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**Fatal and Serious-Injury Traffic Crash Trends  
in Michigan: 1997-2001**

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16. Abstract <p>Michigan vehicle crashes from 1997-2001 that resulted in fatalities or serious injuries (KA crashes) were analyzed for patterns and trends. Counts, rates, and distributions by time, location, age, and sex of involved drivers were obtained for all KA crashes and those in which the driver "had been drinking". Trends in levels of blood alcohol concentration (BAC) of fatal-crash-involved drivers were obtained from Fatality Analysis Reporting System (FARS) data, and safety belt use of KA-crash-involved vehicle occupants was examined. The results show a decrease in counts and rates of involvement in KA crashes and "had been drinking" KA crashes. However, the proportion of "had been drinking" crashes remained at 12% of all KA crashes. Drivers under age 24 continue to have the highest rates for KA crashes, and male drivers age 18-24 have the highest rates of "had been drinking" KA crashes. Of drivers who were tested for BAC levels, 30% had positive BAC levels, 28% were at or above 0.08 g/dl, 26% were at or above 0.10 g/dl, and 19% were at or above 0.15 g/dl. Safety belt use for KA-crash-involved vehicle occupants was lowest for the 18-24 age group. Child seat and safety belt use for KA-crash-involved children under age 5 decreased slightly between 1997 and 2001.</p>					
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## **EXECUTIVE SUMMARY**

This report examines the trends and patterns in Michigan motor vehicle crashes that resulted in at least one death or serious injury (KA crashes) from 1997 to 2001. The objective is to provide the Michigan Office of Highway Safety Planning (OHSP) with information about the trends and changes in the occurrence of these crashes so that they can continue to identify opportunities to reduce crash-related deaths and injuries and evaluate existing efforts.

Between the years 1997 to 2001, the number of licensed drivers in Michigan increased by 13%, the number of registered vehicles increased by 7%, and the number of vehicle miles traveled (VMT) increased by 8%. If the rates of vehicle crash involvement by driver, vehicle, or amount of travel remained at 1997 levels, the numbers of crashes, deaths, and serious injuries resulting from these crashes would have increased. However, during the same period, vehicle crashes in Michigan decreased by 6%, and the number of KA crashes decreased by 27%. The number of people who were killed or seriously injured (sustained KA injuries) in vehicle crashes decreased by 29%. Forecasts based on time-series analysis of present trends indicate that the downward trends in the KA proportions of crashes and in the KA-injured proportions of crash-involved persons can be expected to continue if present traffic safety efforts are sustained.

The pattern of KA crash occurrence by month has changed from 1997 to 2001. Although more crashes per month continue to occur May through August, the proportion of KA crashes that occurred in May has decreased steadily over the five-year period. There were no notable changes in the trends of KA crash occurrence by day of week, highway class, speed limit, or vehicle type. Fridays and Saturdays remained the peak days of the week for KA crashes. The majority of KA crashes continued to occur on city streets and county roads. The greatest portion of KA crashes continued to occur on road segments with 55 mph speed limits, with the majority of these crashes involving passenger cars. The patterns of hazardous actions recorded in KA crashes did not change over the five-year period. Speeding continued to be the most frequently

recorded hazardous action in single-vehicle KA crashes. Failing to yield the right-of-way, following too closely, and violating traffic controls continued to be the most frequent hazardous actions in multiple-vehicle KA crashes.

The numbers and rates of KA crash involvement decreased for drivers of all ages. The decreases in rate per 1,000 licensed drivers ranged from a maximum decrease of 41% for drivers of age 25-34, to the smallest decrease of 31% for drivers of age 18-24. However, despite these decreases, the rates of involvement for young drivers remained much higher than for older drivers. In 2001, drivers under age 18 were involved in 4.38 KA crashes per 1,000 licensed drivers, and drivers age 18-24 were involved in 3.60 KA crashes per 1,000 licensed drivers. In contrast, the rate for drivers age 70 and older was 1.12 KA crashes per 1,000 licensed drivers.

The proportion of male drivers among KA-crash-involved drivers was approximately 60% for all the age groups. The rates of KA involvement for male drivers were higher than those for female drivers in each age category, but the difference between the rates of male and female drivers was greatest in the youngest age groups. Male drivers under age 18 were involved in 5.07 KA crashes per 1,000 licensed drivers, while the rate for women in the same age group was 3.39.

Both the number of KA crashes in which a driver had been drinking and the rate per 1,000 licensed drivers decreased by 30% between 1997 and 2001. There was also a noticeable decrease in the proportion of KA “had been drinking” crashes that occurred in May. The number of KA-crash-involved drivers who had been drinking decreased by 30%, and their rate per 1,000 licensed drivers decreased by 37%. However, the proportion of KA-crash-involved drivers who had been drinking remained at about 12% of all KA-crash-involved drivers during the five-year period. The highest rates of KA-involved drivers who “had been drinking” was among drivers age 18-24. In 2001, their rate of “had been drinking” KA crash involvement was at 0.577 per 1,000 licensed drivers. When only male drivers in this age group were considered, the rate was 0.925 per 1,000 licensed drivers. The second highest rate of KA-had been drinking crash

involvement was among drivers age 25-34. In 2001 their rate of involvement was 0.372 per 1,000 licensed drivers. For male drivers in this group, the rate was 0.604 per 1,000 licensed drivers. In 2001, the rate of “had been drinking” KA crash involvement for drivers under age 18 was 0.147 per 1,000 licensed drivers, with a rate of 0.222 per 1,000 licensed drivers for males in that age category. The lowest “had been drinking” KA crash involvement was among drivers age 70 and older. In 2001, this rate was 0.037 per 1,000 licensed drivers.

Blood alcohol concentration (BAC) levels were examined for drivers involved in fatal crashes only between 1997 and 2001, because BAC data for nonfatal crashes were not available. The pattern of BAC levels did not vary over the five-year period. About one-half of drivers involved in fatal crashes were tested for blood alcohol. Among those, one-third had positive BAC levels. Among drivers with positive BAC levels, about 82% were at or over 0.08 g/dl BAC; about 77% were at or above 0.10 g/dl BAC; and about 56% were at or over 0.15 g/dl BAC. Although the majority of drivers with positive BAC levels were male, the proportion of women among them increased from 13% in 1997 to 18% in 2001.

Safety belt use among drivers and passengers involved in KA crashes increased in 2000 when the primary safety belt enforcement law went into effect, and then decreased in 2001. This is a typical pattern following changes from secondary to primary enforcement for the safety belt law (Eby, Vivoda, and Fordyce, 2002). The net change in safety belt use among all KA-crash-involved drivers was 2%, rising from 70% in 1997 to 72% in 2001. KA-crash-involved passenger safety belt use increased from 55% to 60% over that five-year period. Among drivers who were killed or severely injured, the rate of safety belt use varied between 58% and 61% over the five-year period. Among passengers who were killed or injured in these crashes, the safety belt use rate varied between 50% and 56% over this time period.

The lowest driver safety belt use was among KA-crash-involved drivers age 18-24, with 65% using safety belts in 1997, and 69% using them in 2001. The belt use

of drivers age 25-34 was only slightly higher, with use rates of 66% in 1997 and 70% in 2001. Among KA-crash-involved drivers under age 18 there was a net decrease in belt use from 69% in 1997 to 65% in 2001. The highest safety belt use was among drivers age 70 and older, with a use rate of 80% in 1997 and 84% in 2001.

The use of child safety seats and safety belts among child passengers under age 5 who were involved in KA crashes, decreased from 77% in 1997 to 75% in 2001, after peaking at 83% in 2000. Among child passengers age 5-15 the safety belt use rate increased from 58% to 64% over the five-year period.

KA crashes involving pedestrians, bicycles, motorcycles, and large trucks were also examined in this report. During the five-years between 1997 and 2001, the number of KA crashes involving pedestrians decreased by 19%; the number of KA crashes involving bicycles decreased by 26%; and the number of KA crashes involving motorcycles increased by 11%. The number of KA crashes involving large trucks decreased by 28%. However, the proportion of all KA crashes that involved large trucks over the five-year period remained at 6%.

Helmet use among KA-crash-involved bicyclists in 2001 was 18%, an increase of 6% from 1997. Although it cannot be stated with certainty (because of a large number of cases with missing data on motorcycle helmet use), there is evidence that helmet use among KA-crash-involved motorcyclists has increased to about 96%, an increase of 5% from 1997.

Several trends were identified in this report as worthy of monitoring for potential action as needed. The first is the overall reduction in the number and rates of KA crashes, which is a positive indication of Michigan's traffic safety efforts. However, effective traffic safety programs must be continued for this trend to be maintained.

Another notable trend is the reduction of the proportion of KA crashes that occurred in the month of May. This may be evidence of positive effects of the public

information programs and special enforcement efforts that are deployed for the Memorial Day weekend. However, without a proper evaluation, it is not possible to attribute the observed changes to these programs. A well-designed evaluation could be useful in determining if and how much these programs contributed to this positive change and in providing insights that could be applied to other situations.

Another important trend seen in this report is in the “had been drinking” KA crashes. Although, the decrease in these crashes from 1997 to 2001 parallels the reduction of all KA crashes, the proportion of all KA crashes that involved a drinking driver remaining at about 12% over the five-year period. The increases in the proportions of drivers age 18-24 and age 35-54 among all KA crash-involved who had been drinking indicates that programs and interventions for reduction of drinking and driving should be specifically targeted at these two age groups.

Drivers and passengers age 18-24 had the lowest safety-belt use among all motorists involved in KA crashes. Drinking and driving and not using safety belts are high-risk behaviors. Clearly, interventions and programs for both drinking and driving reduction and safety belt usage that could reach and influence persons age 18-24 would have a positive impact on traffic safety. It may be helpful to examine recent studies on the risk-taking behavior of young adults to obtain information and insights for developing effective traffic safety intervention strategies for this age group.

Another trend noted in this report is the small decrease in the rate of occupant restraint use among children under age 4 involved in KA crashes. Among passengers of other age groups involved in KA crashes, seat belt use increased over the same time period. It should be noted that the number of cases involving children under age 4 reported every year was not large, but the decrease may be an indication of a more general problem regarding child safety seat use. Because the use of child safety seats is very important, this trend should be monitored and information on statewide child safety use studies should be updated.

An increase in the number of motorcycle KA crashes over the five-year period was noted in this report. OHSP is aware of this trend and has sponsored a study to examine this issue. Trends in motorcycle crashes, severity, alcohol use, and helmet use are being examined. The findings from this study should help to understand the reasons for the increase and to formulate strategies, programs and interventions for increased motorcycle safety.

## **1. INTRODUCTION**

This report examines the trends in motor vehicle crashes in Michigan that resulted in at least one fatality or serious injury from 1997 to 2001. It is part of an ongoing series of reports (e.g., Streff, 1999; Streff & Sudharsan, 2001) that monitor the circumstances of occurrence of fatal and serious-injury crashes and the characteristics of persons involved in these crashes. As in previous reports, a three-year forecast of the proportions of fatal and serious-injury crashes relative to all vehicle crashes is made based on current trends. The objective of this report is to provide Michigan's Office of Highway Safety Planning (OHSP) with information about the trends in the occurrence of the most serious crashes so that OHSP can continue to identify opportunities for reducing crash-related deaths and injuries and evaluate existing efforts.

This report is organized as follows. Data and methods used in the analysis of the crashes are described in the second section. The statistical trend analysis of the proportion of fatal and serious-injury crashes and injuries is in the third section. The fourth section examines the fatal and serious-injury crashes for all drivers and for drivers by age category. Fatal and serious-injury crashes involving alcohol and the crash-involved drivers who had been drinking alcohol are examined in the fifth section. Included in this section is an analysis of the Blood Alcohol Concentration (BAC) of drivers involved in fatal crashes. Use of safety belts by drivers and passengers is examined in the sixth section. In the seventh section, fatal and serious-injury crashes that involved pedestrians, bicyclists, and motorcyclists are examined. Fatal and serious-injury crashes involving large truck crashes are examined in the eighth section. Notable trends are reported in the ninth section.

## **2. DATA AND METHODS**

Michigan Vehicle Crash Data from 1997 to 2001 (UMTRI Transportation Data Center, 1998, 1999, 2000, 2001, & 2002) are used for most of the analyses reported. These data cover all police-reported motor vehicle crashes in Michigan for the five-year period and come from information coded on police crash reports (UD-10 forms). Fatal and serious-injury crashes are defined as those crashes in which at least one crash-involved person was killed or sustained a serious injury coded as K or A level injuries in the UD-10 forms. These crashes are, henceforth, referred to as KA crashes in this report. Crashes for which the record of at least one of the drivers was “flagged” for alcohol are referred to as “had been drinking” crashes.

Most analyses in this effort examined changes in distributions of key variables from the Michigan Vehicle Crash Data files. The data files for each year contain three linked files: the crash file with descriptive information about the crash itself; the vehicle/driver file with information on the vehicle and the driver; and the person file with information on the occupants of the vehicles in the crash. Choices about which files to use when similar information was contained in more than one file were based on the amount of missing data for the variable in each file. KA crashes for each year were identified by filtering the year’s crash file for crashes in which the most severe injury was coded as K or A. Information about drivers involved in the crash came from the vehicle/driver file. Identification of drivers who were killed or injured was based on the vehicle/driver file. The person file was used to identify drivers who had been drinking and also to determine their safety belt use. Injuries, fatalities, and safety belt use of passengers were obtained from the person file.

Rates for KA crash occurrence were based on vehicles miles of travel (VMT), the number of registered vehicles, the population of Michigan, and the number of licensed drivers for each year. VMT data were obtained from the Michigan Department of Transportation. The numbers of licensed drivers by age and sex and the numbers of registered vehicles were obtained from the Michigan Department of State. Michigan’s population by age and sex was obtained from the U.S. Census Bureau for the years



1997 through 2000. The U.S. Census Bureau did not publish state-level population estimates by age and sex for 2001. The numbers of people in the age and sex categories used in this report were estimated by applying the proportions of these groups in the population of Michigan for 2000 to the overall Michigan population in 2001. The distribution of licensed drivers and population used in this report are in Appendix A.

Time-series analysis, using SAS software (Woodfield, 2000) was used to fit a forecasting model to obtain a three-year forecast (2002-2004) of trends in the proportions of crashes that were KA crashes and the proportion of crash-involved persons who were killed or seriously injured.

Because of proposed changes in Michigan's per-se law concerned with drinking and driving, patterns of Blood Alcohol Concentration (BAC) levels of drivers who had been drinking were analyzed. Because Michigan Vehicle Crash Data files did not contain BAC information, data from the Fatality Analysis Reporting System (FARS) (National Highway Traffic Safety Administration, 2001) were used. FARS data contain detailed information about all vehicle crashes in the United States that resulted in at least one fatality. BAC levels were included in these data, if the person was tested. Thus, the BAC analysis examines only drivers who were involved in fatal crashes rather than fatal and serious-injury crashes.

### 3. STATISTICAL TREND ANALYSIS

In the five-year period from 1997 to 2001, Michigan experienced a decrease in the overall number of police reported vehicle crashes. There were also decreases in the proportion of all crashes that were KA crashes, and in the number of persons killed or seriously injured. Table 1 shows the total number of vehicle crashes, the number and proportion of KA crashes, total number of persons involved in crashes and the number and proportion of persons receiving a KA injury for the years 1997 to 2001.

Number and Rate of KA Crashes and Persons Receiving KA Injuries, 1997-2001				
Year	Number of Crashes	KA Crashes (% of all crashes)	Number of crash-involved persons	Persons receiving KA injury (% of crash-involved persons)
1997	425,793	12,843 (3.02%)	785,377	16,657 (2.12%)
1998	403,766	12,201 (3.02%)	746,523	15,738 (2.18%)
1999	415,675	11,206 (2.70%)	760,877	14,388 (1.89%)
2000	424,852	10,438 (2.45%)	775,119	13,328 (1.72%)
2001	400,813	9,388 (2.32%)	722,552	11,858 (1.64%)

Table 1: Numbers and Rates of KA Crashes and Persons Receiving KA Injuries, 1997-2001

Data on the proportions of KA crashes and injuries from 1997 through 2001 were included in a statistical time-series analysis that estimated what Michigan could expect to experience in the next three years (2002-2004), based on the current trend. This analysis yields 95% confidence limits, which describe the range within which we can be 95% confident that the future KA crash and injury rates will fall if there is no change in the present environment and traffic safety programs. Figure 1 shows the model results for the proportion of KA crashes and Figure 2 shows the model results for the proportion of crash-involved persons receiving KA injuries. Model details are in Appendix B.

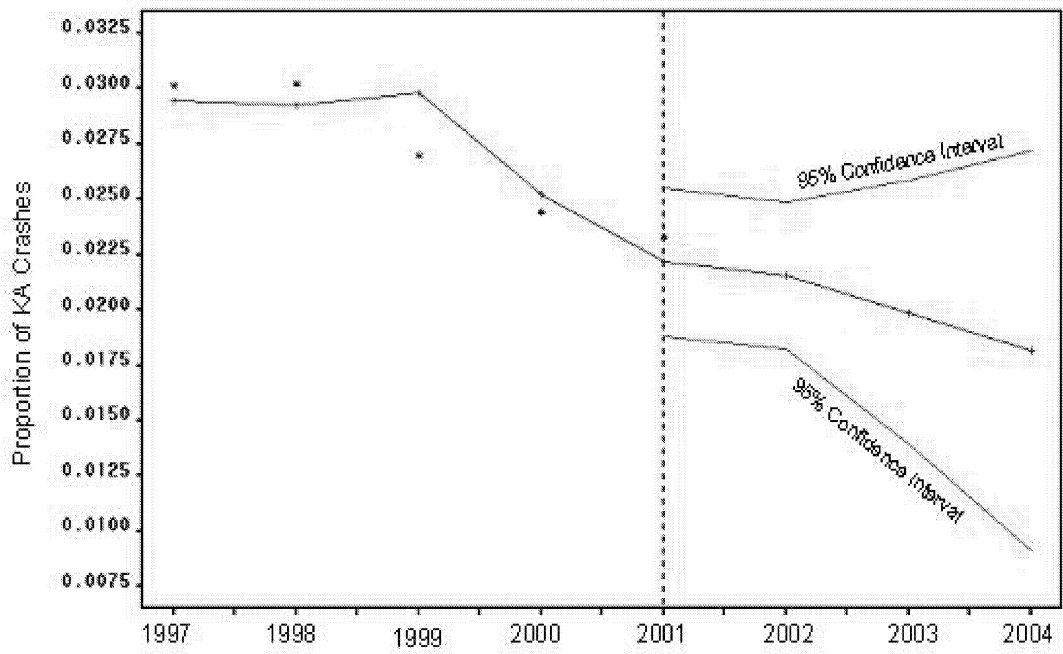


Figure 1: Proportion of Crashes Resulting in KA Injury, 1997-2004

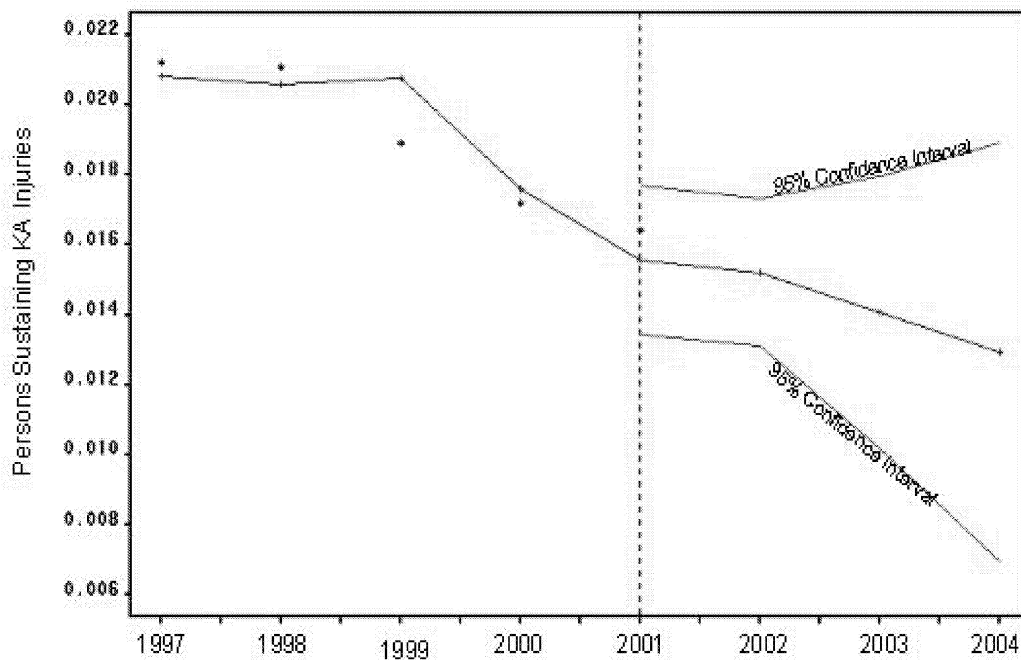


Figure 2: Proportion of Persons Sustaining KA Injuries 1997-2004

Both figures show a general decline in the proportion of KA crashes and crash-involved persons receiving KA injuries from 1997 to 2001. The forecasts for 2002 to 2004 indicate continued decreases for both the proportions of KA crashes and persons receiving KA injuries. However, examination of the upper bound of the 95<sup>th</sup> confidence interval indicates that even if there are no significant changes in the environment and traffic safety programs, small increases in these proportions are possible.

## 4. KA CRASHES

This section reports on overall KA crashes and KA crashes by driver age category. The numbers and rates of KA crashes and the patterns of occurrence by month and day of week are presented for all drivers and for drivers by age category. Because patterns and trends in the location of KA crashes by highway category, speed limit and the hazardous actions leading to the crashes were similar for all age groups of drivers, tables and figures are not shown in the main body of the report, but can be found in Appendix C. A summary of key findings on KA crash trends is provided at the end of this section.

### All Drivers

Table 2 shows the number of crashes and rates of KA crashes in Michigan from 1997 to 2001. During this time, there were increases of 8% in the VMT, 7% in the number of registered vehicles, 2% in the population, and 13% in the number of licensed

Number and Rate of Fatal or Serious Injury Crashes by Year					
Year	Number of Crashes	Rate per 100 Million VMT*	Rate per 1000 Registered Vehicles	Rate per 1000 Population	Rate per 1000 Licensed Drivers
1997	12,843	14.398	1.420	1.312	1.810
1998	12,201	13.727	1.328	1.242	1.706
1999	11,206	12.042	1.191	1.136	1.552
2000	10,438	11.000	1.070	1.050	1.483
2001	9,388	9.956	0.962	0.940	1.324
Change 1997 to 2001	-26.90%	-30.83%	-32.27%	-28.40%	-26.86%
Change 2000 to 2001	-10.06%	-9.49%	-10.09%	-10.53%	-10.72%

\*VMT: Vehicle Miles of Travel

Table 2: Number and Rate of KA Crashes by Year

drivers. Thus, if the rate of KA crash occurrence per VMT, per person, and per licensed driver remained the same, we would expect an increase in the number of KA crashes. However, the rates of KA crashes decreased steadily every year for total decreases of between 27% to 32% over the five-year period. The resulting decrease in the number of KA crashes was 27%.

