75	2.07	2.33
1981	1.32	1.60	1.95	2.42	3.21	4.06	1.82	2.42
1982	1.76	1.82	1.91	2.71	3.68	4.34	3.53	2.80
1983	1.90	1.69	1.92	2.73	3.15	4.20	2.77	2.58
1984	1.65	2.00	2.00	2.47	3.46	4.33	2.86	2.60
1985	1.77	1.82	1.92	2.69	3.51	3.80	3.15	2.53
1986	1.66	1.80	1.81	2.25	3.51	3.41	3.67	2.36

In general, the larger the car the more pedestrians killed per thousand driver fatalities in single-vehicle accidents. It is not possible from these data to determine the reasons for this pattern: whether larger cars are driven near more pedestrians, protect their drivers better, are less able to avoid pedestrians, or are more aggressive to pedestrians that they strike.

Nonfatal Pedestrian Injuries:

Five years of data from the National Accident Sampling System (NASS, 1982 through 1986) were used to investigate pedestrian injuries and fatalities by striking vehicle type and car size. Table 43 shows estimated annual averages from NASS data, with injuries to survivors categorized using the Abbreviated Injury Scale (AIS). National estimates produced by NASS are not accurate enough for trend analysis. The average annual estimates were produced from a straight average of the five annual estimates from NASS.

Most pedestrians involved in police-reported accidents were injured. The fatality rate increased with increasing striking vehicle size (motorcycle, car, light truck, and heavy truck). The injury rates (AIS 2 or AIS 3 and above, including all fatalities) did not show this pattern. They are based on a larger number of raw cases and should be more accurate than the fatality rates. Therefore, the possibility must be considered that the fatality rate pattern was caused by chance.

Table 43: Body Types of Vehicles that Struck Pedestrians
-- National Annual Average Estimates of Police-Reported Involvements

Injury	Car	Motor cycle	Light truck	Heavy truck	Other	Unknown	Multi-vehicle	Total
Injured?								
--No	23,874	96	21,112	97	2,087	0	619	47,885
--Unknown	3,886	0	764	0	0	0	0	4,650
--Yes:								
Survivor								
AIS=1	251,631	4,284	34,139	4,749	8,758	1,171	11,958	316,690
AIS=2	76,119	2,777	11,950	1,417	2,763	1,139	6,113	102,278
AIS=3	52,206	1,135	7,243	980	1,704	578	2,717	66,563
AIS=4	5,539	112	713	764	159	141	414	7,842
AIS=5	3,123	177	255	72	0	0	83	3,710
Unknown	53,722	251	7,572	2,242	2,859	2,385	4,020	73,051
Fatality	17,871	187	4,764	763	1,555	996	2,108	28,244
Total	487,971	9,019	88,512	11,084	19,885	6,410	28,032	650,913
Percent:								
Injured	94.3%	98.9%	75.3%	99.1%	89.5%	100.0%	97.8%	91.9%
AIS>=2	31.7%	48.7%	28.2%	36.1%	31.1%	44.5%	40.8%	32.1%
AIS>=3	16.1%	17.9%	14.7%	23.3%	17.2%	26.8%	19.0%	16.3%
Fatality	3.7%	2.1%	5.4%	6.9%	7.8%	15.5%	7.5%	4.3%
Raw counts:								
Survivors	2,760	58	387	60	87	37	181	3,570
Fatalities	206	3	61	13	16	13	23	335
Total	2,966	61	448	73	103	50	204	3,905

The small number of fatalities investigated by NASS (335 pedestrian fatalities in these five years) makes estimates from them particularly susceptible to sampling error. For this reason, Table 44 was calculated using NASS survivors (Table 43) and FARS fatalities (Table 10) for these five years. FARS indicates that NASS underestimated pedestrian fatalities. Fatality rates from the NASS-FARS data are higher than the straight NASS rates, but preserve the order across vehicle type.