Table 3 shows the distribution of KA crashes by month and year. The seasonal variations in KA crashes and their overall decreases for each successive year are shown in Figure 3.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	982	885	913	920	1,190	1,174	1,267	1,223	1,148	1,158	1,081	1,012
1998	947	677	875	952	1,162	1,132	1,144	1,173	1,076	1,084	907	1,062
1999	793	734	797	825	1,075	1,057	1,084	1,100	1,020	908	840	963
2000	978	726	706	762	947	910	960	970	915	905	787	862
2001	655	581	655	734	839	876	932	888	849	804	736	799

Table 3: KA Crashes by Month and Year

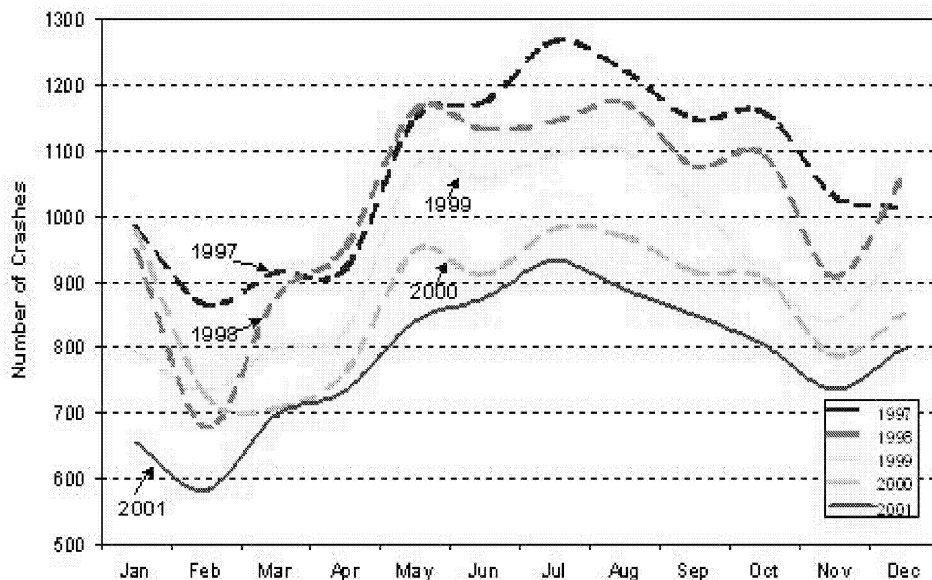


Figure 3: Fatal and Serious Crashes by Month and Year

As seen in the figure, more KA crashes occurred from May through August than during other times. These are the months of more travel in the state and the higher numbers of KA crashes may simply reflect that. However, it is interesting to note that the "bump" in KA crashes in May, present from 1997 to 2000, was no longer evident in 2001. The reduction of the May peak may well be the result of special enforcement efforts during the Memorial Day weekend.

Table 4 and Figure 4 show the number of KA crashes by day of week. The peak days of the week for KA crashes were Friday, Saturday, and Sunday. The reduction in the proportions of crashes appears to be uniform across the days of the week and the overall pattern of KA crashes by day of week has not changed from 1997 to 2001.

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	1,745	1,654	1,623	1,707	1,778	2,164	2,172
1998	1,659	1,604	1,657	1,581	1,695	2,021	1,984
1999	1,590	1,434	1,452	1,422	1,472	1,977	1,859
2000	1,431	1,366	1,293	1,376	1,404	1,706	1,862
2001	1,307	1,193	1,218	1,274	1,192	1,518	1,686

Table 4: KA by Day of Week and Year

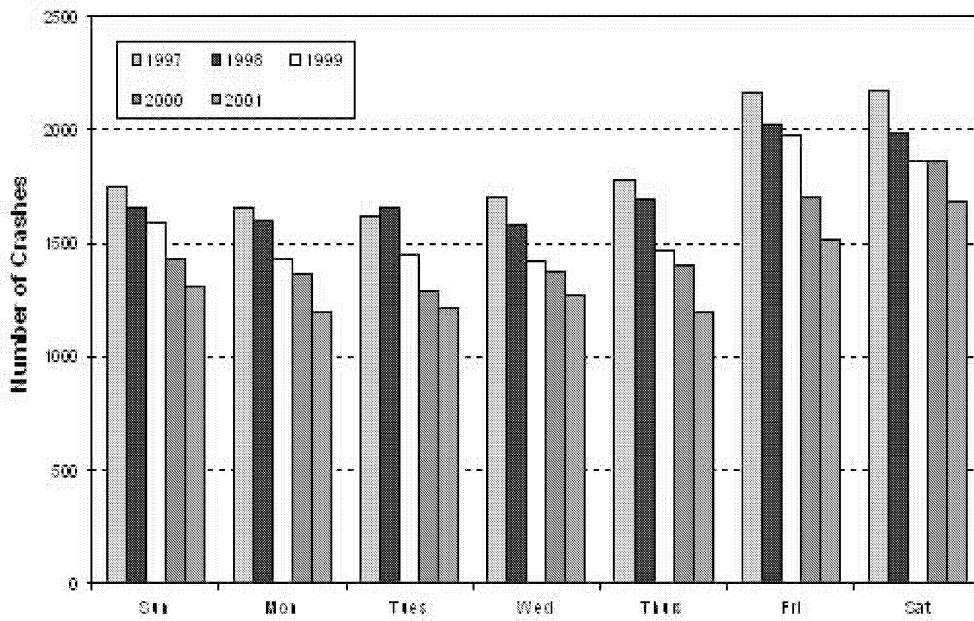


Figure 4: KA Crashes by Day of Week and Year

Table 5 and Figure 5 show the pattern of KA crashes by highway class. Because of problems in the coding of highway class in the year 2000 crash data file, no crashes by highway class are shown for this year. About 65% of the KA crashes occurred on city streets or county roads, and about 20% occurred on Michigan state routes. This pattern has not changed over the five-year period.

	Interstate	U.S. Route	MI Route	City/County
1997	968	949	2,319	7,420
1998	809	851	1,906	6,685
1999	872	824	1,745	6,249
2000				
2001	724	473	1,410	4,457

Table 5: KA Crashes by Highway Class and Year

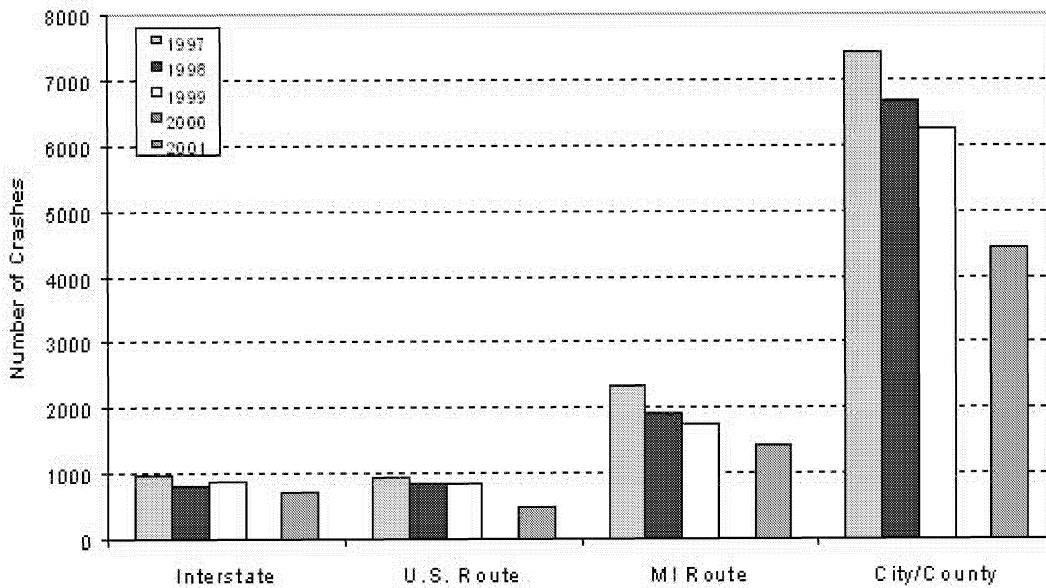


Figure 5: KA Crashes by Highway Class and Year



The number of KA crashes by the speed limit of the road segment on which they occurred are shown in Table 6 and Figure 6. Declines in the number of crashes occurred in every speed zone category, but the rate of decline was slightly lower in 55 mph zones than in other speed zones. In 1997, 41% of the KA crashes were in 55 mph zones and by 2001, this percentage increased to 47%. The proportion of KA crashes in 45 mph zones remained at 15 to 16%, and the proportion of crashes in 35 mph zones remained at 16 to 17%.

	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	65+ mph
1997	843	1,742	929	1,689	516	4,234	373
1998	779	1,642	784	1,542	427	4,221	223
1999	670	1,494	745	1,289	384	3,975	257
2000	635	1,301	590	1,306	461	3,745	169
2001	526	1,144	555	1,089	338	3,368	146

Table 6: KA Crashes by Speed Limit and Year

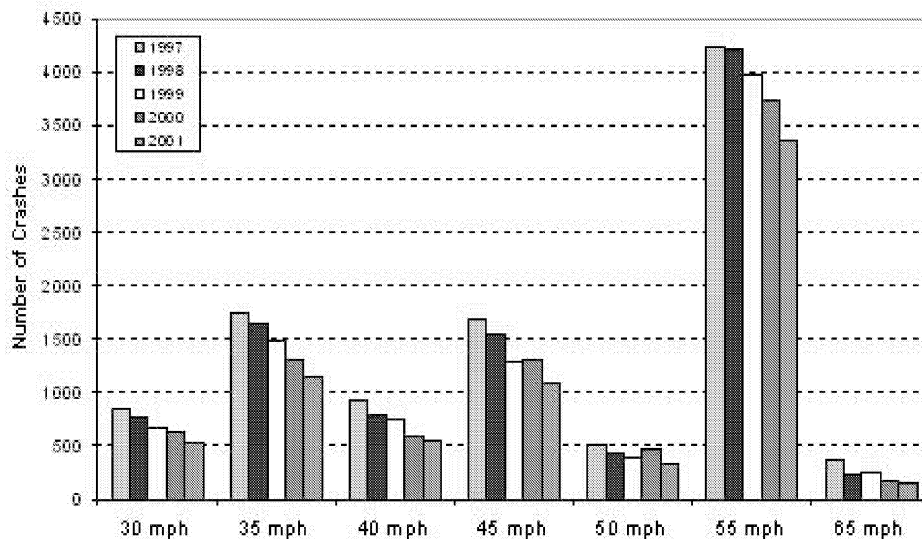


Figure 6: KA Crashes by Speed Limit and Year

Table 7 and Figure 7 show the numbers of KA crashes by vehicle type. The largest number of vehicles involved in KA crashes are passenger cars, which is not surprising because passenger cars represent the largest portion of vehicles on Michigan roads.

Number of Vehicles Involved in KA Injury Crashes by Vehicle Type and Year												
	Car		Heavy Truck		Light Truck		Motorcycle		Pickup		Van	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1997	15,001	68.3%	811	3.7%	319	1.5%	665	3.0%	3,095	14.1%	1,573	7.2%
1998	13,791	66.3%	788	3.8%	393	1.9%	718	3.5%	3,055	14.7%	1,560	7.5%
1999	12,331	65.3%	791	4.2%	387	2.1%	677	3.6%	2,866	15.2%	1,380	7.3%
2000	11,239	63.7%	711	4.0%	428	2.4%	708	4.0%	2,734	15.5%	1,325	7.5%
2001	9,746	64.1%	526	3.5%	331	2.2%	737	4.9%	2,301	15.1%	1,148	7.6%

Note: Percentages are calculated based on crashes where vehicle type was recorded.

Table 7: Vehicles Involved in KA Crashes by Vehicle Type and Year

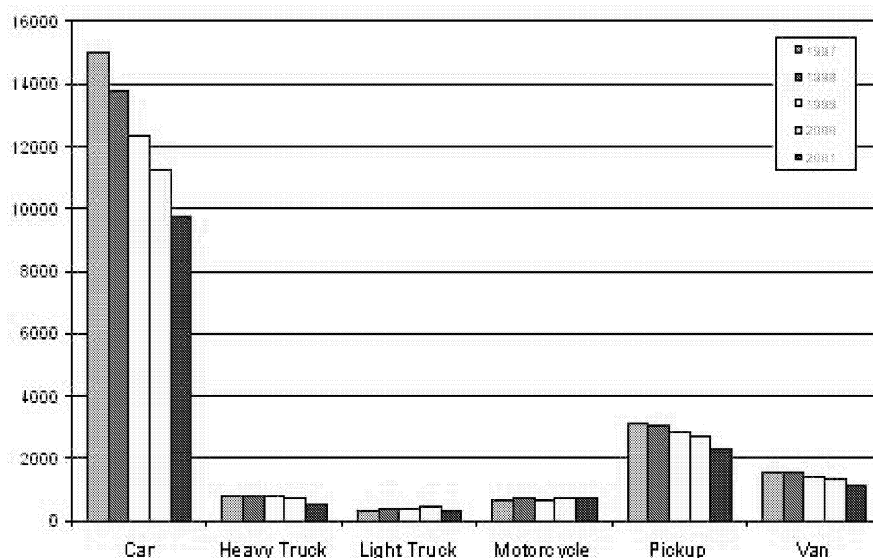


Figure 7: Vehicles Involved in KA Crashes by Vehicle Type and Year

Table 8 shows the number of hazardous actions recorded by police in single-vehicle KA crashes. The most frequently recorded hazardous action in single-vehicle crashes, “speed too fast”, accounted for more than one-half of the recorded known hazardous actions. The actual percentage of speeding actions increased from 54% in 1997 to 59% in 2001.

<b>Numbers of Hazardous Actions Recorded for Single-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	446	410	379	424	360
Speed too Fast	1,627	1,559	1,441	1,166	1,065
Speed too Slow	10	6	10	8	5
Fail to Yield	15	20	11	10	7
Traffic Control	32	43	32	22	29
Wrong Way	2	5	2	1	5
Left of Center	59	57	64	50	30
Improper Passing	21	13	10	6	6
Improper Lane Use	33	34	50	26	25
Improper Turn	6	11	3	4	0
Improper Signal	1	3	0	1	1
Improper Backing	0	7	5	4	3
Clear Distance	155	138	134	108	68
Other	1,047	1,045	1,097	600	583
Unknown	218	229	242	244	242

Table 8: Single-Vehicle KA Crashes by Hazardous Action and Year

Table 9 shows the numbers of each hazardous action recorded for multi-vehicle KA crashes. The pattern was consistent over the five-year period. The most frequently recorded hazardous action in multiple-vehicle KA crashes was “fail to yield” (the right-of-way), at approximately 32% of recorded known hazardous actions in multiple-vehicle KA crashes every year. This was followed in frequency by “clear distance” (which means following too closely) and (violation of) “traffic control”, which were consistently at 16% and 14% of the hazardous actions recorded.

<b>Numbers of Hazardous Actions Recorded for Multiple-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	9,784	9,118	8,142	7,928	6,297
Speed too Fast	882	698	648	600	506
Speed too Slow	30	30	19	20	19
Fail to Yield	2,875	2760	2421	2013	1894
Traffic Control	1,267	1184	1022	988	791
Wrong Way	55	44	64	56	35
Left of Center	465	454	381	337	303
Improper Passing	105	110	98	88	64
Improper Lane Use	211	236	193	136	121
Improper Turn	221	220	198	148	130
Improper Signal	14	25	16	9	16
Improper Backing	29	40	33	34	22
Clear Distance	1,418	1274	1231	1031	848
Other	1,228	1,240	1,170	917	793
Unknown	490	530	425	409	384

Table 9: Multiple-Vehicle KA Crashes by Hazardous Action and Year

### **Drivers Under Age 18**

Table 10 shows the changes in the numbers and rates of KA crashes for male and female drivers younger than age 18. Approximately 60% of the KA-crash-involved drivers in this age group were male, and 40% were female. This pattern of involvement

did not change much over the five-year period. The KA crash rates by population and licensed drivers declined for both sexes, but the decline in rates was higher for women than for men. Overall, there was a consistent yearly decline in the numbers and rates of KA crash involvement for this age group. The overall number of KA crashes declined by 30% over the five-year period. The decline in KA crashes for women was 35% while the decline for men was 29%.

Frequency and Rates of Involvement in Fatal or Serious Crashes for Drivers Under 18 by Sex and Year										
Driver Age	Year	Count			Rate per 1000 Population**			Rate per 1000 Licensed Drivers		
		Male	Female	Total <sup>1</sup>	Male	Female	Total	Male	Female	Total
<18 yr	1997	935	662	1,622	4.115	3.069	3.662	7.842	5.710	6.897
	1998	812	598	1,421	3.575	2.772	3.209	6.556	4.913	5.786
	1999	657	532	1,201	2.891	2.464	2.710	5.395	4.504	5.007
	2000	695	451	1,155	3.124	2.157	2.676	5.432	3.638	4.585
	2001	662	433	1,129	2.960	2.060	2.602	5.073	3.399	4.378
	Change 1997 to 2001	-29.20%	-34.59%	-30.39%	-28.06%	-32.89%	-28.94%	-35.31%	-40.48%	-36.53%
	Change 2000 to 2001	-4.75%	-3.99%	-2.25%	-5.25%	-4.49%	-2.76%	-6.60%	-6.59%	-4.52%

\*Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

\*\*Rate based on population of 15-17 year olds.

Table 10: KA Crashes for Drivers Under Age 18 by Sex and Year

Table 11 and Figure 8 show the distribution of KA crashes by month for drivers under age 18. There is some evidence of a change in the KA crash patterns of this age group. In 1997 and 1998, the highest number of KA crashes occurred in August. However, in 1999, the largest number of crashes occurred in May. In 2000, the number of KA crashes in May was just slightly less than in August, and in 2001, the largest number of crashes occurred in April and May. This may be a chance fluctuation, or evidence of a new trend which may be related to the formal dances and graduation festivities which many members of this age group attend in May.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	110	100	116	122	141	164	156	183	176	130	118	106
1998	115	90	97	105	134	151	132	170	126	121	83	97
1999	74	85	74	74	144	119	91	115	130	114	90	91
2000	104	65	81	65	116	102	114	125	126	96	79	82
2001	80	56	84	118	125	96	118	102	104	90	76	80

Table 11: KA Crashes by Month and Year, Drivers Under Age18

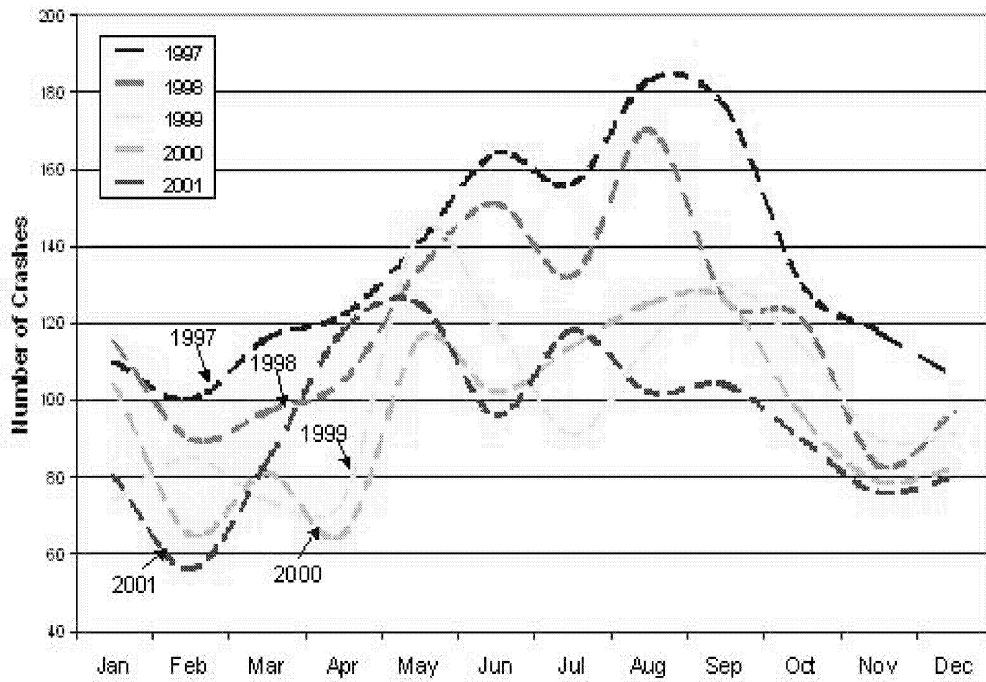


Figure 8: KA Crashes by Month and Year, Drivers Under Age 18

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	217	239	206	219	206	300	235
1998	203	204	176	167	216	248	207
1999	171	166	162	155	164	210	173
2000	135	160	144	163	162	193	198
2001	146	133	150	167	154	200	179

Table 12: KA Crashes by Day of Week and Year, Drivers Under Age 18

Table 12 shows the number of KA crashes for drivers under age 18 by day of week. Figure 9 shows this distribution graphically. The pattern of KA crashes by day of week has not changed much over the five-year period. The largest proportions of KA crashes continued to occur on Friday and Saturday.

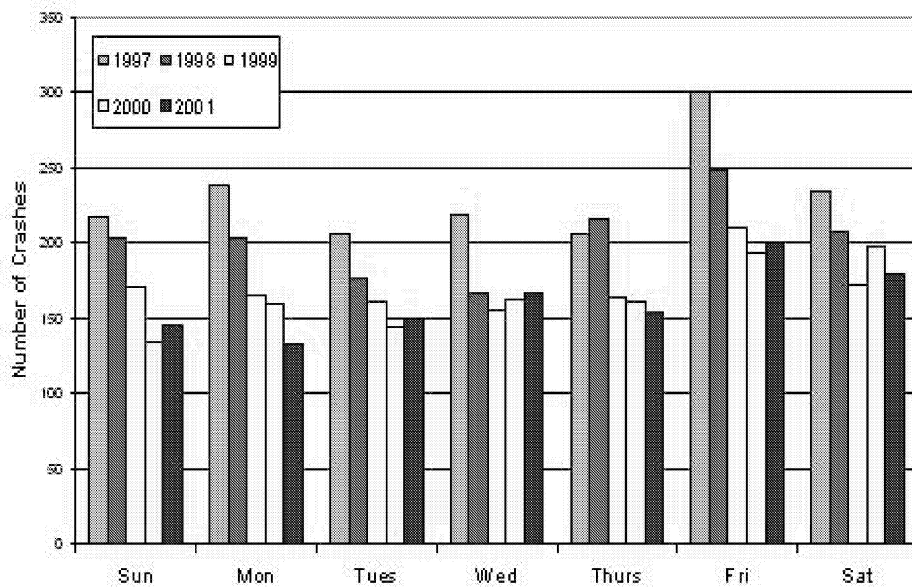


Figure 9: KA Crashes by Day of Week and Year, Drivers Under Age 18

### Drivers, Age 18-24

Table 13 shows the numbers and rates of KA crashes for drivers age 18-24. Over the five-year period, the ratio of males to females in this group of drivers was about 60-64% to 40-36%. There was an overall decline of 26% in the number of KA crashes for this age group. The decline in KA crashes for female drivers was 33% and the decline for male drivers was 21%.

Frequency and Rates of Involvement in Fatal or Serious Crashes for Drivers 18-24 by Sex and Year										
Driver Age	Year	Count			Rate per 1000 Population			Rate per 1000 Licensed Drivers		
		Male	Female	Total*	Male	Female	Total	Male	Female	Total
18-24 Yr	1997	2,488	1,535	4,099	5.420	3.352	4.470	6.448	3.884	5.248
	1998	2,469	1,420	3,940	5.339	3.084	4.269	6.354	3.573	5.013
	1999	2,282	1,334	3,673	4.905	2.883	3.958	5.786	3.317	4.611
	2000	2,163	1,279	3,489	4.594	2.773	3.743	4.995	3.129	4.144
	2001	1,957	1,027	3,050	4.135	2.215	3.255	4.491	2.493	3.598
	Change 1997 to 2001	-21.34%	-33.09%	-25.59%	-0.237	-0.339	-27.18%	-30.35%	-35.82%	-31.44%
	Change 2000 to 2001	-9.52%	-19.70%	-12.58%	-0.100	-0.201	-13.04%	-10.08%	-20.33%	-13.19%

\*Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

Table 13: KA Crashes by Sex and Year, Drivers Age 18-24

Table 14 and Figure 10 show the distribution of KA crashes for drivers age 18-24 by month. The pattern shows a relatively uniform reduction in KA crashes across all months over the five-year period. The peak seen in August 1997 was not evident in subsequent years.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	331	299	298	301	351	338	391	436	344	368	322	310
1998	320	220	286	316	367	394	346	372	348	352	282	337
1999	288	249	250	271	352	375	391	337	353	298	257	312
2000	318	248	247	275	328	317	349	296	265	299	254	296
2001	210	181	209	237	287	318	308	283	282	255	231	249

Table 14: KA Crashes by Month and Year, Drivers Age 18-24



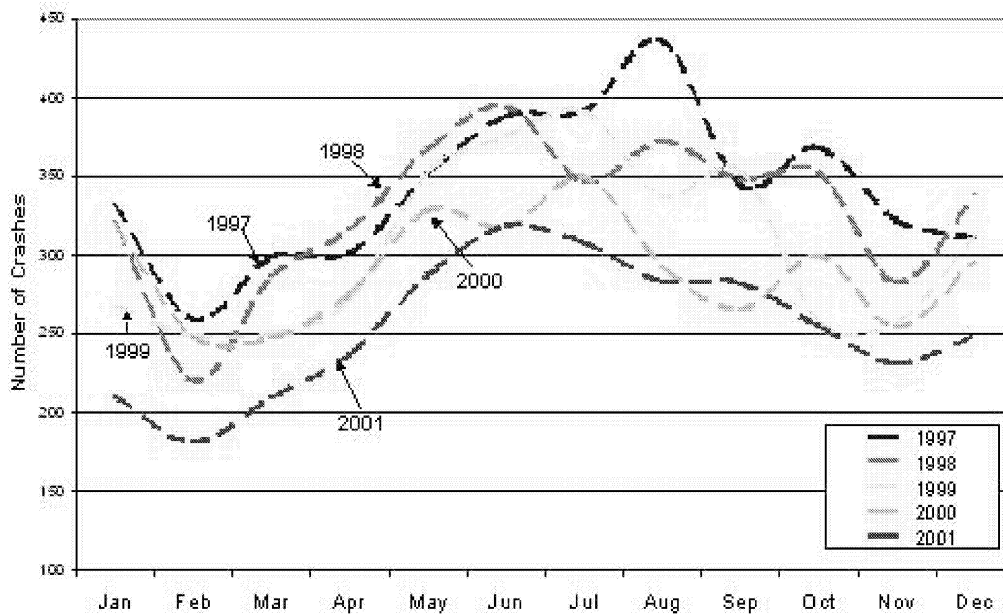


Figure 10: KA Crashes by Month and Year, Drivers Age 18-24

Table 15 and Figure 11 show that the largest number of KA crashes involving drivers of this age group continue to occur on Friday and Saturday.

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	592	465	491	529	576	706	740
1998	555	469	529	489	546	660	692
1999	570	436	475	461	453	662	626
2000	491	470	405	408	461	557	697
2001	452	368	371	378	387	502	592

Table 15: KA Crashes by Day of Week and Year, Drivers Age 18-24

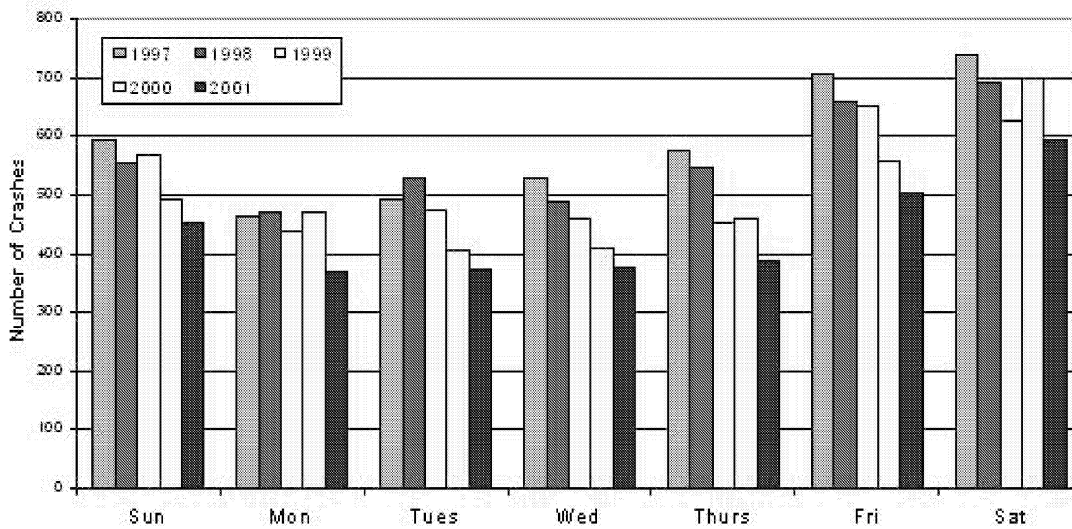


Figure 11: KA Crashes by Day of Week and Year, Drivers Age 18-24

### Drivers, Age 25-34

Table 16 shows the number and rates of KA crashes for drivers age 25-34 by sex. As in the younger age groups, each year about 60% of the KA-crash-involved drivers were male. The rates of decrease of KA crashes for women in this age group were greater than those for men. Female drivers experienced a 42% decrease while male drivers experienced a 36% decrease in KA crashes. There was an overall decrease of 38% in the number of crashes for this age group.

Frequency and Rates of Involvement in Fatal or Serious Crashes for Drivers 25-34 by Sex and Year										
Driver Age	Year	Count			Rate per 1 000 Population			Rate per 1000 Licensed Drivers		
		Male	Female	Total*	Male	Female	Total	Male	Female	Total
25-34 yr	1997	2,947	1,794	4,808	4.233	2.467	3.378	5.251	2.746	3.959
	1998	2,745	1,552	4,357	4.032	2.182	3.130	4.976	2.428	3.659
	1999	2,381	1,347	3,784	3.577	1.933	2.778	4.420	2.160	3.256
	2000	2,210	1,275	3,517	3.239	1.875	2.582	3.399	2.008	2.737
	2001	1,880	1,034	2,984	2.741	1.513	2.179	2.927	1.654	2.354
	Change 1997 to 2001	-36.21%	-42.36%	-37.94%	-0.362	-0.387	-35.49%	-44.26%	-39.78%	-40.53%
	Change 2000 to 2001	-14.93%	-18.90%	-15.15%	-0.154	-0.193	-15.60%	-13.89%	-17.66%	-13.99%

\*Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

Table 16: KA Crashes by Sex and Year, Drivers Age 25-34

Table 17 and Figure 12 show the distribution of crashes by month for drivers age 25-34. The monthly pattern is very similar to that for all drivers shown in Figure 3, with the peak seen in May 1997 no longer evident in May 2001.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	408	331	349	349	452	406	471	404	419	442	365	412
1998	364	238	321	353	413	400	409	379	396	370	330	364
1999	295	251	262	287	372	361	362	342	319	307	302	324
2000	324	248	237	251	313	280	329	304	338	304	290	299
2001	241	192	210	252	252	265	285	271	295	232	247	242

Table 17: KA Crashes by Month and Year, Drivers Age 25-34

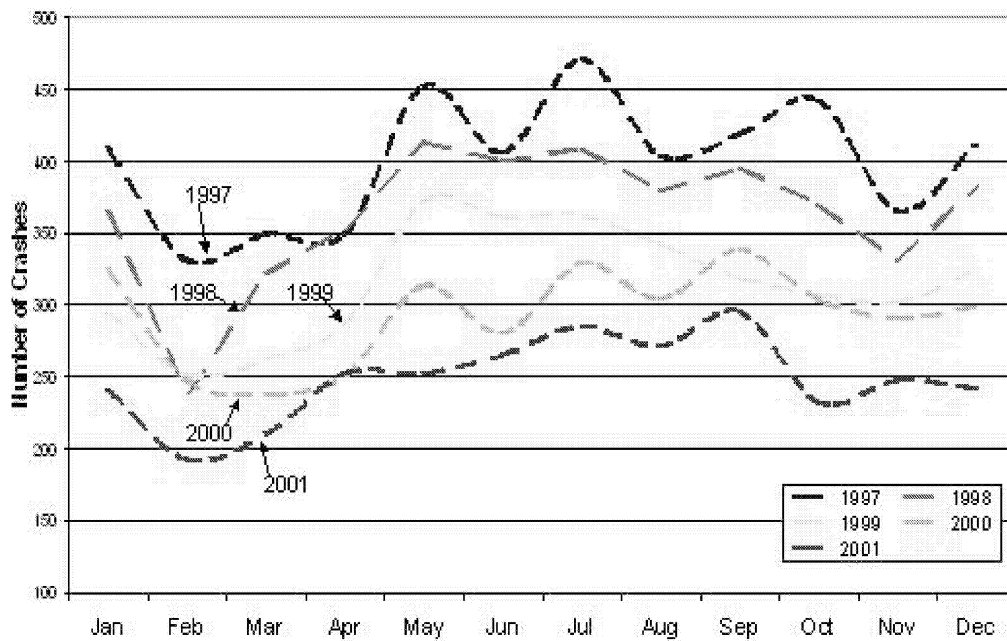


Figure 12: KA Crashes by Month and Year, Drivers Age 25-34

Table 18 and Figure 13 show the KA crash patterns by day of week. Friday and Saturday remained the peak days of the week for KA crashes in this age group. The proportions of crashes by day of week remained relatively constant over the five-year period.

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	618	590	596	649	716	838	801
1998	544	564	620	569	646	749	666
1999	483	481	511	458	525	709	617
2000	482	440	411	520	470	580	614
2001	423	385	362	434	363	478	499

Table 18: KA Crashes by Day of Week and Year, Drivers Age 25-34

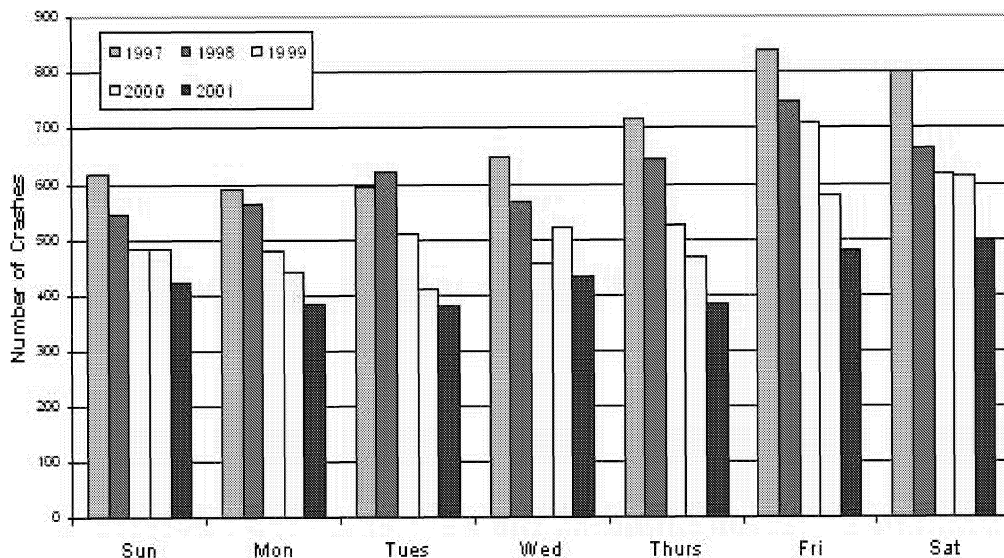


Figure 13: KA Crashes by Day of Week and Year, Drivers Age 25-34

### Drivers Age 35-54

The number and rates of KA crashes by sex for drivers age 35-54 are shown in Table 19. The number of KA crashes decreased by 24% for these drivers. The reduction in KA crashes was 27% for women and 22% for men. As in the younger age groups, approximately 60 to 62% of the KA-crash-involved drivers in this age group were men.

Frequency and Rates of Involvement in Fatal or Serious Crashes for Drivers 35-54 by Sex and Year										
Driver Age	Year	Count			Rate per 1000 Population			Rate per 1000 Licensed Drivers		
		Male	Female	Total*	Male	Female	Total	Male	Female	Total
35-54 yr	1997	3,929	2,469	6,496	2.768	2.355	2.632	3.590	1.859	2.681
	1998	3,862	2,403	6,366	2.694	2.269	2.554	3.491	1.783	2.594
	1999	3,678	2,192	5,980	2.535	2.039	2.368	3.285	1.596	2.399
	2000	3,410	2,033	5,507	2.322	1.417	1.897	2.427	1.422	1.943
	2001	3,060	1,804	4,958	2.073	1.251	1.699	2.173	1.258	1.745
	Change 1997 to 2001	-22.12%	-26.93%	-23.68%	-0.251	-0.469	-35.47%	-39.46%	-32.31%	-34.93%
	Change 2000 to 2001	-10.26%	-11.26%	-9.97%	-0.107	-0.117	-10.44%	-10.47%	-11.48%	-10.18%

\*Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

Table 19: Numbers and Rates of KA Crashes by Sex and Year, Drivers Age 35-54

\_\_\_\_\_ Table 20 and Figure 14 show the distribution of KA Crashes for drivers age 35-54 by month. The pattern of KA crashes by month for this age group is similar to that of the younger age groups. There have been some shifts in the peak periods, but the largest proportions of crashes for this age group still occur from May through August.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	544	491	463	449	604	554	594	575	567	559	575	521
1998	496	394	480	503	570	548	564	590	573	578	515	566
1999	447	382	492	443	555	543	553	599	531	473	434	528
2000	501	418	377	399	508	466	467	525	454	479	414	498
2001	387	294	368	398	439	447	488	455	401	432	402	447

Table 20: KA Crashes by Month and Year, Drivers Age 35-54

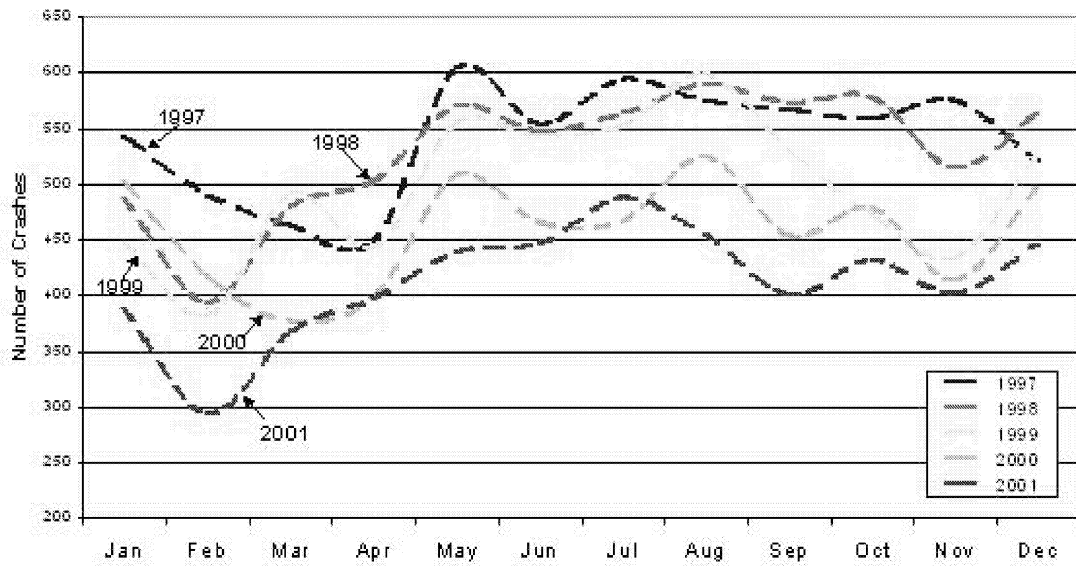


Figure 14: KA Crashes by Month and Year, Drivers Age 35-54

The pattern of KA crash occurrence by day of week has not changed over the five-year period and is similar to that of younger groups with the largest proportions of the KA crashes occurring on Fridays and Saturdays as shown in Table 21 and Figure 15.

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	785	884	860	914	961	1,086	1,006
1998	744	858	930	894	860	1,090	990
1999	720	766	808	781	850	1,103	952
2000	659	752	713	736	798	936	913
2001	592	655	673	708	679	868	783

Table 21: KA Crashes by Day of Week and Year, Drivers Age 35-54

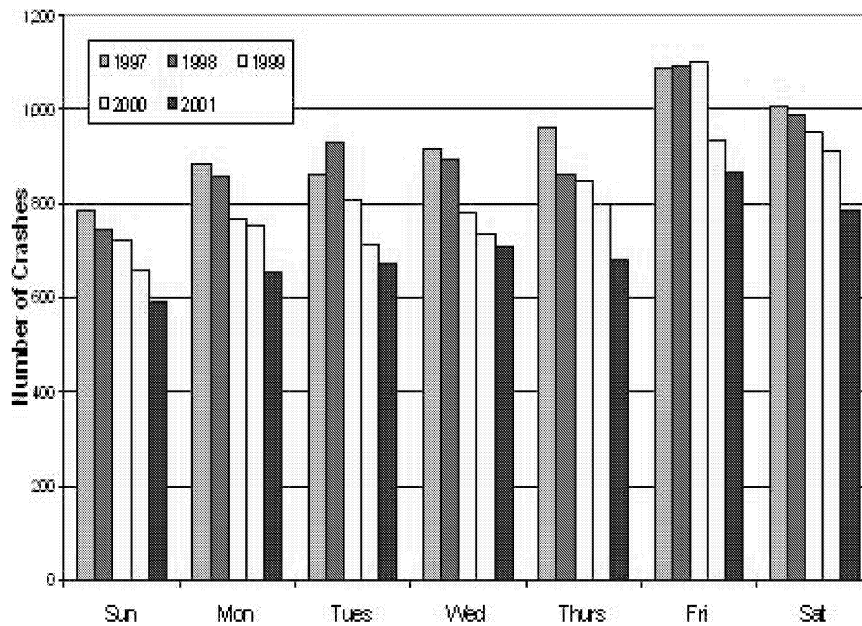


Figure 15: KA Crashes by Day of Week and Year, Drivers Age 35-54

### Drivers, Age 55-69

Table 22 shows the number and rates of KA crashes by sex for drivers age 55-69. The pattern of decreases in KA crashes by sex in this age group was different than in other age groups. For drivers age 35-54, the declines in the rates of KA crash occurrence by population, and licensed drivers were greater for men than for women. The overall decrease in the number of KA crashes was 23%. The decline in KA crashes for women was 23%, and the decline for men was 25%. As with younger age groups, approximately 60% of the KA-crash-involved drivers in this age group were men.



Frequency and Rates of Involvement in Fatal or Serious Crashes for Drivers 55-69 by Sex and Year										
Driver Age	Year	Count			Rate per 1000 Population			Rate per 1000 Licensed Drivers		
		Male	Female	Total <sup>1</sup>	Male	Female	Total	Male	Female	Total
55-69 yr	1997	1,125	674	1,820	2.080	1.118	1.591	2.466	1.263	1.839
	1998	1,114	637	1,780	2.028	1.042	1.534	2.400	1.168	1.763
	1999	959	582	1,564	1.729	0.943	1.335	2.038	1.045	1.522
	2000	1,043	586	1,638	1.830	0.943	1.375	1.878	1.025	1.454
	2001	847	520	1,401	1.479	0.832	1.170	1.471	0.877	1.199
	Change 1997 to 2001	-24.71%	-22.85%	-23.02%	-0.289	-0.256	-26.50%	-40.34%	-30.58%	-34.81%
	Change 2000 to 2001	-18.79%	-11.26%	-14.47%	-0.192	-0.117	-14.92%	-21.66%	-14.45%	-17.52%

<sup>1</sup>Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

Table 22: Number and Rates of KA Crashes by Sex and Year, Drivers Age 55-69

Table 23 and Figure 16 show the distributions of KA crashes for drivers age 55-69 by month. Since 1998, the largest monthly proportion of KA crashes occurred in May, and there has been a small but steady decrease in the proportion of crashes that occurred in December (from 10% in 1998 to 8% in 2001).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	126	113	133	138	163	159	159	168	186	165	167	143
1998	138	86	140	127	189	159	151	162	151	185	118	174
1999	114	89	97	115	162	138	137	141	156	141	128	146
2000	142	115	95	117	163	161	123	160	149	145	127	141
2001	108	75	99	98	144	110	134	128	140	128	119	118

Table 23: KA Crashes by Month and Year, Drivers Age 55-69

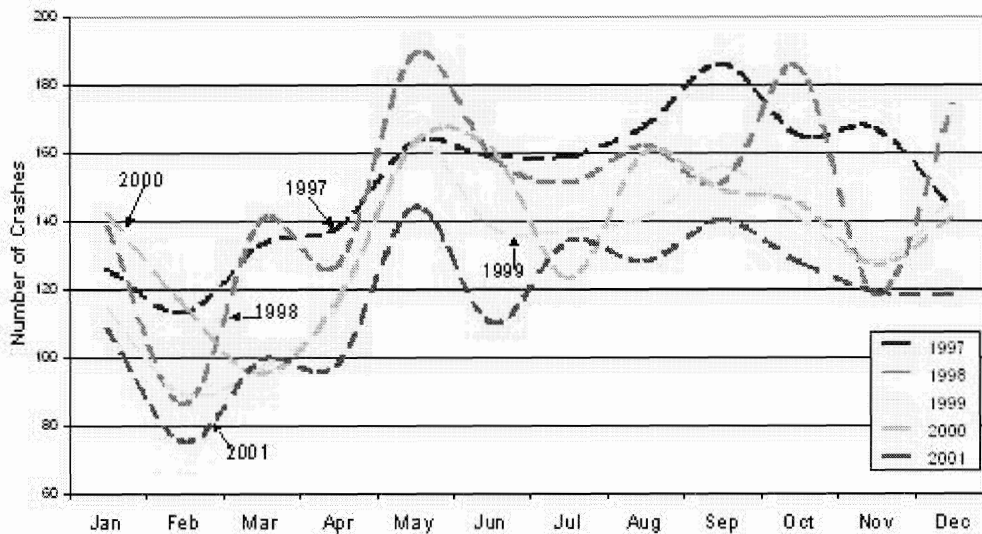


Figure 16: KA Crashes by Month and Year, Drivers Age 55-69

Table 24 and Figure 17 show the distribution of KA crashes by sex for this age group by day of week. The pattern of KA crash occurrence by day of week is different than that of younger age groups. Friday was the peak day for KA crashes for this age group from 1997 to 1999. From 2000, however, the distribution is more uniform for Monday through Saturday. Sunday has consistently been the day with the smallest proportion of KA crashes for this age group.