Table 44: Body Types of Vehicles that Struck Pedestrians
-- National Annual Average Estimates of Police-Reported Involvements
Supplemented with FARS Fatalities

Injury	Car	Motor cycle	Light truck	Heavy truck	Other	Unknown	Multi-vehicle	Total
Injured?								
--No	23,874	96	21,112	97	2,087	0	619	47,885
--Unknown	3,886	0	764	0	0	0	0	4,650
--Yes:								
Survivor								
AIS=1	251,631	4,284	34,139	4,749	8,758	1,171	11,958	316,690
AIS=2	76,119	2,777	11,950	1,417	2,763	1,139	6,113	102,278
AIS=3	52,206	1,135	7,243	980	1,704	578	2,717	66,563
AIS=4	5,539	112	713	764	159	141	414	7,842
AIS=5	3,123	177	255	72	0	0	83	3,710
Unknown	53,722	251	7,572	2,242	2,859	2,385	4,020	73,051
Fatality	20,341	365	6,192	1,889	1,149	2,473	2,360	34,769
Total	490,441	9,197	89,940	12,210	19,479	7,887	28,284	657,438
Percent:								
Injured	94.3%	99.0%	75.7%	99.2%	89.3%	100.0%	97.8%	92.0%
AIS>=2	32.1%	49.6%	29.3%	41.9%	29.6%	54.9%	41.3%	32.7%
AIS>=3	16.6%	19.5%	16.0%	30.3%	15.5%	40.5%	19.7%	17.2%
Fatality	4.1%	4.0%	6.9%	15.5%	5.9%	31.4%	8.3%	5.3%

Table 43 and 44 suggest higher serious injury rates (fatalities plus survivors injured at AIS 3 and above) for heavy trucks, but do not show marked differences among other vehicle types.

Table 45 shows NASS estimates of pedestrians struck, by car size. Almost all struck pedestrians were injured. The data do not indicate that larger cars are more aggressive to pedestrians, using either injury, moderate injury (AIS 2 and greater), serious injury (AIS 3 and greater), or fatality as the criteria.

Table 45: Size of Cars that Struck Pedestrians
National Estimates of Police-Reported Involvements

Injury	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
Injured?								
--No	417	2,556	1,244	3,464	2,092	3,256	10,844	23,873
--Unknown	0	542	132	65	179	1,422	1,547	3,887
--Yes:								
Survivor								
AIS=1	7,640	32,120	28,756	45,560	37,644	43,392	56,520	251,632
AIS=2	2,066	11,952	10,019	11,120	14,400	16,681	9,883	76,121
AIS=3	2,290	8,318	7,811	8,773	8,550	9,971	6,492	52,205
AIS=4	170	800	1,188	1,014	467	1,382	517	5,538
AIS=5	75	148	747	338	692	1,037	86	3,123
Unknown	1,782	6,473	5,581	8,998	7,778	9,144	13,965	53,721
Fatality	213	2,669	3,679	3,395	2,496	4,308	1,112	17,872
Total	14,653	65,578	59,157	82,727	74,298	90,593	100,966	487,972
Percent:								
Injured	97.2%	95.3%	97.7%	95.7%	96.9%	94.8%	87.7%	94.3%
AIS>=2	32.9%	36.4%	39.6%	29.8%	35.8%	36.8%	17.9%	31.7%
AIS>=3	18.8%	18.2%	22.7%	16.3%	16.4%	18.4%	8.1%	16.1%
Fatality	1.5%	4.1%	6.2%	4.1%	3.4%	4.8%	1.1%	3.7%
Raw counts:								
Survivors	90	376	369	505	486	542	392	2,760
Fatalities	2	37	35	39	31	46	16	206
Total	92	413	404	544	517	588	408	2,966

Table 46 is based on NASS (survivors) and FARS (fatalities) data. Again, the results do not indicate higher fatality rates for pedestrians struck by larger cars.

Table 46: Size of Cars that Struck Pedestrians
National Estimates of Police-Reported Involvements
Supplemented with FARS Fatalities

Injury	Mini-compact	Sub-compact	Compact	Inter-mediate	Full-sized	Largest	Unknown	Total
Injured?								
--No	417	2,556	1,244	3,464	2,092	3,256	10,844	23,873
--Unknown	0	542	132	65	179	1,422	1,547	3,887
--Yes:								
Survivor								
AIS=1	7,640	32,120	28,756	45,560	37,644	43,392	56,520	251,632
AIS=2	2,066	11,952	10,019	11,120	14,400	16,681	9,883	76,121
AIS=3	2,290	8,318	7,811	8,773	8,550	9,971	6,492	52,205
AIS=4	170	800	1,188	1,014	467	1,382	517	5,538
AIS=5	75	148	747	338	692	1,037	86	3,123
Unknown	1,782	6,473	5,581	8,998	7,778	9,144	13,965	53,721
Fatality	1,050	2,687	2,831	4,302	3,911	3,103	2,457	20,341
Total	15,490	65,596	58,309	83,634	75,713	89,388	102,311	490,441
Percent:								
Injured	97.3%	95.3%	97.6%	95.8%	97.0%	94.8%	87.9%	94.3%
AIS>=2	36.5%	36.4%	38.8%	30.5%	37.0%	36.0%	19.0%	32.1%
AIS>=3	23.1%	18.2%	21.6%	17.3%	18.0%	17.3%	9.3%	16.6%
Fatality	6.8%	4.1%	4.9%	5.1%	5.2%	3.5%	2.4%	4.1%