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	175	267	258	239	275	345	261
1998	188	248	274	283	270	302	215
1999	164	218	220	230	218	292	222
2000	176	223	243	239	257	247	253
2001	137	213	220	212	191	217	211

Table 24: KA Crashes by Day of Week and Year, Drivers Age 55-69

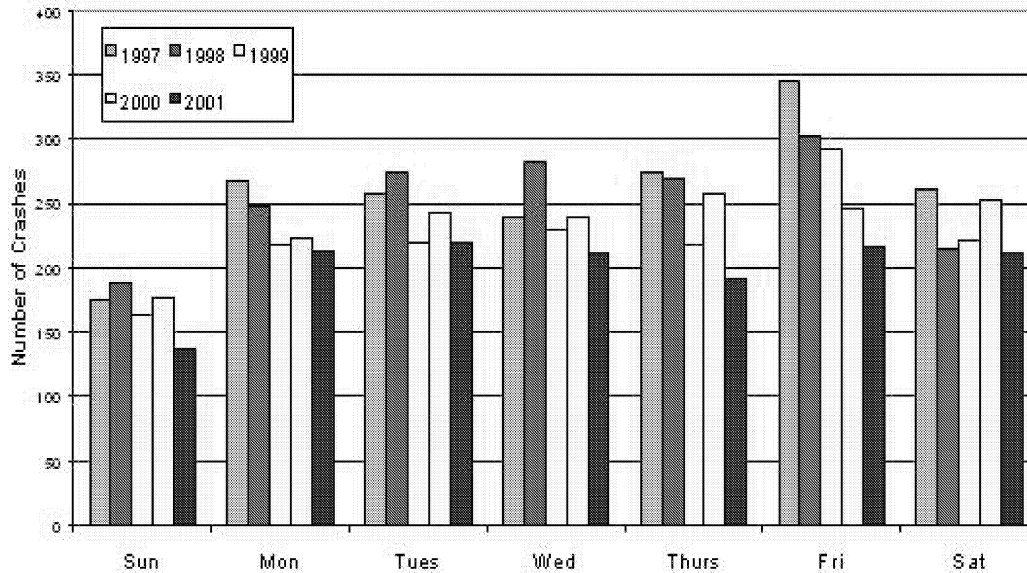


Figure 17: KA Crashes by Day of Week and Year, Drivers Age 55-69

### Drivers Age 70 and Older

Table 25 shows the number and rates of KA crashes for drivers age 70 and older. The proportion of men among KA-crash-involved drivers in this age group is slightly less than in the younger age groups, at 55 to 60%. The rates of KA crash involvement decreased for both men and women in this age group, but the decreases in the rates were greater for women than for men. The overall reduction in the numbers of KA crashes in which these drivers were involved was 29% for all drivers, with reductions of 31% for women, and 25% for men.

Frequency and Rates of Involvement in Fatal or Serious Crashes for Drivers 70+ by Sex and Year										
Driver Age	Year	Count			Rate per 1000 Population			Rate per 1000 Licensed Drivers		
		Male	Female	Total*	Male	Female	Total	Male	Female	Total
70 + yr	1997	616	480	1,117	1.811	0.909	1.286	2.113	1.385	1.750
	1998	604	467	1,088	1.739	0.876	1.236	2.012	1.310	1.656
	1999	575	390	968	1.629	0.722	1.084	1.889	1.057	1.438
	2000	546	351	902	1.561	0.659	1.022	1.682	0.935	1.289
	2001	461	330	793	1.311	0.617	0.900	1.412	0.866	1.128
	Change 1997 to 2001	-25.16%	-31.25%	-28.56%	-0.276	-0.322	-30.05%	-33.17%	-37.44%	-35.55%
	Change 2000 to 2001	-15.57%	-5.98%	-11.53%	-0.160	-0.065	-11.99%	-16.06%	-7.40%	-12.48%

\*Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

Table 25: Number and Rate of KA Crashes by Sex and Year, Drivers Age 70+

The distribution of KA crashes by month is shown in Table 26 and Figure 18. In the time period reported, the number of crashes declined for every month (except January). The greatest decline in the number of KA crashes, however, occurred in July.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	58	69	72	77	113	99	112	115	106	102	86	108
1998	66	43	77	86	109	105	107	92	84	117	84	116
1999	59	62	53	60	90	88	98	104	96	100	84	74
2000	70	57	49	54	94	79	94	102	80	88	70	65
2001	59	43	58	72	84	69	58	80	70	83	66	56

Table 26: KA Crashes by Month and Year, Drivers Age 70+

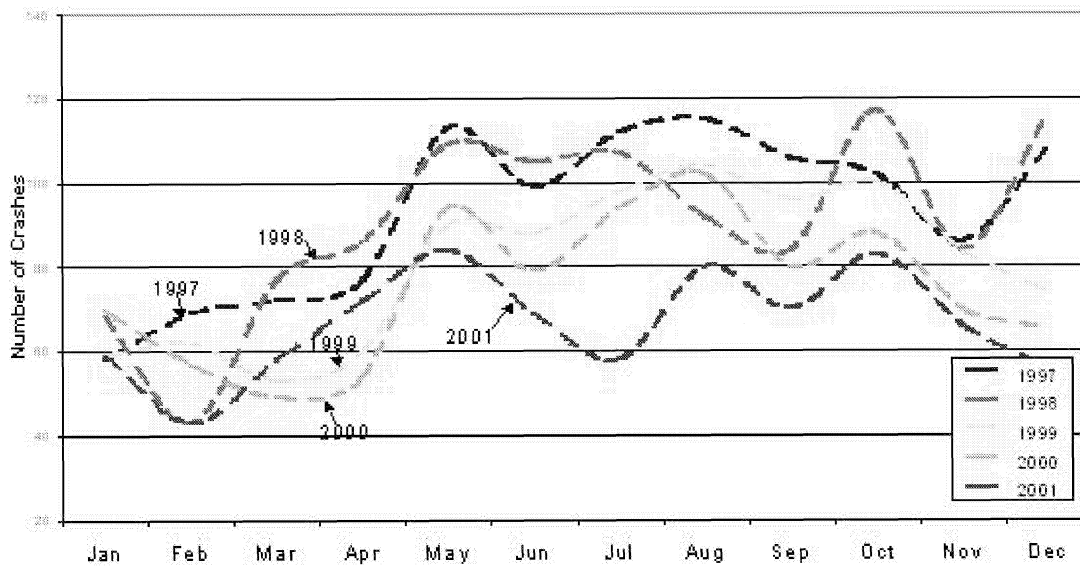


Figure 18: KA Crashes by Month and Year, Drivers Age 70+

The distribution of KA crashes by day of week for this age group is shown in Table 27 and Figure 19. This pattern is different from all other age groups. Although the largest proportions of KA crashes occurred on Fridays, the proportions of crashes on the other days are much more uniformly distributed than those for other groups.

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	112	179	184	157	155	189	141
1998	121	181	179	158	156	163	130
1999	112	156	144	136	117	172	131
2000	95	158	120	138	129	143	119
2001	99	114	125	122	97	143	98

Table 27: KA Crashes by Day of Week and Year, Drivers Age 70+

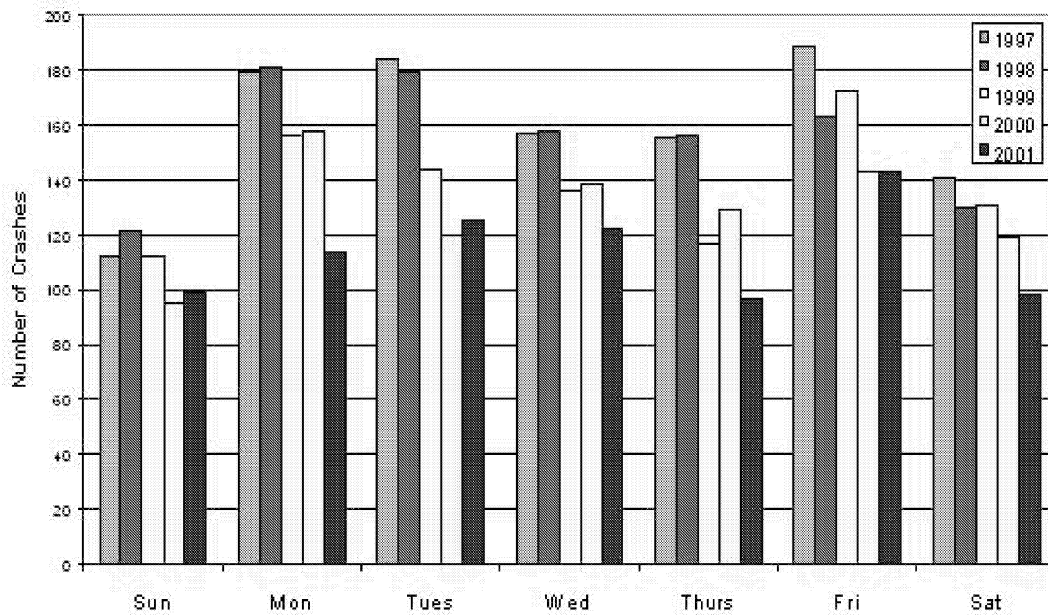


Figure 19: KA Crashes by Day of Week and Year, Drivers Age 70+

A possible explanation for this distribution by day of week may be that many of the drivers in this age group are retired and the timing of their travel is not dictated by a Monday through Friday work week.

## Summary

Salient trends in KA crashes from 1997 to 2001 are listed below:

- ! The number of KA crashes decreased by 27%.
- ! The number of persons killed and seriously injured decreased by 29%.
- ! Rates of KA crashes per VMT, registered vehicles, population, and licensed drivers decreased from 27% to 32%.
- ! Decreases in the KA crash rates of women were greater than the decreases in the KA crash rates for men.
- ! The proportion of KA crashes that occur in May has decreased.
- ! The patterns of location (by road type) of KA crashes remained the same.
- ! The largest percentages of KA crashes continue to occur on weekends.
- ! Speeding continues to be the most frequent hazardous action in single-vehicle KA crashes.
- ! Failing to yield the right-of-way, following too closely, and violating traffic controls continue to be the most frequent hazardous actions in multiple-vehicle KA crashes.
- ! The percent of men among KA-crash-involved drivers continues to be about 60%.
- ! Drivers under age 18 experienced the highest rate of KA crash involvement per licensed driver (4.38 KA crashes/1,000 licensed drivers in 2001).
- ! Male drivers under age 18 consistently have the highest rate of KA crash involvement (5.07 KA crashes per 1,000 licensed driver in 2001).
- ! Male drivers age 18-24 are consistently the group with the second highest KA crash involvement 18-24 (4.49 KA crashes per licensed driver in 2001).

## 5. KA “HAD BEEN DRINKING” CRASHES AND DRIVERS

This section examines the KA crashes in which an alcohol “flag” was coded in the record for at least one of the involved drivers. The patterns and trends in the numbers, rates, time and location of these crashes are examined. Numbers and rates of KA-crash-involved drivers who had been drinking are further examined by age category and sex. BAC levels of drivers involved in fatal crashes are examined by age category. Key points are summarized at the end of this section.

### “Had Been Drinking” Crashes

The rates of KA crashes in which a driver had been drinking relative to the VMT, registered vehicles, population, and licensed drivers have decreased steadily over the five years. Table 28 shows the trends in the numbers and rates of KA crashes in which at least one of the drivers had been drinking. The overall decrease in the number of

Number and Rate of Fatal or Serious Injury 'Had Been Drinking' Crashes					
Year	Number of Crashes	Rate per 100 Million VMT*	Rate per 1000 Registered Vehicles	Rate per 1000 Population	Rate per 1000 Licensed Drivers
1997	2,635	2.953	0.291	0.271	0.371
1998	2,518	2.833	0.274	0.257	0.352
1999	2,363	2.539	0.251	0.241	0.327
2000	2,025	2.133	0.209	0.203	0.288
2001	1,854	1.923	0.19	0.186	0.261
Change 1997 to 2001	-29.64%	-34.88%	-34.80%	-31.25%	-29.73%
Change 2000 to 2001	-8.44%	-9.85%	-9.09%	-8.37%	-9.37%

\*VMT: Vehicle Miles of Travel

Table 28: Numbers and Rates of “Had Been Drinking” KA Crashes by Year

these crashes from 1997 to 2001 was 30%. Although the numbers and rates of KA “had been drinking” crashes have decreased, the relative proportion of these crashes to all KA crashes has remained at about 12% over the five-year period.



The overall downward trend in the number of KA “had been drinking” crashes can be seen in Table 29 and Figure 20, which show the distribution of these crashes by month for each of the five years. The seasonal pattern of more crashes during the summer and fall than in winter and spring is still present. However, note the absence of the peak in May 2001, that was very prominent in year 1997. This may be the result of educational programs and the special enforcement efforts coinciding with the Memorial Day weekend.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	192	195	190	204	261	221	240	260	210	248	217	197
1998	175	172	178	185	212	214	245	249	224	230	205	229
1999	169	149	175	185	217	203	235	251	221	180	183	195
2000	202	134	160	174	170	168	179	195	162	198	146	137
2001	92	108	140	145	144	175	191	178	188	177	168	148

Table 29: KA “Had Been Drinking” Crashes by Month and Year

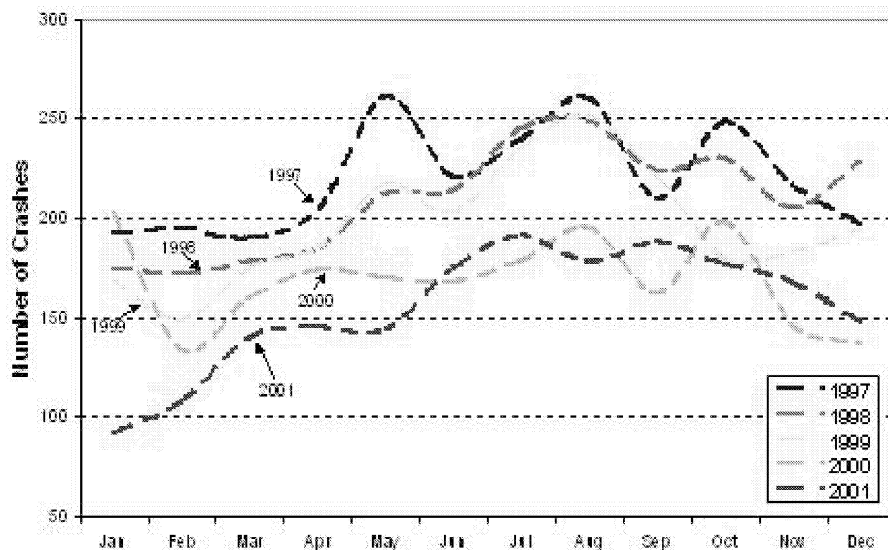


Figure 20: KA “Had Been Drinking” Crashes by Month and Year

The patterns of KA “had been drinking” crashes by day of week are shown in Table 30 and Figure 21. Saturdays and Sundays remain the peak days for “had been drinking” KA crashes.

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	559	242	215	251	280	443	645
1998	483	203	218	265	343	408	598
1999	484	207	207	213	252	404	596
2000	401	181	152	184	226	343	538
2001	370	174	152	175	211	296	476

Table 30: KA “Had Been Drinking” Crashes by Day of Week and Year

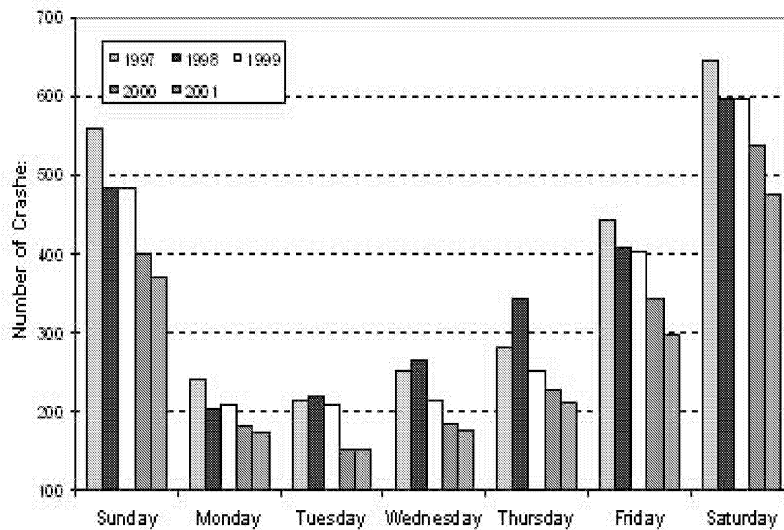


Figure 21: KA “Had Been Drinking” Crashes by Day of Week and Year

The distribution of “had been drinking” KA crash location by highway class is shown in Table 31 and Figure 22. Because the data on highway class for year 2000 were unreliable, no location information is shown for that year. It can be seen from the table and figure that the greatest portions of KA “had been drinking” crashes still occur on city streets and county roads.

	Interstate	U.S. Route	MI Route	City/County
1997	210	161	442	1591
1998	172	145	332	1488
1999	298	151	302	1374
2000				
2001	140	77	232	945

Table 31: KA “Had Been Drinking” Crashes by Highway Class and Year

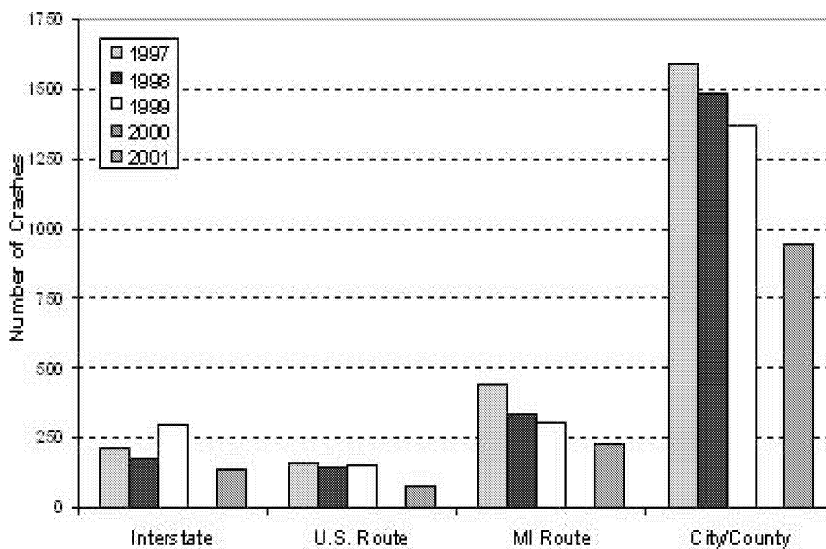


Figure 22: KA “Had Been Drinking” Crashes by Highway Class and Year

### “Had Been Drinking” Drivers

There was a steady decrease every year in the number and rates of “had been drinking” drivers involved in KA crashes from 1997 to 2001. The changes in the rates are shown in Table 32. From 1997 to 2001, the rates based on population decreased by 30%, and the rates based on licensed drivers decreased by 37%.

<b>Numbers and rates of KA-Crash-Involved Drivers, Who “Had Been Drinking” by Year</b>			
Year	Number of Drivers	Rate per 1000 population	Rate per 1000 licensed drivers
1997	2,569	0.263	0.409
1998	2,451	0.250	0.386
1999	2,278	0.231	0.356
2000	1,976	0.199	0.281
2001	1,825	0.183	0.257
Change from 2000 to 2001	-5.88%	-8.10%	-8.30%
Change from 1997 to 2001	-28.96%	-30.44%	-37.07%

Table 32: Numbers and Rates of “Had Been Drinking” KA-Crash-Involved Drivers by Year

Table 33 shows the numbers of drivers involved in all KA crashes and in those crashes in which the driver “had been drinking” by sex and year. The number of “had-been-drinking” drivers decreased by 29%. This paralleled the 29% decrease in the numbers of drivers involved in KA crashes. Indeed, the proportion of KA-crash-involved drivers who “had been drinking” remained at 12% over the five-year period.

<b>Had Been Drinking' KA Crash Involved Drivers by Sex and Year</b>						
<b>Year</b>	<b>Number of KA Crash Involved Drivers</b>			<b>Number of KA Crash Involved Drivers Who Had Been Drinking</b>		
	<b>Male</b>	<b>Female</b>	<b>Total</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
1997	12,665	7,852	22,082	2,001	440	2,569
1998	12,176	7,372	20,894	1,878	455	2,451
1999	11,063	6,619	18,964	1,749	418	2,278
2000	10,476	6,165	17,927	1,534	365	1,976
2001	8,520	5,864	15,886	1,416	309	1,825
Change 1997 to 2001	-32.73%	-25.32%	-28.06%	-29.24%	-29.77%	-28.96%
Change 2000 to 2001	-18.67%	-4.88%	-11.39%	-7.69%	-15.34%	-7.64%

\*Total includes those records with missing values for sex.

Table 33: “Had Been Drinking” KA-Crash-Involved Drivers by Sex and Year

During this time, the proportion of KA-crash-involved women who had been drinking was 5 to 6% and the portion of KA-crash-involved men who had been drinking was 15 to 17%.

Table 34 shows the age distribution of the KA “had been drinking” drivers. Because driver age was available for 95% of the cases, the sum of the number of drivers by age category does not equal the totals shown in Tables 32 and 33. Despite the overall decline in the numbers of KA-crash-involved “had been drinking” drivers, the changes in the proportions were not uniform across all age categories. Over this five-year period, there has been an increase in the proportion of “had been

<b>Number and Percent of KA-Involved Drivers, Who “Had Been Drinking” by Year</b>					
<b>Driver Age</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>
Under 18 (%)	61 (2.5%)	58 (2.5%)	72 (3.3%)	49 (2.6%)	38 (2.2%)
18-24 (%)	571 (23.1%)	579 (24.6%)	564 (25.6%)	481 (25.2%)	489 (28.0%)
25-34 (%)	851 (34.4%)	728 (30.9%)	605 (27.5%)	563 (29.5%)	472 (27.0%)
35-54 (%)	840 (34.0%)	857 (36.4%)	841 (38.2%)	701 (36.7%)	663 (37.9%)
55-69 (%)	125 (5.1%)	108 (4.6%)	97 (4.4%)	96 (5.3%)	75 (4.3%)
70+ (%)	24 (1.0%)	19 (1.0%)	22 (1.0%)	19 (1.0%)	12 (0.7%)
Total (%)	2,472 (100%)	2,356 (100%)	2,201 (100%)	1,976 (100%)	1,749 (100%)

Table 34: Distribution of KA-Crash-Involved “Had Been Drinking” Drivers by Age and Year

drinking” KA-crash-involved drivers among the 18-24 and 35-54 age groups. This may indicate that programs to reduce drinking and driving are more successful with other age groups than they are with these two groups.

The following set of six tables shows the changes from 1997 to 2001 in the number and rates of KA-crash-involved “had been drinking” drivers by sex and for each age category.

Fatal or Serious Crash Involvement of Drivers Under 18 who 'Had Been Drinking' by Sex and Year										
Driver Age	Year	Count			Rate per 1000 Population**			Rate per 1000 Licensed Drivers		
		Male	Female	Total*	Male	Female	Total	Male	Female	Total
< 18 yr	1997	47	11	61	0.207	0.051	0.138	0.394	0.095	0.259
	1998	42	16	58	0.185	0.074	0.131	0.339	0.131	0.236
	1999	50	22	72	0.220	0.102	0.162	0.411	0.186	0.300
	2000	33	16	49	0.148	0.077	0.114	0.258	0.129	0.195
	2001	29	9	38	0.130	0.043	0.088	0.222	0.071	0.147
	Change 1997 to 2001	-38.30%	-18.18%	-37.70%	-0.373	-0.161	-36.40%	-43.62%	-25.54%	-43.19%
	Change 2000 to 2001	-12.12%	-43.75%	-22.45%	-0.126	-0.440	-22.86%	-13.83%	-45.27%	-24.25%

\*Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

\*\*Rate based on population of 15-17 year olds.

Table 35: Numbers and Rates of “Had Been Drinking” KA-Crash-Involved Drivers Under Age 18 by Sex and Year

Fatal or Serious Crash Involvement of Drivers 18-24 who 'Had Been Drinking' by Sex and Year										
Driver Age	Year	Count			Rate per 1000 Population			Rate per 1000 Licensed Drivers		
		Male	Female	Total*	Male	Female	Total	Male	Female	Total
18-24 yr	1997	479	89	571	1.043	0.194	0.623	1.241	0.225	0.731
	1998	484	94	579	1.047	0.204	0.627	1.246	0.237	0.737
	1999	489	96	584	0.987	0.207	0.608	1.164	0.239	0.708
	2000	374	103	481	0.794	0.223	0.516	0.864	0.252	0.571
	2001	403	78	489	0.851	0.168	0.522	0.925	0.189	0.577
	Change 1997 to 2001	-15.87%	-12.36%	-14.36%	-0.184	-0.136	-16.19%	-25.50%	-15.93%	-21.09%
	Change 2000 to 2001	7.75%	-24.27%	1.66%	0.072	-0.247	1.13%	7.09%	-24.86%	0.96%

\*Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

Table 36: Numbers and Rates of “Had Been Drinking” KA-Crash-Involved Drivers by Sex and Year, Age 18-24

Fatal or Serious Crash Involvement of Drivers 25-34 who 'Had Been Drinking' by Sex and Year										
Driver Age	Year	Count			Rate per 1000 Population			Rate per 1000 Licensed Drivers		
		Male	Female	Total <sup>a</sup>	Male	Female	Total	Male	Female	Total
25-34 yr	1997	685	156	851	0.984	0.215	0.598	1.221	0.215	0.701
	1998	576	145	728	0.846	0.204	0.523	1.044	0.204	0.611
	1999	469	128	605	0.705	0.184	0.444	0.871	0.184	0.521
	2000	461	98	563	0.676	0.144	0.413	0.709	0.144	0.438
	2001	388	79	472	0.566	0.116	0.345	0.604	0.116	0.372
	Change 1997 to 2001	-43.36%	-49.36%	-44.54%	-0.425	-0.461	-42.35%	-50.51%	-46.12%	-46.86%
	Change 2000 to 2001	-15.84%	-19.39%	-16.16%	-0.163	-0.198	-16.60%	-14.80%	-19.81%	-15.01%

\*Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

Table 37: Numbers and Rates of “Had Been Drinking” KA-Crash-Involved Drivers by Sex and Year, Age 25-34

Fatal or Serious Crash Involvement of Drivers 35-54 who 'Had Been Drinking' by Sex and Year										
Driver Age	Year	Count			Rate per 1000 Population			Rate per 1000 Licensed Drivers		
		Male	Female	Total <sup>a</sup>	Male	Female	Total	Male	Female	Total
35-54 yr	1997	663	163	840	0.467	0.155	0.340	0.606	0.123	0.347
	1998	663	180	857	0.462	0.170	0.344	0.599	0.134	0.349
	1999	674	151	841	0.465	0.140	0.333	0.602	0.110	0.337
	2000	564	135	701	0.384	0.094	0.241	0.401	0.094	0.247
	2001	525	129	663	0.356	0.089	0.227	0.373	0.090	0.233
	Change 1997 to 2001	-20.81%	-20.86%	-21.07%	-0.239	-0.425	-33.27%	-38.45%	-26.69%	-32.71%
	Change 2000 to 2001	-6.91%	-4.44%	-5.42%	-0.074	-0.049	-5.92%	-7.13%	-4.68%	-5.65%

\*Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

Table 38: Numbers and Rates of “Had Been Drinking” KA-Crash-Involved Drivers, by Sex and Year, Age 35-54



Fatal or Serious Crash Involvement of Drivers 55-69 who 'Had Been Drinking' by Sex and Year										
Driver Age	Year	Count			Rate per 1000 Population			Rate per 1000 Licensed Drivers		
		Male	Female	Total*	Male	Female	Total	Male	Female	Total
55-69 yr	1997	108	16	125	0.200	0.027	0.109	0.237	0.030	0.126
	1998	95	12	108	0.173	0.020	0.093	0.205	0.022	0.107
	1999	77	19	97	0.139	0.031	0.083	0.164	0.034	0.094
	2000	86	10	96	0.151	0.016	0.081	0.155	0.017	0.085
	2001	61	12	75	0.106	0.019	0.063	0.106	0.020	0.064
	Change 1997 to 2001	-43.52%	-25.00%	-40.00%	-0.467	-0.276	-42.71%	-55.25%	-32.51%	-49.19%
	Change 2000 to 2001	-29.07%	20.00%	-21.88%	-0.294	0.194	-22.28%	-31.58%	15.69%	-24.66%

\*Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

Table 39: Numbers and Rates of “Had Been Drinking” KA-Crash-Involved Drivers by Sex and Year, Age 55-69

Fatal or Serious Crash Involvement of Drivers Over 70 who 'Had Been Drinking' by Sex and Year										
Driver Age	Year	Count			Rate per 1000 Population			Rate per 1000 Licensed Drivers		
		Male	Female	Total*	Male	Female	Total	Male	Female	Total
70+ yr	1997	19	5	24	0.056	0.009	0.028	0.065	0.014	0.082
	1998	18	8	26	0.052	0.015	0.030	0.060	0.022	0.087
	1999	20	2	22	0.057	0.004	0.025	0.066	0.005	0.072
	2000	16	3	19	0.046	0.006	0.022	0.049	0.008	0.059
	2001	10	2	12	0.028	0.004	0.014	0.031	0.005	0.037
	Change 1997 to 2001	-47.37%	-60.00%	-50.00%	-0.491	-0.605	-51.05%	-53.00%	-63.60%	-55.35%
	Change 2000 to 2001	-37.50%	-33.33%	-36.84%	-0.378	-0.337	-37.17%	-37.86%	-34.34%	-37.21%

\*Total crash count may exceed sum of crash counts for males and females because of missing data for sex.

Table 40: Numbers and Rates of “Had Been Drinking” KA-Crash-Involved Drivers by Sex and Year, Age 70+

There was a reduction in the numbers and rates of involvement in “had been drinking” KA crashes for each age and sex group. However, these reductions were not uniform. The largest reductions were among drivers age 70 and older, who had very few “had been drinking” KA crashes throughout the five-year period. The smallest reduction in the numbers and rates of crashes was among drivers age 18-24.

Examining the set of tables reveals that the highest rates of KA crash involvement by drivers who “had been drinking” are among male drivers age 18-24. The rates of involvement for this group in 2001 were 0.85 for every 1,000 males age 18-24 in Michigan and 0.93 for every 1,000 males age 18-24 licensed to drive in Michigan. The second highest rates of involvement were among male drivers age 25-34. The involvement rates for these drivers was 0.57 involvements per 1,000 population and 0.60 per 1,000 licensed drivers. The rates of involvement for the younger men were about 35% higher than for the men age 25-34.

### **Blood Alcohol Concentration (BAC) Levels of Fatal-Crash-Involved Drivers**

Knowledge about BAC patterns of drivers involved in fatal and serious-injury crashes is needed for the current debate about changing the BAC level in the per-se drinking and driving laws. At the present time, it is illegal to drive a vehicle in Michigan with a BAC of 0.10 g/dl or more (a driver with BAC at or above 0.08 g/dl but below 0.10 g/dl can be charged with operating a vehicle while impaired [OWI], a lesser charge). The proposed change would decrease the BAC level above which it is illegal to drive to 0.08 g/dl. Another proposal is to add more severe sanctions when drivers have BAC levels at or above 0.15 g/dl.

Because BAC information was not available in the electronic Michigan Crash data files, FARS data were used. This limits the analysis of BAC levels to drivers involved in fatal crashes only.

Table 41 shows the availability of BAC information for drivers involved in fatal crashes. Of all drivers involved in fatal crashes in Michigan from 1997 to 2001, about 45% were not tested for blood alcohol. BAC levels were recorded for approximately 50% of drivers involved in fatal crashes.

<b>BAC Testing of Fatal-Crash-Involved Drivers by Year</b>					
	1997	1998	1999	2000	2001
Number and percent of drivers involved in fatal crashes	2,058 (100%)	2,010 (100%)	2,000 (100%)	2,008 (100%)	1,932 (100%)
Number and percent of drivers tested for BAC - known results	1,029 (50.0%)	1,028 (51.1%)	1,023 (51.1%)	1,052 (52.4%)	963 (49.8%)
Number and percent tested for BAC - test results unknown	68 (3.3%)	77 (3.8%)	89 (4.5%)	91 (4.5%)	83 (4.3%)
Number and percent not tested for BAC	1,029 (46.7%)	904 (45.0%)	888 (44.4%)	862 (42.9%)	886 (45.9%)

Table 41: BAC Testing of Fatal-Crash-Involved Drivers by Year

Table 42 shows the numbers and percentages of BAC tested drivers at four relevant levels of BAC: 1) Greater than 0.00 g/dl, which indicates that the driver had been drinking; 2) equal to or greater than 0.08 g/dl; [the proposed legal limit]; 3) equal to or greater 0.10 g/dl [the current legal limit]; and 4) equal to or greater than 0.15 g/dl [the level for proposed additional sanctions].

<b>Number and Distribution of BAC-Tested Fatal-Crash-Involved Drivers by BAC Level and Year</b>					
	1997	1998	1999	2000	2001
BAC > 0.00 g/dl	365 (35.5%)	370 (36.0%)	338 (33.0%)	320 (30.4%)	319 (33.1%)
BAC ≥ 0.08 g/dl	285 (27.7%)	309 (30.1%)	284 (27.8%)	258 (24.5%)	269 (27.9%)
BAC ≥ 0.10 g/dl	270 (26.2%)	279 (27.1%)	266 (26.0%)	243 (23.1%)	251 (26.1%)
BAC ≥ 0.15 g/dl	185 (18.0%)	221 (21.5%)	199 (19.5%)	166 (15.8%)	180 (18.7%)

Table 42: Number and Distribution of BAC-Tested Fatal-Crash-Involved Drivers by BAC Level and Year

Of drivers who were tested, approximately one-third had BAC levels over 0.00 g/dl. The BAC levels equaled or exceeded 0.08 g/dl for approximately 28% of the drivers tested; equaled or exceeded 0.10 g/dl for approximately 26% of the drivers

tested; and equaled or exceeded 0.15 g/dl for approximately 19% of the drivers tested. This pattern did not change much over the five-year period between 1997 and 2001.

Table 43 compares the numbers and proportions of drivers involved in fatal crashes who had BAC positive levels at or beyond the proposed legal BAC limit, the current legal BAC limit, and the proposed BAC level for additional sanctions.

<b>Comparison of numbers and proportions of BAC levels of fatal-crash-involved drivers who had been drinking by year</b>					
Drivers	1997	1998	1999	2000	2001
BAC > 0.00 g/dl	365 (100%)	370 (100%)	338 (100%)	320 (100%)	319 (100%)
BAC ≥ 0.08 g/dl	285 (78.1%)	309 (83.5%)	284 (84.0%)	258 (80.6%)	269 (84.3%)
BAC ≥ 0.10 g/dl	270 (74.0%)	279 (75.4%)	266 (78.7%)	243 (75.9%)	251 (78.7%)
BAC ≥ 0.15 g/dl	185 (50.7%)	221 (59.7%)	199 (58.9%)	176 (55.0%)	180 (56.4%)

Table 43: Comparison of Numbers and Proportions of BAC Levels by Year

Between 1997 and 2001, among drivers who were involved in fatal crashes and tested positively for BAC, about 82% were at or above BAC of 0.08 g/dl; approximately 77% were at or above BAC of 0.10 g/dl; and approximately 56% were at or above BAC of 0.15 g/dl. The number and proportion of fatal-crash-involved and BAC tested drivers are shown in Table 44 by age and BAC category.

<b>BAC-Tested Fatal-Crash-Involved Drivers by BAC Level, Age, and Year</b>						
	Age	1997	1998	1999	2000	2001
BAC > 0.00 g/dl	<18 (%)	10 (2.7)	10 (2.7)	9 (2.3)	9 (2.8)	10 (2.7)
	18-24	81 (22.2)	86 (22.2)	104 (26.8)	65 (20.3)	81 (22.2)
	25-34	130 (35.6)	109 (29.5)	91 (23.5)	109 (34.1)	91 (28.5)
	35-54	106 (29.0)	133 (35.9)	112 (28.9)	112 (35.0)	111 (34.9)
	55-69	24 (6.6)	23 (6.2)	18 (4.6)	22 (6.9)	20 (6.3)
	70+	10 (2.7)	10 (2.7)	4 (1.0)	3 (0.9)	5 (1.6)
	Total	365 (100)	370 (100)	338 (100)	320 (100)	319 (100)
BAC > 0.08 g/dl	<18	6 (2.1)	4 (1.3)	7 (2.5)	6 (2.3)	3 (1.1)
	18-24	64 (22.5)	68 (22.0)	84 (29.6)	53 (20.5)	73 (27.1)
	25-34	106 (37.2)	98 (31.7)	80 (28.2)	90 (34.9)	80 (29.7)
	35-54	87 (30.5)	113 (36.6)	96 (33.8)	90 (34.9)	93 (34.6)
	55-69	16 (5.6)	18 (5.8)	14 (4.9)	17 (6.6)	16 (5.9)
	70+	6 (2.1)	8 (2.6)	3 (1.1)	2 (0.8)	4 (1.5)
	Total	285 (100)	309 (100)	284 (100)	258 (100)	269 (100)
BAC > 0.10 g/dl	<18	5 (1.9)	2 (0.7)	7 (2.6)	5 (2.1)	3 (1.1)
	18-24	60 (22.2)	61 (21.8)	78 (29.3)	49 (20.2)	63 (25.1)
	24-34	100 (37.0)	91 (32.6)	75 (28.2)	85 (35.0)	76 (30.3)
	35-54	83 (30.7)	102 (36.6)	89 (33.5)	86 (35.4)	90 (35.9)
	55-69	16 (5.9)	16 (5.7)	14 (5.2)	16 (6.6)	16 (6.4)
	70+	6 (2.2)	7 (2.5)	3 (1.1)	2 (0.8)	3 (1.2)
	Total	270 (100)	279 (100)	266 (100)	243 (100)	251 (100)

<b>BAC-Tested Fatal-Crash-Involved Drivers by BAC Level, Age, and Year</b>						
BAC ≥ 0.15 g/dl	<18	2 (1.2%)	2 (0.9%)	4 (2.0%)	3 (1.7%)	1 (0.6%)
	18-24	30 (18.5%)	37 (16.7%)	51 (25.6%)	33 (18.8%)	40 (22.2%)
	25-34	63 (38.9%)	73 (33.0%)	58 (29.1%)	62 (35.2%)	56 (31.1%)
	35-54	57 (35.2%)	90 (40.7%)	74 (37.2%)	65 (36.9%)	67 (37.2%)
	55-69	8 (4.9%)	12 (5.4%)	10 (5.0%)	11 (6.3%)	13 (7.2%)
	70+	2 (1.2%)	7 (3.2%)	2 (1.0%)	2 (1.1%)	3 (1.7%)
	Total	162 (100%)	221 (100%)	199 (100%)	176 (100%)	180 (100%)

Table 44: Distribution of BAC-Tested Fatal-Crash-Involved Drivers by BAC Level, Age, and Year

The pattern by age group remained relatively constant over the five-year period and was similar when any of the BAC levels greater than 0.00 g/dl were considered. About 1 to 2% of the drivers were under age 18; 20% to 25% were age 18-24; 30% to 35% were age 25-34; 35% were age 35-54; 5% to 6% were age 55-69; and about 2% were over 70 years of age.

<b>Number and Proportion of Male BAC-Tested Fatal-Crash-Involved Drivers by BAC Level and Year</b>					
	1997	1998	1999	2000	2001
BAC > 0.00 g/dl	314 (86.0%)	310 (83.8%)	281 (83.1%)	258 (80.6%)	261 (81.8%)
BAC ≥ 0.08 g/dl	251 (88.1%)	262 (84.8%)	235 (82.7%)	206 (79.8%)	222 (82.5%)
BAC ≥ 0.10 g/dl	238 (88.2%)	236 (84.6%)	219 (82.3%)	194 (79.8%)	206 (82.1%)
BAC ≥ 0.15 g/dl	162 (87.6%)	186 (84.2%)	170 (85.4%)	141 (80.1%)	148 (82.1%)

Table 45: Number and Proportion of Male BAC-Tested Fatal-Crash-Involved Drivers by BAC Level and Year

The patterns by sex of the fatal-crash involved drivers with some amount of alcohol concentration (shown for male drivers in Table 45) were consistent across the four BAC categories and showed a decrease in the proportion of male drivers from about 87% to about 82% over the five-year period. Conversely, there was an increase in the proportion of women among fatal-crash-involved drivers who had been drinking from about 13% to 18%.

## Summary

Salient trends in “had been drinking” crashes from 1997 to 2001 are listed below:

- ! The overall number of “had been drinking” KA crashes decreased by 30% from 1997 to 2001.
- ! “Had been drinking” crashes remained at approximately 12% of all KA crashes between 1997 and 2001.
- ! The numbers and rates of crashes decreased for all age groups, but the decreases were not uniform.
- ! The proportion of KA-crash-involved drivers age 18-24 who “had been drinking” increased from 23% to 28%.
- ! The proportion of KA-crash-involved drivers age 35-54 who “had been drinking” increased from 34% to 38%.
- ! The highest rates of “had been drinking” KA crash involvement are among male drivers age 18-24 (0.925 per 1,000 licensed drivers in 2001).

Trends in BAC levels which follow are for fatal-crash involved drivers only.

- ! About 53% of drivers involved in fatal crashes are tested for blood alcohol.
- ! About one-third of drivers involved in fatal crashes, who were tested for blood alcohol, tested positively.
- ! About 28% of tested drivers involved in fatal crashes had BAC levels equal to or greater than 0.08 g/dl.
- ! About 26% of tested drivers involved in fatal crashes had BAC levels equal to or greater than 0.10 g/dl.
- ! Of drivers who had been drinking and were involved in a fatal crash, approximately 77% had BAC levels at or above 0.10 g/dl, and approximately 82% had BAC levels at or above 0.08 g/dl.
- ! Of fatal-crash-involved drivers testing positively for BAC (for each of the three levels), about 25% were age 18-24, 30% were age 25-34, and 35% were age 35-54.
- ! The proportion of women among fatal-crash-involved drivers testing positively for BAC at all three levels increased from about 13% to 18% from 1997 to 2001.



## 6. SAFETY BELT USE

Safety belt use among vehicle occupants involved in KA crashes from 1997 to 2001 are examined in this section. Safety belt use rates are examined by seating position and age. The safety belt use rates of killed and injured occupants are also examined. Key findings are summarized at the end of this section.

### Vehicle Occupants

The patterns of safety belt use among all vehicle occupants involved in KA crashes and those who were killed or seriously injured were examined. Table 46 shows the number of vehicle drivers and passengers involved in KA crashes between 1997 and 2001, and the number and proportions killed and seriously injured in these crashes.