Registered Vehicles:

Data were not readily available for registered vehicles by car size except for accident years 1983 and 1984. Table 47 shows counts of pedestrian fatalities, registered vehicles, and pedestrian fatalities per million registered vehicles for 1983 and 1984. Subcompact, compact, and the largest cars have the lowest fatalities per million registered vehicles. These were the cars with the lowest fatalities per involved pedestrian from FARS and NASS data, shown in Table 46.

There is no pattern of increasing or decreasing fatality rates with vehicle size. Thus, vehicle mass alone does not appear to be the crucial factor in pedestrian fatality causation. It appears more likely that different cars are bought for different purposes, and that these purposes determine the likelihood of involvement with a pedestrian. Again, detailed exposure data could be used to describe where vehicles are used and how this use differs by vehicle type, by car size, and over time.

Table 47: Pedestrian Deaths per Million Registered Vehicles

1983 Data:

Car Size	Pedestrian Fatalities	Registered Vehicles	Fatalities/ Million Cars
Minicompact	234	4,359,821	53.7
Subcompact	425	15,294,478	27.8
Compact	520	15,873,408	32.8
Intermediate	891	17,154,091	51.9
Fullsized	768	15,560,716	49.4
Largest	693	22,194,977	31.2
Unknown	488	17,095,429	28.5
Total	4,019	107,532,920	37.4

1984 Data:

Car Size	Pedestrian Fatalities	Registered Vehicles	Fatalities/ Million Cars
Minicompact	202	4,373,867	46.2
Subcompact	561	17,439,897	32.2
Compact	602	17,418,566	34.6
Intermediate	881	17,878,456	49.3
Fullsized	800	15,619,257	51.2
Largest	685	20,302,825	33.7
Unknown	453	17,564,218	25.8
Total	4,184	110,597,086	37.8

Appendix

Table A: Pedestrian Deaths in Five-Year Groups

Age	1975	1976	1977	1978	1979	1980
0-4	548	510	433	459	423	393
5-9	815	782	729	722	671	582
10-14	449	421	383	401	354	363
15-19	616	664	680	705	766	751
20-24	550	550	639	676	795	830
25-29	388	421	474	500	597	617
30-34	298	321	374	428	440	472
35-39	292	249	293	337	361	363
40-44	301	313	298	310	353	316
45-49	336	335	312	340	314	343
50-54	387	416	398	406	414	369
55-59	378	338	367	386	371	401
60-64	330	363	441	383	384	366
65-69	396	372	396	394	408	384
70-74	424	391	422	387	400	372
75-79	431	386	428	357	389	444
80-84	325	325	325	299	281	297
85 +	168	189	208	171	207	231
Unknown	84	81	132	134	168	176
Total	7,516	7,427	7,732	7,795	8,096	8,070

Age	1981	1982	1983	1984	1985	1986
0-4	330	344	332	311	345	302
5-9	549	472	441	450	454	459
10-14	329	301	304	303	242	262
15-19	653	662	538	486	476	474
20-24	802	816	711	708	647	641
25-29	665	617	602	614	567	640
30-34	535	492	479	507	473	470
35-39	375	455	363	384	423	439
40-44	328	324	316	351	334	324
45-49	332	328	280	294	274	333
50-54	359	307	314	324	297	291
55-59	364	301	318	333	357	315
60-64	347	328	336	366	337	279
65-69	350	325	307	299	284	273
70-74	395	363	293	332	346	315
75-79	371	356	307	329	341	346
80-84	296	236	276	290	282	285
85 +	216	169	205	213	201	211
Unknown	241	135	104	131	128	120
Total	7,837	7,331	6,826	7,025	6,808	6,779