Vehicle Occupants Killed and Seriously Injured by Seating Position and Year		1997	1998	1999	2000	2001
Drivers	KA-crash-involved	22,150	20,957	19,002	17,909	15,914
	Killed or seriously injured (%)	10,608 (48%)	9,989 (48%)	9,221 (49%)	8,688 (49%)	7841 (49%)
Passengers	KA-crash-involved	7,265	6,587	6,020	5,476	4,962
	Killed or seriously injured (%)	4,461 (61%)	4,106 (62%)	3,712 (62%)	3379 (62%)	3118 (63%)
Total Vehicle Occupants	KA-crash-involved	29,424	27,544	25,022	23,385	20,876
	Killed or seriously injured (%)	15,069 (51%)	14,095 (51%)	12,933 (52%)	12,067 (52%)	10,959 (52%)

Table 46: Vehicle Occupants Killed or Seriously Injured by Seating Position and Year

The total number of vehicle occupants killed and seriously injured decreased by 27% from 15,069 in 1997 to 10,959 in 2001. Over this time period, the relative proportions of drivers to passengers among vehicle occupants killed and seriously injured remained the same, with about 7 drivers to every 3 passengers. The proportions of drivers and passengers involved in KA crashes who were killed or seriously injured from 1997 to 2001 remained at 48-49% for drivers and 61-62% for passengers.

Safety belt data were available for approximately 95% of vehicle occupants involved in KA crashes, which is adequate to examine the trends in safety belt use among these persons. Table 47 shows the number of drivers involved in KA crashes

and the proportion using safety belts. Safety-belt use among these drivers increased from 70% in 1997 to 75% in 2000 and then decreased slightly to 72% in 2001. This pattern reflects the change to primary enforcement of the safety belt law and follows a pattern observed in statewide safety belt use Eby, Vivoda, & Fordyce, 2002).

Among drivers who did not sustain serious injuries in these crashes, safety belt use was 84% between 1997 and 1999, increased to 89% in 2000, and then decreased slightly to 88% in 2001. Among drivers who sustained KA injuries, the safety belt use rate was 57% between 1997 and 1999. This rate increased to 61% in 2000, and then decreased to 58%.

<b>KA Crash-Involved Vehicle Drivers by Safety Belt Use, Injury Severity, and Year</b>					
	1997	1998	1999	2000	2001
Drivers involved in KA crashes	20,014	19,005	17,205	16,189	14,344
Belted Drivers	14,089	13,421	12,024	12,123	10,391
(% Belted)	(70.4)	(70.6)	(69.9)	(74.9)	(72.4)
Drivers killed and seriously injured	10,123	9,562	8,817	8,244	7,436
Belted Drivers	5,751	5,440	4,983	5,054	4,311
(% Belted)	(56.8)	(56.9)	(56.5)	(61.3)	(58.0)
Drivers not killed or seriously injured	9,891	9,443	8,388	7,945	6,908
Belted Drivers	8,338	7,981	7,041	7,069	6,080
(% Belted)	(84.3)	(84.5)	(83.9)	(88.9)	(88.0)

Table 47: KA Crash-Involved Drivers by Safety Belt Use, Injury Severity, and Year

The number of passengers involved in fatal and serious-injury crashes and their use of safety belts is shown in Table 48. Between 1997 and 1999, safety belt use

<b>KA Crash-Involved Vehicle Passengers by Safety Belt* Use, Injury Severity, and Year</b>					
	1997	1998	1999	2000	2001
Passengers Involved in KA Crashes	5,736	5,887	5,708	5,278	4,801
Belted Passengers (% Belted)	3,162 (55.1)	3,180 (54.0)	3,156 (55.3)	3,284 (62.2)	2,881 (60.0)
Passengers - killed or seriously injured	3,494	3,679	3,532	3,265	3,024
Belted Passengers (% Belted)	1,707 (49.8)	1,864 (49.3)	1,764 (49.9)	1,837 (56.3)	1,695 (56.1)
Passengers - not seriously injured	2,242	2,208	2,176	2,013	1,777
Belted Passengers (% Belted)	1,455 (64.9)	1,316 (59.6)	1,392 (64.0)	1,447 (71.9)	1,186 (66.7)

\* Includes Child Safety Seats

Table 48: KA Crash-Involved Passengers by Safety Belt Use, Injury Severity, and Year

among passengers involved in KA crashes was constant at 55%. In year 2000, safety belt use increased to 62% and decreased slightly to 60% in 2001.

Safety belt use among passengers who were killed and seriously injured was 50% between 1997 and 1999, and increased to 56% in 2000, with no significant decrease in 2001. Among those passengers who were not seriously injured, safety belt use varied between 60 and 65% from year 1997 to 1999, and increased to 72% in 2000, but decreased to 67% in 2001.

The percent of drivers and passengers who were killed or seriously injured is shown by safety belt use in Table 49.

<b>Percent of Vehicle Occupants Killed or Seriously Injured by Seating Position, Safety Belt Use, and Year</b>					
	1997	1998	1999	2000	2001
Belted Driver	40.8%	40.8%	41.4%	41.6%	41.5%
Unbelted Driver	73.8%	73.8%	74.0%	78.5%	79.1%
Belted* Passenger	54.0%	58.6%	55.9%	55.9%	58.8%
Unbelted Passenger	69.4%	67.0%	69.3%	71.6%	69.2%

\* Includes child safety seat for children below age 5.

Table 49: Percent of Vehicle Occupants Killed or Seriously Injured by Seating Position, Safety Belt Use, and Year

Among belted drivers involved in KA crashes, 41% were killed or seriously injured. This did not change much over the five-year period. Among unbelted drivers, the fatality and serious-injury rate increased in 2000 from 74% (unchanged between 1997 and 1999) to 79%, where it remained in 2001. The rates of fatal and serious-injury crashes for belted passengers fluctuated between 54% and 59% over the five-year period, with no identifiable trend. The fatality and serious injury rate among unbelted passengers fluctuated between 67% and 72%, with no identifiable trend.

### Driver Safety Belt Use by Age

Table 50 shows the age distribution of drivers involved in fatal and serious-injury crashes and the portion of each age group using safety belts. The pattern of safety belt use by age among KA-crash-involved drivers reflects that of safety belt use among Michigan drivers in general, with the lowest overall safety belt use among drivers age 18-34, except in 2001, when the safety belt use for drivers under age 18 was slightly lower. Safety belt use among drivers under age 18 was only slightly higher than that for drivers age 18-34 from 1997 to 2000. There was a marked increase in the safety belt use for all age groups in year 2000, followed by a small decrease in 2001.

KA Crash-Involved Drivers by Age Category, Safety Belt Use, and Year						
Age	All Drivers	1997	1998	1999	2000	2001
< 18	Involved in KA crash	1,642	1,436	1,218	1,143	1,134
	Belted (% belted)	1,131 (68.9)	1,000 (69.6)	818 (69.9)	831 (72.7)	741 (65.3)
18-24	Involved in KA crash	4,106	3,956	3,670	3,485	3,061
	Belted (% belted)	2,689 (65.5)	2,530 (64.0)	2,335 (63.6)	2,489 (71.4)	2,113 (69.0)
25-34	Involved in KA crash	4,796	4,355	3,788	3,510	2,985
	Belted (% belted)	3,186 (66.4)	2,907 (66.8)	2,545 (67.2)	2,484 (70.8)	2,075 (69.5)
35-54	Involved in KA crash	6,512	6,375	5,988	5,501	4,956
	Belted (% belted)	4,783 (73.5)	4,664 (73.2)	4,286 (71.6)	4,205 (76.4)	3,693 (74.5)
55-69	Involved in KA crash	1,827	1,784	1,569	1,637	1,401
	Belted (% belted)	1,406 (77.0)	1,412 (79.1)	1,234 (78.7)	1,342 (82.0)	1,095 (78.2)
70+	Involved in KA crash	1,123	1,096	969	902	796
	Belted (% belted)	893 (79.5)	906 (82.7)	804 (83.0)	771 (85.5)	672 (84.4)

Table 50: KA Crash-Involved Drivers by Age Category, Safety Belt Use, and Year

Table 51 shows the age distribution and safety belt use of drivers who were killed and seriously injured in crashes by year. The safety belt use among the killed or seriously injured drivers follows the same pattern as for all KA involved drivers with respect to age. The pattern of an increase in year 2000 followed by a decrease in year 2001 is also present. The safety belt use rate of drivers who were killed or seriously injured was consistently about 15% lower than that of all drivers involved in KA crashes for age groups below age 55. For drivers ages 55-69, this difference was about 11%, and for drivers age 70 and older, this difference was about 7%. The smaller differences in safety belt use between killed or seriously injured drivers and KA-crash-involved drivers in the older age groups clearly show the fragility of older people in crashes.

<b>Killed and Seriously-injured Vehicle Drivers by Age Category, Safety Belt Use, and Year</b>						
	Number of Drivers	1997	1998	1999	2000	2001
< 18	Killed or seriously injured	803	744	600	589	595
	Belted	433	415	310	332	273
	(% belted)	(53.9)	(55.8)	(51.7)	(56.4)	(45.9)
18-24	Killed or seriously injured	2,117	1,985	1,934	1,776	1,597
	Belted	1,099	958	978	1,027	880
	(% belted)	(51.9)	(48.3)	(50.6)	(57.8)	(55.1)
25-34	Killed or seriously injured	2,375	2,153	1,901	1,777	1,514
	Belted	1,188	1,095	1,011	988	800
	(% belted)	(50.0)	(50.9)	(53.2)	(55.6)	(52.8)
35-54	Killed or seriously injured	3,239	3,125	3,003	2,718	2,492
	Belted	1,940	1,854	1,708	1,692	1,489
	(% belted)	(59.9)	(59.3)	(56.9)	(62.3)	(59.8)
55-69	Killed or seriously injured	906	907	807	836	737
	Belted	597	629	545	594	485
	(% belted)	(65.7)	(69.4)	(67.5)	(71.1)	(65.8)
70+	Killed or seriously injured	679	647	572	539	493
	Belted	493	488	431	421	383
	(% belted)	(72.6)	(75.4)	(75.4)	(78.1)	(77.7)

Table 51: Killed and Seriously-injured Drivers by Age Category, Safety Belt Use, and Year

### **Passenger Safety Belt Use by Age**

Tables 52 and 53 show the age distribution and safety belt use rate of all passengers involved in KA crashes and those passengers who were killed or seriously

injured. There was an increase in safety belt use in 2000 among passengers involved in KA crashes similar to that for drivers. However, across all age groups, safety belt use was lower among passengers than among drivers. The difference was greatest among younger age groups.

The lowest safety belt use was among passengers age 18 to 24 at 41% among all KA-crash-involved passengers (Table 52) and 38% among those killed or injured (Table 53) in 1997. By 2001, the safety belt use rate for this age group increased to 48% among all KA-crash-involved passengers and to 44% among those KA-crash-involved passengers who were killed or seriously injured. Safety belt use rates of the KA-crash-involved passengers were higher in the older age groups.

<b>KA-Crash-involved Vehicle Passengers by Age Category, Safety Belt Use, and Year</b>						
Age	All Passengers	1997	1998	1999	2000	2001
< 4	Involved in KA crash	304	282	285	265	224
	Belted or in Child Safety Seat (% restrained)	234 (77.0)	212 (75.2)	205 (71.9)	220 (83.0)	168 (75.0)
5-15	Involved in KA crash	1296	1401	1,285	1,165	1,014
	Belted (% belted)	755 (57.8)	807 (57.6)	763 (59.4)	777 (66.7)	649 (64.0)
16-17	Involved in KA crash	580	629	602	509	503
	Belted (% belted)	271 (46.7)	282 (43.1)	276 (45.9)	279 (54.8)	272 (54.1)
18-24	Involved in KA crash	1,165	1,156	1,193	1,106	1,075
	Belted (% belted)	480 (41.2)	498 (47.2)	532 (44.6)	558 (50.5)	515 (47.9)
25-34	Involved in KA crash	803	788	754	679	567
	Belted (% belted)	391 (48.7)	373 (54.7)	353 (46.8)	362 (53.3)	300 (52.9)
35-54	Involved in KA crash	931	987	943	899	864
	Belted (% belted)	555 (59.6)	540 (54.7)	545 (57.8)	566 (63.0)	529 (61.2)
55-69	Involved in KA crash	334	334	333	356	302
	Belted (% belted)	240 (71.9)	236 (70.7)	236 (70.9)	284 (79.8)	235 (77.8)
70+	Involved in KA crash	323	310	313	299	252
	Belted (% belted)	228 (70.6)	232 (74.8)	237 (75.5)	221 (73.9)	198 (78.6)

Table 52: KA-Crash-involved Passengers by Age Category, Safety Belt Use, and Year

The trend in safety belt and child safety seat use among all child passengers age 0-4 who were involved in KA crashes, declined from 77% in 1997 to 72% in 1999, followed by an increase to 83% in 2000, and a subsequent decrease to 75% in 2001 (Table 52). Safety belt and child safety seat use among those child passengers age 0-4 who were killed or seriously injured, was lower. The use rates varied between 62% and 66% in 1997 to 1999, increased to 77% in 2000, and then declined to 68% in 2001 (Table 53).

Use of safety belts among child passengers age 5-15 involved in KA crashes was 58% to 59% from 1997 to 1999. In 2000, the use rate increased to 67%, and then decreased to 64% in 2001. The use rate among those child passengers who were killed or seriously injured was 51% to 53% in 1997 to 1999, with an increase to 61% in 2000, and a slight decline to 60% in 2001.

<b>Vehicle Passengers Killed or Seriously Injured by Age Category, Safety Belt Use, and Year</b>						
Age	Number of passengers	1997	1998	1999	2000	2001
< 4	Killed or seriously injured	123	131	131	112	117
	Belted or in Child Safety Seat (% restrained)	79 (64.2)	86 (65.6)	81 (61.8)	86 (76.8)	80 (68.4)
5-15	Killed or seriously injured	685	780	674	613	547
	Belted (% belted)	348 (50.8)	399 (51.2)	359 (53.3)	376 (61.3)	326 (59.6)
16-17	Killed or seriously injured	352	356	346	306	314
	Belted (% belted)	141 (40.1)	145 (40.7)	144 (41.6)	145 (47.4)	158 (50.3)
18-24	Killed or seriously injured	762	741	761	694	673
	Belted (% belted)	288 (37.8)	287 (38.7)	298 (39.2)	291 (41.9)	295 (43.8)
25-34	Killed or seriously injured	505	526	496	440	369
	Belted (% belted)	226 (44.8)	230 (43.7)	212 (42.7)	212 (48.2)	183 (49.6)
35-54	Killed or seriously injured	626	658	636	629	620
	Belted (% belted)	354 (56.6)	330 (50.2)	329 (51.7)	361 (57.4)	359 (57.9)
55-69	Killed or seriously injured	206	240	240	251	205
	Belted (% belted)	140 (68.0)	162 (67.5)	160 (66.7)	195 (77.7)	155 (75.6)
70+	Killed or seriously injured	235	247	248	220	179
	Belted (% belted)	158 (67.2)	173 (70.0)	180 (72.6)	166 (75.5)	134 (74.9)

Table 53: Passengers Killed or Seriously Injured by Age Category, Safety Belt Use, and Year

## Summary

Salient trends in safety belt use among drivers and passengers involved in KA crashes from 1997 to 2001 are listed below:

- ! The number of persons killed and seriously injured in KA crashes decreased by 29% between 1997 and 2001.
- ! Safety belt use among drivers and passengers increased in year 2000. The pattern of increase was similar to that observed statewide with the implementation of the primary safety belt enforcement law.
- ! Safety belt use among KA-crash-involved passengers is lower by about 15% than for KA-crash-involved drivers.
- ! Safety belt use rates among drivers killed or injured in KA crashes was about 13% lower than the rate for all KA-involved drivers.
- ! Safety belt use rates among passengers killed or injured in KA crashes was about 5% lower than the rate for all KA-involved passengers.

### *Children Under Age 5*

- ! The number of children under age 5 who were killed or seriously injured in KA crashes between 1997 and 2001 decreased 19%.
- ! The use of child safety seats and safety belt use among children under age 5 who were involved in KA crashes decreased from 77% to 75% between 1997 and 2001, despite an increase in year 2000.
- ! Child safety seat and safety belt use among KA-crash-involved children under age 5 who were killed or seriously injured was lower by 6-13% than for all KA crash-involved children that age.

### *Children Age 5-15*

- ! The decrease in the number of children age 5-15 who were killed and seriously injured as passengers in KA crashes between 1997 and 2001 was 25%.
- ! The safety belt use rate among child passengers age 5-15 who were involved in KA crashes, was 64% in 2001, a 6% increase from 1997.
- ! Safety belt use among KA-crash-involved children age 5-15 who were killed or seriously injured, was lower by about 6% than for all KA crash-involved children that age.



## 7. KA CRASHES INVOLVING PEDESTRIANS, BICYCLES, AND MOTORCYCLES

In this section, KA crashes from 1997 to 2001 involving pedestrians, bicycles, and motorcycles are examined. The numbers and rates of KA crashes are calculated as are the proportions of “had been drinking” and “hit and run” crashes. Helmet use in bicycle and motorcycle crashes is also examined.

### Pedestrians

Table 54 shows the number of fatal and serious-injury crashes that involved pedestrians, and proportions that involved “had been drinking” drivers and “hit and run” drivers. The overall number of KA crashes involving pedestrians decreased by 19% from 1997 to 2001. However, the proportion of these crashes involving drinking has remained at approximately 20% over the five-year period. The proportion of these crashes that involved “hit and run” drivers also remained relatively constant at about 19% over the five-year period.

Pedestrian KA Crashes					
Year	Total Pedestrian KA Crashes	HBD Crashes		Hit and Run Crashes	
		HBD KA Pedestrian Crashes	Proportion of KA Pedestrian Crashes	Hit and Run Pedestrian KA Crashes	Proportion of KA Pedestrian Crashes
1997	1,040	206	19.81%	178	17.12%
1998	1,055	192	18.20%	204	19.34%
1999	931	199	21.37%	182	19.55%
2000	737	148	20.08%	126	17.10%
2001	840	161	19.17%	167	19.88%
Change 1997 to 2001	-19.23%	-21.84%	-0.64%	24.00%	2.76%
Change 2000 to 2001	13.98%	8.78%	-0.91%	32.54%	2.78%

Table 54: KA Crashes Involving Pedestrians by Year

The distributions of pedestrian crashes by month are shown in Table 55 and Figure 23. There is no distinct pattern or trend over the months of the year.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	68	77	69	63	100	100	89	88	94	105	91	96
1998	108	69	89	89	99	74	92	82	93	98	82	80
1999	79	52	73	83	76	85	90	81	90	90	56	76
2000	89	58	59	55	47	53	46	55	73	62	61	79
2001	74	64	52	72	67	73	61	72	70	83	80	72

Table 55: Pedestrian KA Crashes by Month and Year

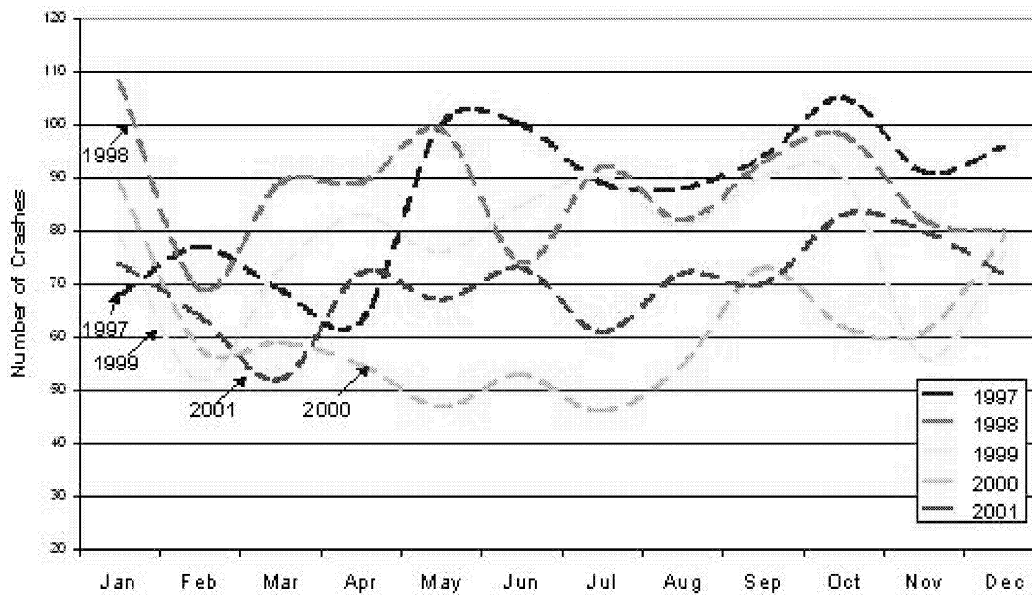


Figure 23: Pedestrian KA Crashes by Month and Year

Table 56 and Figure 24 show the distribution of KA crashes involving pedestrians by day of week. The only pattern that can be discerned is that Friday and Saturday continue to be the peak days of the week for pedestrian KA crashes.

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	112	148	133	134	145	217	151
1998	118	142	162	145	138	195	155
1999	96	119	119	132	151	170	144
2000	86	95	99	112	114	123	108
2001	98	132	113	108	90	160	139

Table 56: Pedestrian KA Crashes by Day of Week and Year

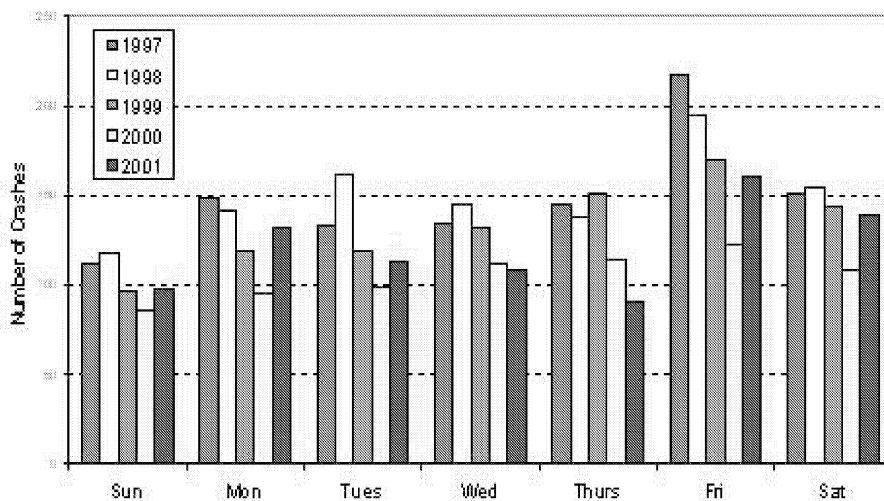


Figure 24: Pedestrian KA Crashes by Day of Week and Year

## Bicycles

The number of fatal and serious-injury crashes involving bicycles has decreased by 26% from 1997 to 2001 (Table 57). The portion of these crashes that involved “had been drinking” drivers was approximately 10% over the five years, although in 2000, the rate was 7%. The proportion of bicycle KA crashes that involved “hit and run” drivers increased slightly over the five-year period from approximately 11% to 15%.