Table B: Population in Thousands in Five-Year Groups

Age	1975	1976	1977	1978	1979	1980
0-4	16,121	15,617	15,564	15,735	16,063	16,458
5-9	17,594	17,671	17,530	17,300	16,947	16,609
10-14	20,646	20,088	19,504	18,920	18,445	18,236
15-19	21,223	21,478	21,477	21,435	21,348	21,104
20-24	19,317	19,794	20,311	20,748	21,096	21,380
25-29	17,183	18,177	18,180	18,585	19,077	19,697
30-34	14,131	14,428	15,661	16,218	16,961	17,754
35-39	11,585	11,883	12,310	13,052	13,592	14,080
40-44	11,175	11,147	11,190	11,321	11,522	11,726
45-49	11,778	11,646	11,495	11,352	11,212	11,048
50-54	11,971	11,969	11,868	11,814	11,724	11,698
55-59	10,646	10,884	11,191	11,425	11,582	11,616
60-64	9,399	9,502	9,588	9,687	9,866	10,145
65-69	8,132	8,318	8,491	8,626	8,745	8,812
70-74	5,785	5,919	6,147	6,370	6,593	6,841
75-79	4,246	4,345	4,415	4,571	4,724	4,828
80-84	2,712	2,800	2,847	2,841	2,875	2,954
85 +	1,821	1,896	1,992	2,095	2,197	2,270
Total	215,465	217,563	219,760	222,095	224,567	227,255

Age	1981	1982	1983	1984	1985	1986
0-4	16,931	17,298	17,650	17,830	18,017	18,128
5-9	16,093	16,020	16,147	16,464	16,822	17,291
10-14	18,312	18,172	17,912	17,511	17,101	16,564
15-19	20,501	19,887	19,274	18,785	18,552	18,610
20-24	21,614	21,587	21,488	21,327	21,000	20,417
25-29	20,200	20,753	21,202	21,535	21,758	22,010
30-34	18,786	18,808	19,211	19,696	20,269	20,774
35-39	14,381	15,599	16,165	16,932	17,708	18,723
40-44	12,019	12,450	13,135	13,614	14,055	14,346
45-49	10,992	11,027	11,226	11,463	11,646	11,927
50-54	11,616	11,455	11,213	11,032	10,943	10,887
55-59	11,579	11,510	11,528	11,444	11,341	11,268
60-64	10,376	10,603	10,705	10,872	10,994	10,962
65-69	8,917	9,039	9,182	9,286	9,432	9,661
70-74	6,997	7,158	7,312	7,453	7,571	7,664
75-79	4,952	5,087	5,227	5,363	5,496	5,629
80-84	3,018	3,093	3,168	3,247	3,330	3,422
85 +	2,353	2,450	2,539	2,624	2,707	2,796
Total	229,637	231,996	234,284	236,477	238,741	241,078

Table C: Pedestrian Deaths per Million People in Five-Year Age Groups

Age	1975	1976	1977	1978	1979	1980
0-4	34.0	32.7	27.8	29.2	26.3	23.9
5-9	46.3	44.3	41.6	41.7	39.6	35.0
10-14	21.7	21.0	19.6	21.2	19.2	19.9
15-19	29.0	30.9	31.7	32.9	35.9	35.6
20-24	28.5	27.8	31.5	32.6	37.7	38.8
25-29	22.6	23.2	26.1	26.9	31.3	31.3
30-34	21.1	22.2	23.9	26.4	25.9	26.6
35-39	25.2	21.0	23.8	25.8	26.6	25.8
40-44	26.9	28.1	26.6	27.4	30.6	26.9
45-49	28.5	28.8	27.1	30.0	28.0	31.0
50-54	32.3	34.8	33.5	34.4	35.3	31.5
55-59	35.5	31.1	32.8	33.8	32.0	34.5
60-64	35.1	38.2	46.0	39.5	38.9	36.1
65-69	48.7	44.7	46.6	45.7	46.7	43.6
70-74	73.3	66.1	68.7	60.8	60.7	54.4
75-79	101.5	88.8	96.9	78.1	82.3	92.0
80-84	119.8	116.1	114.2	105.2	97.7	100.5
85 +	92.3	99.7	104.4	81.6	94.2	101.8
Total	34.9	34.1	35.2	35.1	36.1	35.5