Bicycle KA Crashes					
Year	Total Bicycle KA Crashes	HBD Crashes		Hit and Run	
		HBD Bicycle KA Crashes	Proportion of Bicycle KA Crashes	Hit and Run Bicycle KA Crashes	Proportion of Bicycle KA Crashes
1997	389	38	9.77%	41	10.54%
1998	376	38	10.11%	40	10.64%
1999	336	40	11.90%	45	13.39%
2000	254	18	7.09%	22	8.66%
2001	289	26	9.00%	42	14.53%
Change 1997 to 2001	-25.71%	-31.58%	-0.77%	24.00%	3.99%
Change 2000 to 2001	13.78%	44.44%	1.91%	90.91%	5.87%

Table 57: KA Crashes Involving Bicycles by Year

Table 58 and Figure 25 show the distribution of KA crashes involving bicycles by month. Table 59 and Figure 26 show the distribution by day of week. The patterns of occurrence of bicycle KA crashes over the months of the year and days of the week have not changed over the five-year period. The majority of bicycle crashes occur from April to October, with no clear pattern over the days of the week.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	6	2	8	35	30	64	73	68	52	38	9	8
1998	11	4	8	24	70	69	46	64	36	25	12	7
1999	2	6	10	28	31	46	46	66	51	25	18	12
2000	7	6	19	12	30	43	28	37	36	28	12	2
2001	0	4	7	24	32	53	37	43	34	28	14	13

Table 58: Bicycle KA Crashes by Month and Year

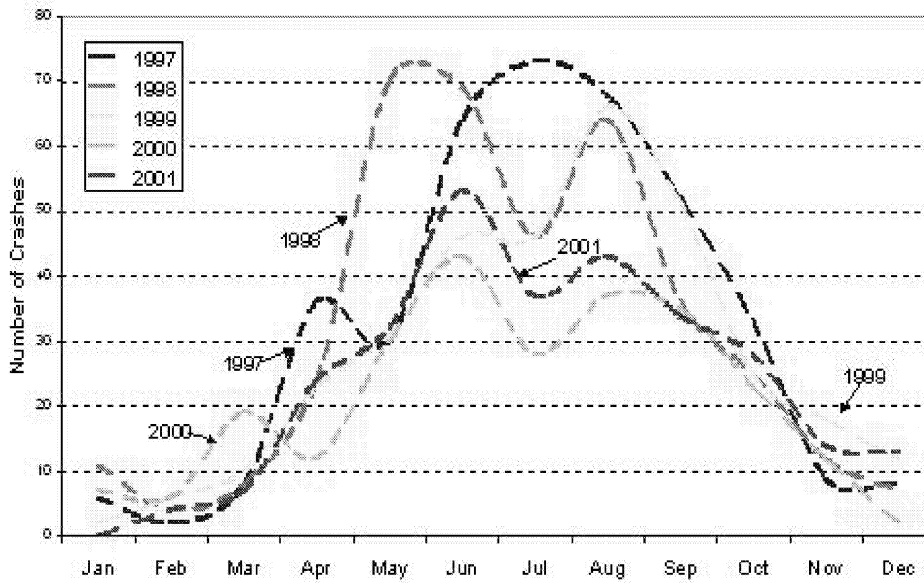


Figure 25: Bicycle KA Crashes by Month and Year

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	44	51	59	58	61	59	57
1998	44	66	47	50	47	66	56
1999	34	53	53	55	48	49	44
2000	28	38	42	42	28	44	32
2001	37	38	44	50	39	48	33

Table 59: Bicycle KA Crashes by Day of Week and Year

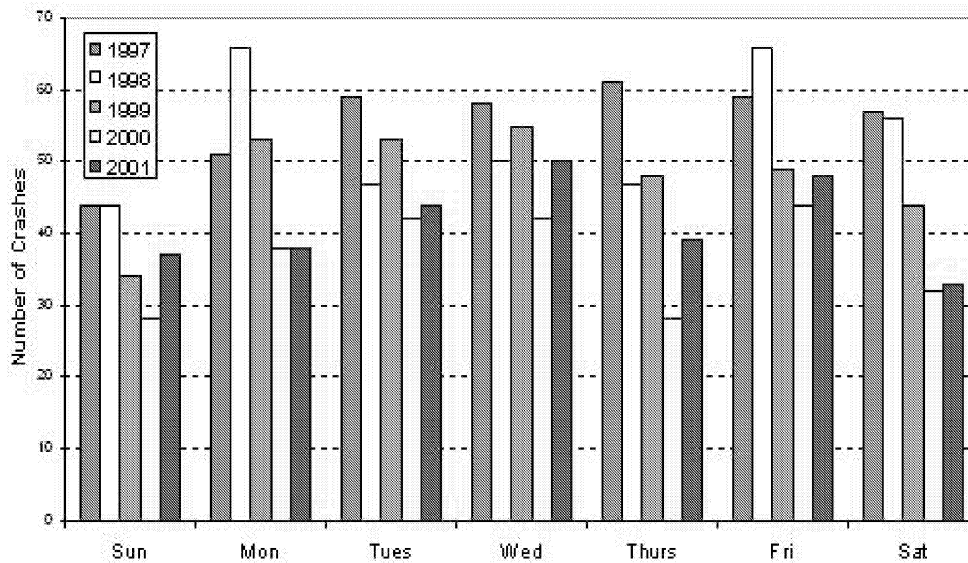


Figure 26: Bicycle KA Crashes by Day of Week and Year

Table 60 shows the helmet use of bicyclists involved in KA crashes. There has been an increase in helmet use among KA crash-involved bicyclists from 12% to 18% over the five-year period.

Year	Helmet Worn	Helmet Not Worn	Use Unknown
1997	22	146	8
1998	10	125	8
1999	26	114	2
2000	17	84	4
2001	21	93	4

Table 60: Bicycle KA Crashes by Helmet Use and Year

## Motorcycles

Table 61 shows the number of KA crashes involving motorcycles and the numbers and proportions that involved a “had been drinking” driver (either the motorcyclist or the car driver). The number of KA crashes involving motorcycles has

increased by 11% from 1997 to 2001. The proportion that involved “had been drinking” drivers has decreased slightly, but is still at about 15% of all motorcycle KA crashes. Whether this slight decrease is the beginning of a trend cannot be determined at this time.

Motorcycle KA Crashes			
Year	Total Motorcycle KA Crashes	HBD Crashes	
		HBD Motorcycle KA Crashes	Proportion of KA Motorcycle Crashes
1997	298	46	15.44%
1998	338	46	13.61%
1999	330	51	15.45%
2000	338	47	13.91%
2001	331	48	14.50%
Change 1997 to 2001	11.07%	4.35%	0.94%
Change 2000 to 2001	-2.07%	2.13%	0.59%

Table 61: KA Crashes Involving Motorcycles by Year

The pattern of crash occurrence by month of year has not changed, with the majority of the crashes occurring between April and October (Table 62 and Figure 27).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	0	1	9	27	34	60	47	41	41	34	3	1
1998	1	7	14	25	45	49	53	60	39	29	13	3
1999	2	0	10	22	55	47	58	50	38	31	15	2
2000	1	4	24	23	45	50	49	68	32	37	4	1
2001	1	1	10	32	28	54	58	58	50	22	13	4

Table 62: Motorcycle KA Crashes by Month and Year

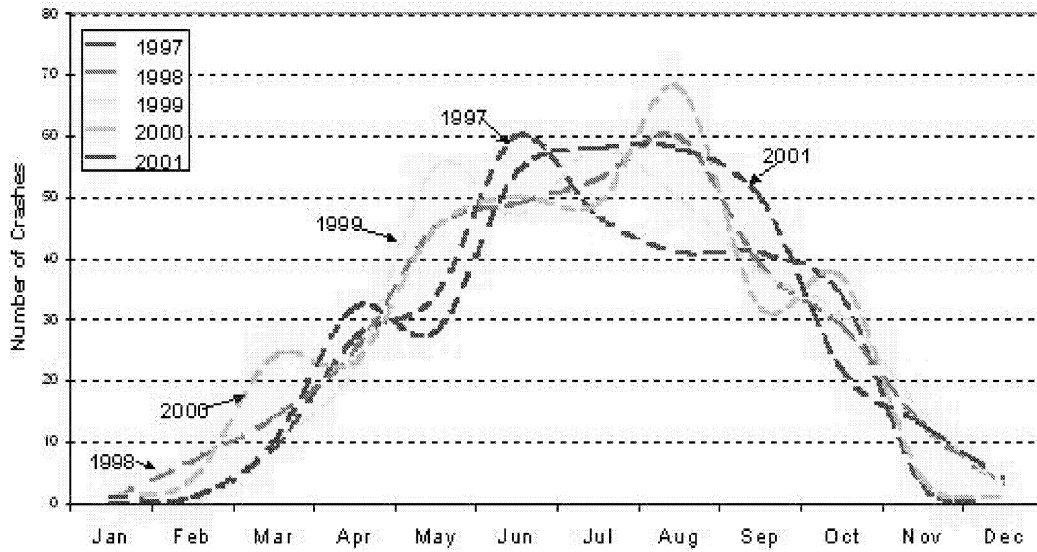


Figure 27: Motorcycle KA Crashes by Month and Year

The pattern of crash occurrence by day of week also has not changed, with the majority of the crashes occurring on weekends (Table 63 and Figure 28).

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	62	29	42	44	36	37	48
1998	57	43	36	38	50	54	60
1999	52	21	48	31	31	65	82
2000	44	41	42	34	47	56	74
2001	53	37	47	50	38	48	58

Table 63: Motorcycle KA Crashes by Day of Week and Year



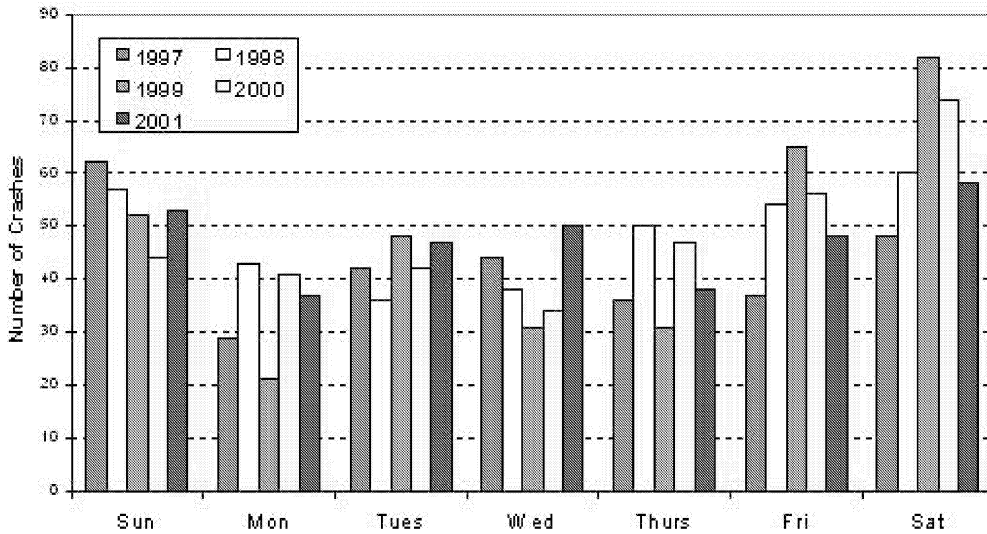


Figure 28: Motorcycle KA Crashes by Day of Week and Year

Table 64 shows helmet use among KA crash-involved motorcyclists for the approximately 72% of KA motorcycle crashes for which helmet use was recorded. Among these cases helmet use increased from 91% to 96% from 1997 to 2001.

Year	Helmet Worn	Helmet Not Worn	Use Unknown
1997	185	16	3
1998	239	23	1
1999	229	7	0
2000	227	14	6
2001	233	10	3

Table 64: Motorcycle KA Crashes by Helmet Use and Year

Because the number of KA crashes involving motorcycles is relatively small and because there was no information for 28% of the cases, it cannot be concluded with certainty that helmet use increased over the five-year period. However Table 64 could

be interpreted as providing some evidence of an increase in helmet use among motorcyclists.

## **Summary**

Salient trends in KA crashes involving pedestrians, bicycles, and motorcycles between 1997 and 2001 are listed below:

- ! The number of pedestrian KA crashes decreased by 19% from 1997 to 2001.
- ! The number of bicycle KA crashes decreased by 26%.
- ! Helmet use among bicyclists involved in KA crashes in 2001 was 18%, an increase of 6% from 1997.
- ! The number of motorcycle KA crashes increased by 11% between 1997 and 2001.
- ! Helmet use among KA-crash involved motorcyclists for cases in which this was recorded, was 96%, an increase of 5% from 1997.

## 8. KA CRASHES INVOLVING LARGE TRUCKS

This section examines changes in KA crashes that involved large trucks. Large trucks are vehicles that have a gross vehicle weight over 10,000 pounds, and do not include buses or other vehicles used for transporting people.

Table 65 shows the numbers of crashes involving large trucks, the number of persons seriously injured or killed in these crashes, and the proportions of these crashes and casualties relative to all KA crashes. Over the five-year period from 1997 to 2001, the number of KA crashes involving large trucks decreased by 36%. However, the proportion of KA crashes that involved large trucks has remained at approximately 6%.

Year	Number of KA Large Truck Crashes	% of All KA Crashes	Persons Killed or Seriously Injured in Large Truck Crashes	Proportion of Persons Killed or Seriously Injured in All KA Crashes
1997	702	5.47%	910	5.44%
1998	690	5.66%	856	7.02%
1999	734	6.55%	872	7.78%
2000	605	5.80%	766	7.34%
2001	452	4.81%	571	6.08%
change 1997-2001	-35.61%	-0.66%	-37.25%	0.64%
change 2000-2001	-25.29%	-0.99%	-25.46%	-1.26%

Table 65: Large Truck KA Crashes by Year

The number of persons killed and seriously injured in crashes involving large trucks has decreased by 37% from 1997 to 2001. The proportion of all persons killed or seriously injured in crashes involving large trucks varied slightly over the five-year period, but averages about 7%.

The distribution of KA crashes involving large trucks by month and day of week has not changed over the five-year period. Approximately 18-20% of these crashes occur in December and January, and about 89% occur from Monday through Friday (Tables 66 and 67, Figures 29 and 30).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	78	48	41	43	46	55	72	64	68	68	52	67
1998	72	33	47	57	53	63	58	64	56	74	51	60
1999	71	43	44	40	59	72	53	61	57	65	66	63
2000	57	40	37	43	59	45	43	50	58	49	59	65
2001	38	24	35	33	37	45	49	35	30	42	41	43

Table 66: Large Truck KA Crashes by Month and Year

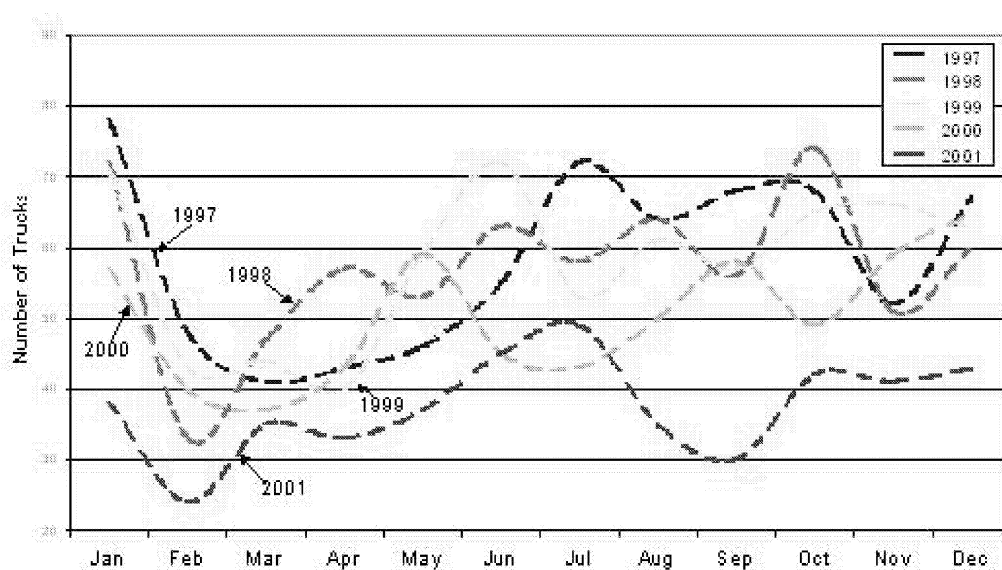


Figure 29: Large Truck KA Crashes by Month and Year

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1997	26	113	110	119	143	134	57
1998	19	120	119	137	124	119	52
1999	41	100	115	123	122	133	60
2000	23	105	106	94	107	124	46
2001	20	78	80	100	63	79	32

Table 67: Large Truck KA Crashes by Day of Week and Year

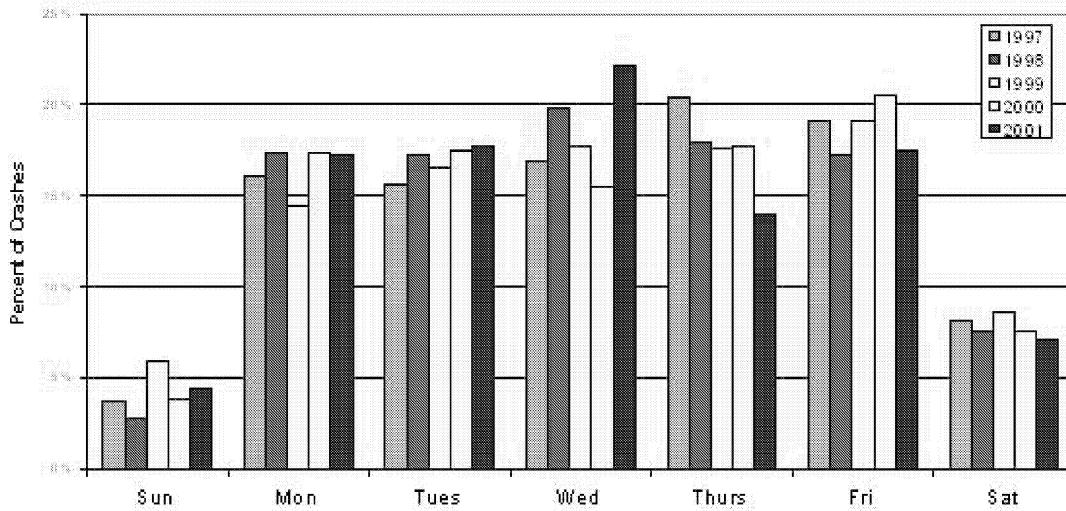


Figure 30: Large Truck KA Crashes by Day of Week and Year

Table 68 and Figure 31 show the location of KA crashes involving large trucks. The proportion of these crashes occurring on city streets and county roads has changed over the five-year period from 41% in 1997 to 37% in 2001. The proportion of crashes occurring on Michigan routes increased from 25% in 1997 to 30% in 2001. At this time, it cannot be determined if this is a chance variation or the beginning of a trend. As noted earlier, data on highway class for year 2000 were unreliable and thus not presented here.

	Interstate	U.S. Route	MI Route	City/County
1997	123	100	162	263
1998	128	96	133	234
1999	136	81	140	225
2000				
2001	64	44	100	122

Table 68: Large Truck KA Crashes by Highway Class and Year

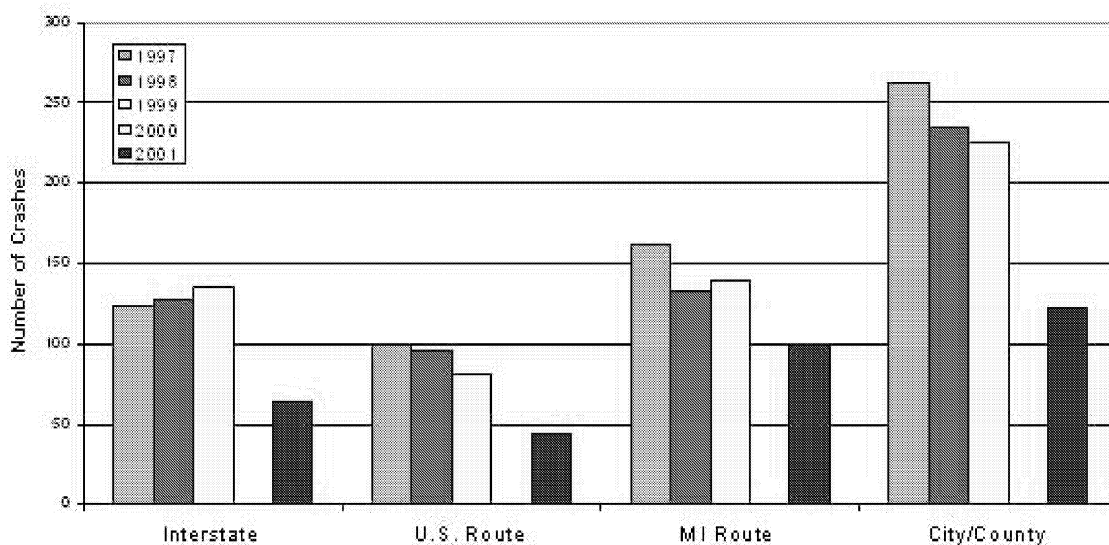


Figure 31: Large Truck KA Crashes by Highway Class and Year

The patterns of hazardous actions by truck drivers and car drivers in multiple vehicle KA crashes involving large trucks have not changed over the five-year period. Table 69 shows that the most frequent hazardous actions by truck drivers are failing to leave adequate clear distance, failing to comply with traffic control, failing to yield the right of way, and speeding. As Table 70 indicates, the most frequent hazardous actions recorded for drivers of the other vehicle are failing to leave adequate clear distance, failing to yield right-of-way, speeding, failing to comply with traffic control, and driving left of center.

Hazardous Actions in Multi-vehicle Large Truck KA Crashes - Truck Drivers				
Year	Clear Distance	Traffic Control	Fail to Yield	Speed too Fast
1997	53	26	53	48
1998	59	33	59	34
1999	54	34	54	45
2000	39	20	39	23
2001	15	11	15	24

Table 69: Hazardous Actions in Multi-Vehicle Large Truck KA Crashes, Truck Drivers

Hazardous Actions in Multiple-Vehicle Large Truck KA Crashes - Other Driver					
Year	Clear Distance	Fail to Yield	Speed too Fast	Traffic Control	Left of Center
1997	93	89	68	47	38
1998	65	76	50	41	48
1999	106	68	66	39	44
2000	86	45	56	44	37
2001	45	51	40	23	36

Table 70: Hazardous Actions in Multi-Vehicle Large Truck KA Crashes, Other Drivers

### Summary

Salient trends in KA crashes involving large trucks between 1997 and 2001 are listed below:

- ! The number of KA crashes involving large trucks decreased by 28% from 1997 to 2001.
- ! The proportion of KA crashes involving large trucks remained constant at 6%.