Age	1981	1982	1983	1984	1985	1986
0-4	19.5	19.9	18.8	17.4	19.1	16.7
5-9	34.1	29.5	27.3	27.3	27.0	26.5
10-14	18.0	16.6	17.0	17.3	14.2	15.8
15-19	31.9	33.3	27.9	25.9	25.7	25.5
20-24	37.1	37.8	33.1	33.2	30.8	31.4
25-29	32.9	29.7	28.4	28.5	26.1	29.1
30-34	28.5	26.2	24.9	25.7	23.3	22.6
35-39	26.1	29.2	22.5	22.7	23.9	23.4
40-44	27.3	26.0	24.1	25.8	23.8	22.6
45-49	30.2	29.7	24.9	25.6	23.5	27.9
50-54	30.9	26.8	28.0	29.4	27.1	26.7
55-59	31.4	26.2	27.6	29.1	31.5	28.0
60-64	33.4	30.9	31.4	33.7	30.7	25.5
65-69	39.3	36.0	33.4	32.2	30.1	28.3
70-74	56.5	50.7	40.1	44.5	45.7	41.1
75-79	74.9	70.0	58.7	61.3	62.0	61.5
80-84	98.1	76.3	87.1	89.3	84.7	83.3
85 +	91.8	69.0	80.7	81.2	74.3	75.5
Total	34.1	31.6	29.1	29.7	28.5	28.1

Table D: Average Weight of Cars that Struck Pedestrians in Five-Year Age Groups

Age	1975	1976	1977	1978	1979	1980
0-4	3,575	3,601	3,571	3,641	3,409	3,502
5-9	3,565	3,517	3,563	3,519	3,542	3,515
10-14	3,505	3,462	3,457	3,467	3,501	3,472
15-19	3,424	3,483	3,446	3,512	3,490	3,401
20-24	3,451	3,517	3,415	3,470	3,421	3,378
25-29	3,443	3,565	3,494	3,441	3,423	3,451
30-34	3,497	3,638	3,474	3,468	3,491	3,380
35-39	3,444	3,609	3,505	3,426	3,618	3,361
40-44	3,469	3,489	3,426	3,589	3,403	3,375
45-49	3,428	3,456	3,492	3,534	3,497	3,323
50-54	3,362	3,384	3,503	3,440	3,346	3,397
55-59	3,498	3,448	3,526	3,443	3,320	3,273
60-64	3,499	3,527	3,430	3,510	3,426	3,273
65-69	3,396	3,525	3,432	3,463	3,472	3,371
70-74	3,416	3,512	3,481	3,424	3,314	3,340
75-79	3,456	3,502	3,542	3,425	3,453	3,294
80-84	3,492	3,373	3,415	3,464	3,353	3,549
85 +	3,377	3,477	3,444	3,405	3,444	3,347
Unknown	3,352	3,694	3,645	3,518	3,480	3,389
Total	3,471	3,508	3,486	3,486	3,446	3,396

Age	1981	1982	1983	1984	1985	1986
0-4	3,534	3,446	3,373	3,387	3,250	3,321
5-9	3,390	3,333	3,348	3,259	3,315	3,109
10-14	3,306	3,222	3,211	3,215	3,033	3,040
15-19	3,271	3,301	3,210	3,210	3,109	3,128
20-24	3,338	3,298	3,236	3,183	3,019	3,025
25-29	3,332	3,244	3,221	3,241	3,114	3,071
30-34	3,320	3,256	3,287	3,252	3,151	3,118
35-39	3,287	3,317	3,194	3,251	3,074	3,050
40-44	3,327	3,328	3,165	3,177	3,140	3,191
45-49	3,509	3,382	3,243	3,228	2,982	3,068
50-54	3,396	3,322	3,407	3,114	3,093	3,008
55-59	3,321	3,298	3,218	3,086	3,136	3,016
60-64	3,319	3,248	3,279	3,098	3,139	3,037
65-69	3,330	3,254	3,089	3,200	3,144	3,052
70-74	3,277	3,218	3,206	3,126	3,113	3,047
75-79	3,368	3,297	3,120	3,086	3,076	3,022
80-84	3,425	3,217	3,245	3,225	3,124	2,962
85 +	3,395	3,267	3,229	3,255	3,125	3,054
Unknown	3,439	3,203	3,284	3,130	3,010	3,131
Total	3,354	3,291	3,241	3,199	3,121	3,075

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