## 9. NOTABLE TRENDS

Of the trends in Michigan motor vehicle KA crashes identified by this report, the following should be noted and monitored for potential action as needed:

### Reduction in KA Crash Rates

There has been a consistent reduction in the number and rates of KA crashes in Michigan from 1997 to 2001. The number of KA crashes has decreased by 27% and the number of persons killed or severely injured has decreased by 29%. The rates of KA crashes per population, licensed drivers, registered vehicles, and vehicle miles of travel have also each decreased by close to 30% over the five-year period from 1997 to 2001. The proportion of all crashes that result in a fatality or severe injury has also decreased over this five-year period (from 3.0% to 2.3% of all crashes) indicating progress toward the reduction of overall crash severity.

It would be useful to compare the reduction of KA crashes in Michigan to that of the nation as a whole. A direct comparison cannot be made without additional analysis which was beyond the scope of this study. However, fatality rates, readily available from NHTSA (2003) provide a simple comparison. As can be seen from Table 71, Michigan's fatality rates are lower than the national average for each of the four exposure measures.

Michigan and U.S. Motor Vehicle Fatality Rates, 2001		
	Michigan	USA
Fatalities/100,000 population	13.29	14.79
Fatalities /100,000 licensed drivers	19.03	22.02
Fatalities/100,000 registered vehicles	15.35	19.04
Fatalities/100 million vehicle miles of travel	1.34	1.51

Table 71: Comparison of Fatality Rates in Michigan and U.S. in 2001



Looking at individual states, Michigan had the 15<sup>th</sup> lowest fatality rate per population, 15<sup>th</sup> lowest fatality rate per licensed driver, the 20 lowest fatality rate per registered vehicle, and 17<sup>th</sup> lowest fatality rate per vehicle miles of travel. (Note, these are fatality rates not KA rates). Although this is a positive assessment of Michigan's traffic safety, current traffic safety efforts have to be continued for this advantage to be maintained.

### **Reduction of KA Crashes in May**

Another noticeable trend is the reduction of the proportion of KA crashes, including those involving alcohol, that occurred in the month of May. The "bumps" in KA and "had been drinking" crashes that were evident in May 1997, decreased each year, until they were no longer evident in 2001. This may be evidence of positive effects of the public information programs and special enforcement efforts that are deployed for the Memorial Day weekend. However, without a proper evaluation, it is not possible to attribute the observed changes to these programs. A well-designed evaluation could be useful in determining if and how much these programs contributed to this positive change and in providing insights that could be applied to other situations.

### **"Had Been Drinking" Crashes and Drivers**

Another trend seen in this report is in the "had been drinking" KA crashes. Over the five year period from 1997 to 2001, the number of these crashes decreased by 30% and the number of drivers involved in KA crashes, who had been drinking decreased by 29%. The decreases in numbers of drivers who "had been drinking" were not uniform across age groups. The smallest decreases in numbers and rates of KA involved drivers who had been drinking were among drivers age 18-24. This age group consistently had the highest rate of involvement in KA "had been drinking" crashes per licensed driver over the five-year period.

Interestingly, the proportion of all KA crashes that involved a drinking driver remained at about 12% over the five-year period, but proportions by age group of KA crash-involved who had been drinking changed. The proportion of drivers age 18-24 among all KA crash-involved drivers who had been drinking increased from 23% to 28% and the proportion of drivers age 35-54 increased from 34% to 38%. The proportions of

the other age groups decreased slightly. This finding indicates that while progress toward the reduction of drinking and driving has been made, there is still room for improvement. Therefore, programs and interventions should continue and be specifically targeted at the worst offenders.

### **Safety Belt Use**

Examination of safety-belt use among drivers and passengers involved in KA crashes showed a general increasing trend in safety-belt use over the five-year period, 1997-2001. However, the safety-belt use behavior of motorists age 18-24 years was again problematic. Drivers and passengers in this age group had the lowest safety-belt use among all drivers and passengers involved in KA crashes.

### **High-Risk Behaviors of Motorists Age 18-24 Years**

Drinking and driving and not using safety belts are high-risk behaviors. Clearly, interventions and programs for both drinking and driving reduction and safety belt usage that could reach and influence persons age 18-24 would have a positive impact on traffic safety. The Psychosocial Correlates of Adolescent Driving Behavior (eg. Shope and Raghunathan (2003), Shope and Bingham (in press), a longitudinal study sponsored by the National Institutes of Health, has followed the behavior and attitudes of young people from childhood through young adulthood, and contains a wealth of information on their high risk behaviors. It would be beneficial to examine this study for information and insights that would help in developing effective traffic safety intervention strategies

### **Child Safety Belt and Child Safety Seat Use**

Examination of the trends in safety-belt and child safety seat use among child passengers under age 15 involved in KA crashes showed an increase in safety-belt use by children age 5-15 from 58% to 64% from 1997 - 2001. However, the rate of occupant restraint use among children under age 4 involved in KA crashes decreased slightly from 77% in 1997 to 75% in 2001. It should be noted that the number of cases reported every year was not large, but the decrease may be an indication of a more general problem regarding child safety seat use. Because the use of child safety seats

is very important, this trend should be monitored and information on statewide child safety use studies should be updated.

### **Motorcycle Crash Trends**

Another trend which was evident from this study is the increase in the number of motorcycle KA crashes. OHSP is aware of this trend and has sponsored a study to examine this issue. Trends in motorcycle crashes, severity, alcohol use, and helmet use are being examined. The findings from this study should help formulate strategies, programs and interventions for increased motorcycle safety.

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**APPENDIX A**  
**Michigan Population and Licensed Drivers**

## Michigan Population

Females					
	1997	1998	1999	2000	2001 (est*)
<b>0-14</b>	1,445,509	1,451,611	1,456,637	1,126,129	1,132,063
<b>15-17</b>	215,683	215,691	215,873	209,108	210,210
<b>18-21</b>	270,086	276,581	279,195	278,278	279,744
<b>22-24</b>	187,862	183,920	183,465	183,021	183,985
<b>25-34</b>	727,089	711,171	696,754	679,848	683,431
<b>35-54</b>	1,048,291	1,059,058	1,074,800	1,434,956	1,442,518
<b>55-69</b>	602,915	611,305	616,989	621,649	624,925
<b>70+</b>	528,130	533,296	540,150	532,360	535,165
<b>Total Females</b>	3,580,056	3,591,022	3,607,226	3,939,220	3,959,979

Males					
	1997	1998	1999	2000	2001 (est*)
<b>0-14</b>	1,077,142	1,077,028	1,083,215	1,109,261	1,115,107
<b>15-17</b>	227,221	227,161	227,279	222,461	223,633
<b>18-21</b>	274,523	281,295	284,061	284,342	285,840
<b>22-24</b>	184,519	181,115	181,172	186,487	187,470
<b>25-34</b>	696,220	680,876	665,601	682,323	685,919
<b>35-54</b>	1,419,420	1,433,623	1,450,959	1,468,556	1,476,295
<b>55-69</b>	540,787	549,206	554,560	569,842	572,845
<b>70+</b>	340,153	347,294	353,065	349,823	351,666
<b>Total Males</b>	3,682,843	3,700,570	3,716,697	3,763,834	3,783,668

## Total Michigan Population by Age Group

Age	1997	1998	1999	2000	2001
<b>0-14</b>	2,522,651	2,528,639	2,539,852	2,235,390	2,247,170
<b>15-17</b>	442,904	442,852	443,152	431,569	433,843
<b>18-24</b>	916,990	922,911	927,893	932,128	937,040
<b>25-34</b>	1,423,309	1,392,047	1,362,355	1,362,171	1,369,349
<b>35-54</b>	2,467,711	2,492,681	2,525,759	2,903,512	2,918,813
<b>55-69</b>	1,143,702	1,160,511	1,171,549	1,191,491	1,197,770
<b>70+</b>	868,283	880,590	893,215	882,183	886,832
<b>Total</b>	<b>9,785,550</b>	<b>9,820,231</b>	<b>9,863,775</b>	<b>9,938,444</b>	<b>9,990,817</b>

Sources:

1997-1999

US Census Bureau, Population Division, Estimates Program  
 Female Population of Michigan by single Year of age, 1990-1999  
 Male Population of Michigan by single Year of age, 1990-1999

2000

US Census Bureau, Census 2000 Population and Housing Summary File 1

\*2001

Estimated - Applied 2000 proportions of sex/age groups to total Michigan population (9,990,817)  
 obtained from census estimate from Time series of Michigan population  
 estimates by County: April 1, 2000 to July 1, 2001.



**Michigan Licensed Drivers 1997 - 2001 by Age Group and Sex**

<b>MALES</b>							
<b>Year</b>	<b>&lt;18</b>	<b>18-24</b>	<b>25-34</b>	<b>35-54</b>	<b>55-69</b>	<b>70+</b>	
1997	119,228	385,880	561,183	1,094,556	456,113	291,591	
1998	123,864	388,556	551,640	1,106,152	464,094	300,260	
1999	121,771	384,376	538,729	1,119,512	470,465	304,467	
2000	127,946	433,068	650,176	1,404,858	555,283	324,644	
2001	130,488	435,767	642,281	1,408,125	575,640	326,533	
<b>FEMALES</b>							
<b>Year</b>	<b>&lt;18</b>	<b>18-24</b>	<b>25-34</b>	<b>35-54</b>	<b>55-69</b>	<b>70+</b>	
1997	115,945	395,222	653,371	1,327,973	533,468	346,661	
1998	121,709	397,384	639,174	1,347,952	545,601	356,624	
1999	118,114	402,129	623,510	1,373,614	557,100	368,863	
2000	123,960	408,792	634,861	1,430,010	571,574	375,240	
2001	127,404	411,985	625,317	1,433,513	592,868	380,978	

**APPENDIX B**  
**Time Series Models**

## Time-Series Forecasting Models

The objective of this analysis was to determine if the proportion of all crashes that resulted in KA injuries and the proportion of persons involved in crashes who sustained KA injuries are decreasing, and if we can expect them to decrease in the future, assuming that factors that influence them remain unchanged. Double Exponential Smoothing models were fitted to the data for 1997 to 2001 and forecasts for years 2002 to 2004 were made.

### Trend in KA Crash Proportion

The results of the modeling of the KA crash proportion trend are shown in the following table. The actual values of the ratio of KA crashes to all crashes, the values predicted by the model (including the forecast values), the upper and lower values of the 95<sup>th</sup> confidence interval, and the model error are shown. The Level/Trend Smoothing weight was significant (at  $P > 0.0056$ ) and the R-squared was 0.711, signifying good model fit.

Year	Actual Value	Value Predicted by Model	Upper (95 <sup>th</sup> conf. int.)	Lower (95 <sup>th</sup> conf. int)	Error
1	0.0302	0.0295	0.0328	0.0262	0.000669
2	0.0302	0.0293	0.0326	0.0259	0.000945
3	0.0270	0.0298	0.0332	0.0265	-0.002875
4	0.0245	0.0252	0.0286	0.0219	-0.000786
5	0.0233	0.0222	0.0255	0.0188	0.001173
6		0.0216	0.0249	0.0182	
7		0.0199	0.0259	0.0139	
8		0.0182	0.0272	0.0091	

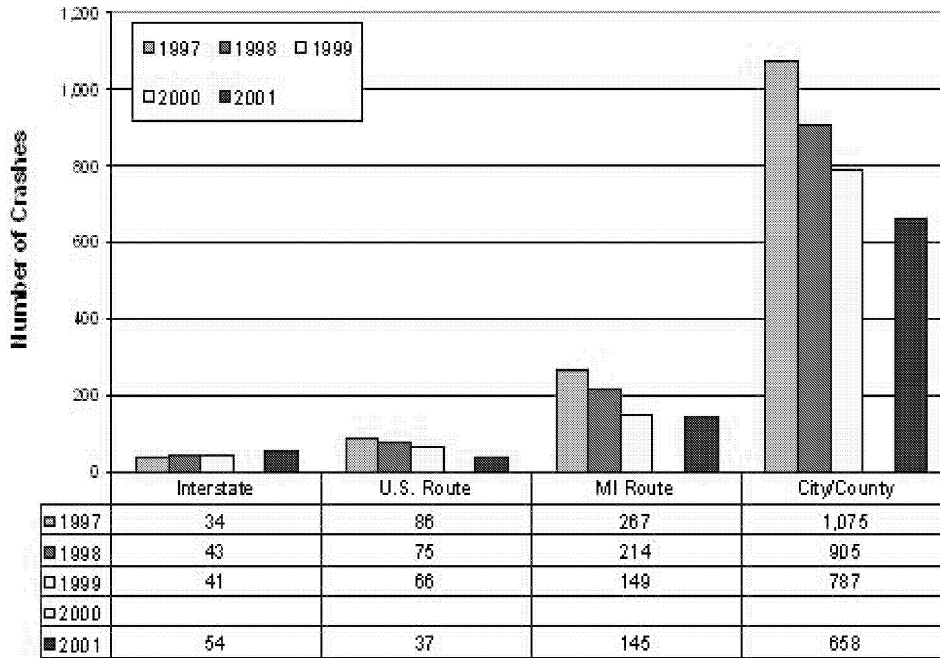
### Trend in Proportion of Persons Sustaining KA Injuries

The following table shows the actual values of the ratio of persons sustaining KA injuries to all persons involved in crashes, the values predicted by the model (including the forecast values), the upper and lower values of the 95<sup>th</sup> confidence interval, and the model error. The Level/Trend Smoothing weight was significant (at  $P > 0.0056$ ) and the R-Squared was 0.756 signifying good model fit.

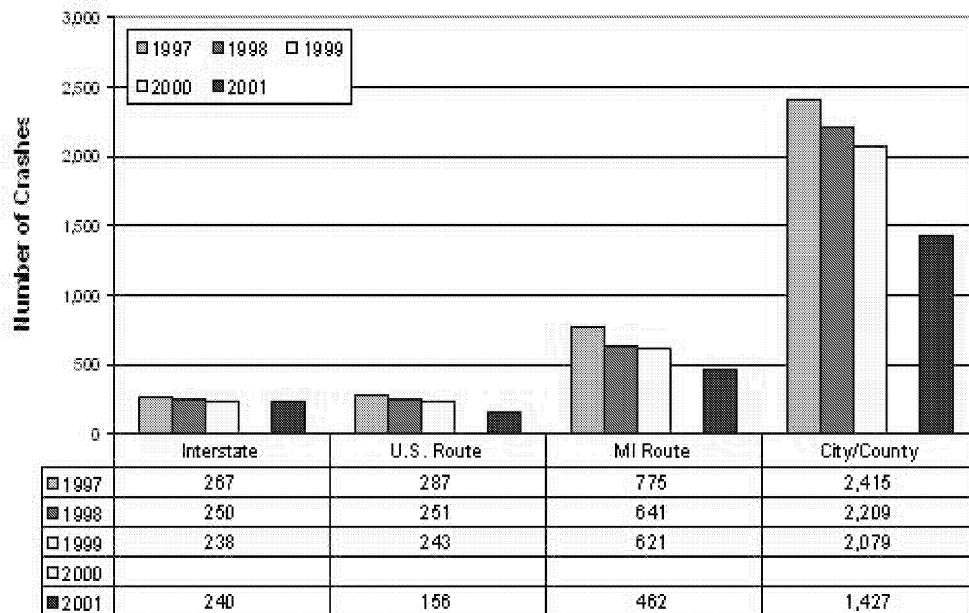
Year	Actual Value	Value Predicted by Model	Upper (95 <sup>th</sup> conf. int.)	Lower (95 <sup>th</sup> conf. int)	Error
1	0.0212	0.0208	0.0229	0.0187	0.000416
2	0.0211	0.0206	0.0227	0.0185	0.000496
3	0.0189	0.0207	0.0229	0.0186	-0.001840
4	0.0172	0.0176	0.0197	0.0155	-0.000409
5	0.0164	0.0156	0.0177	0.0135	0.000840
6		0.0152	0.0173	0.0131	
7		0.0141	0.0180	0.0102	
8		0.0129	0.0189	0.0070	

**Appendix C**  
**Distribution of KA Crashes by Highway Class, Speed limit,**  
**Vehicle Type, and Hazardous Actions by Driver Age Categories**

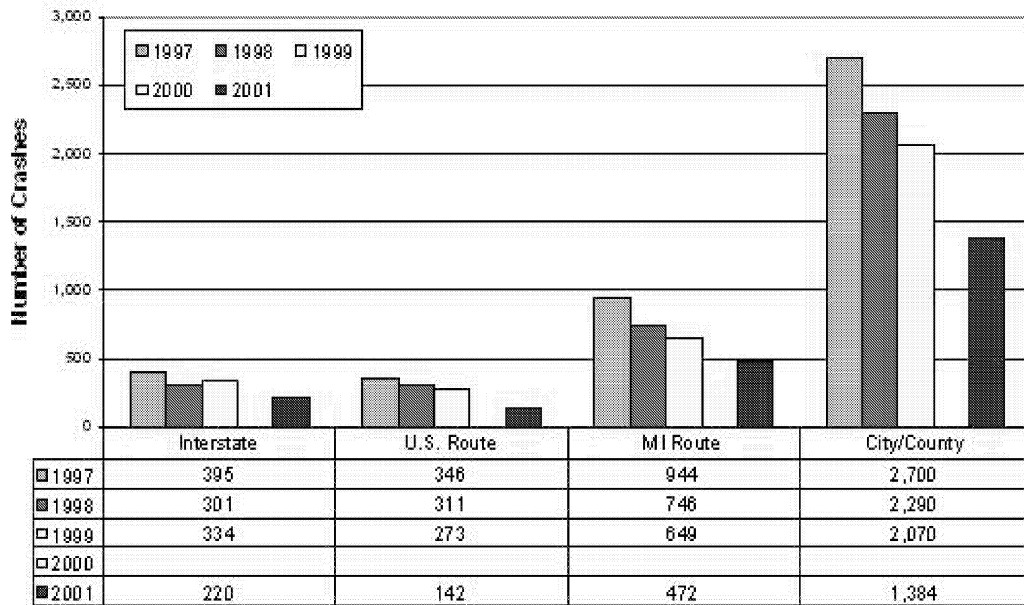
## Number of KA Crashes by Highway Class Drivers Under Age 18



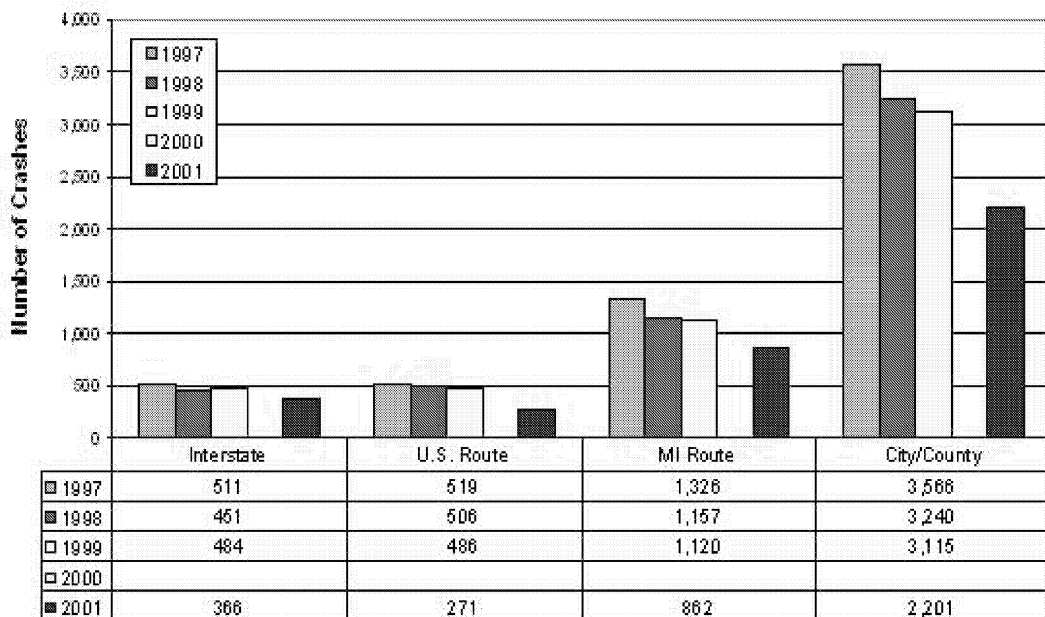
## Driver Age 18-24



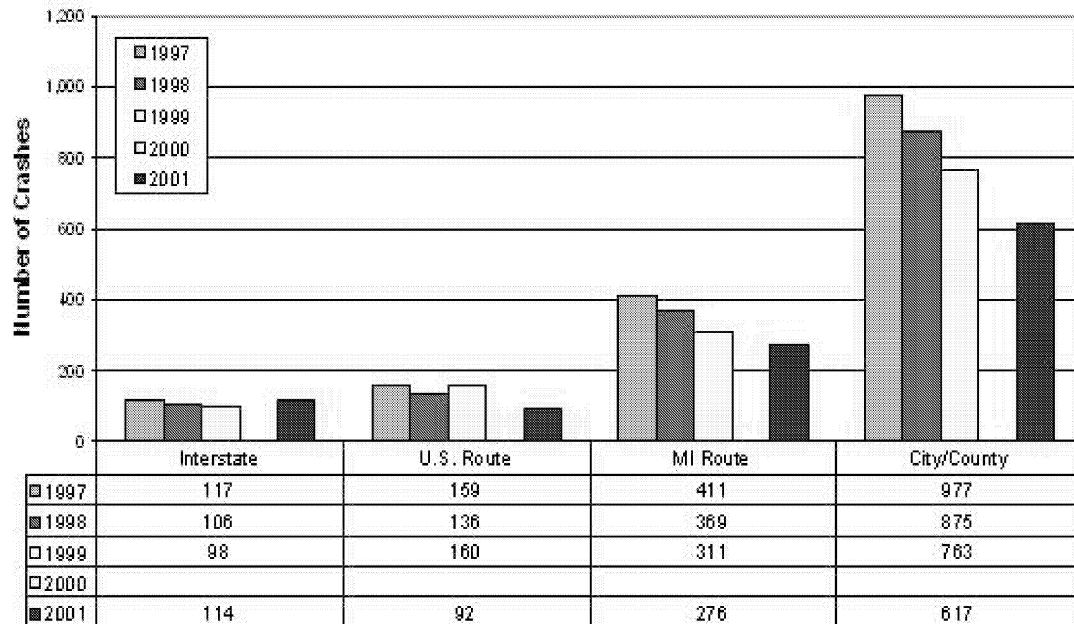
## Drivers Age 25-34



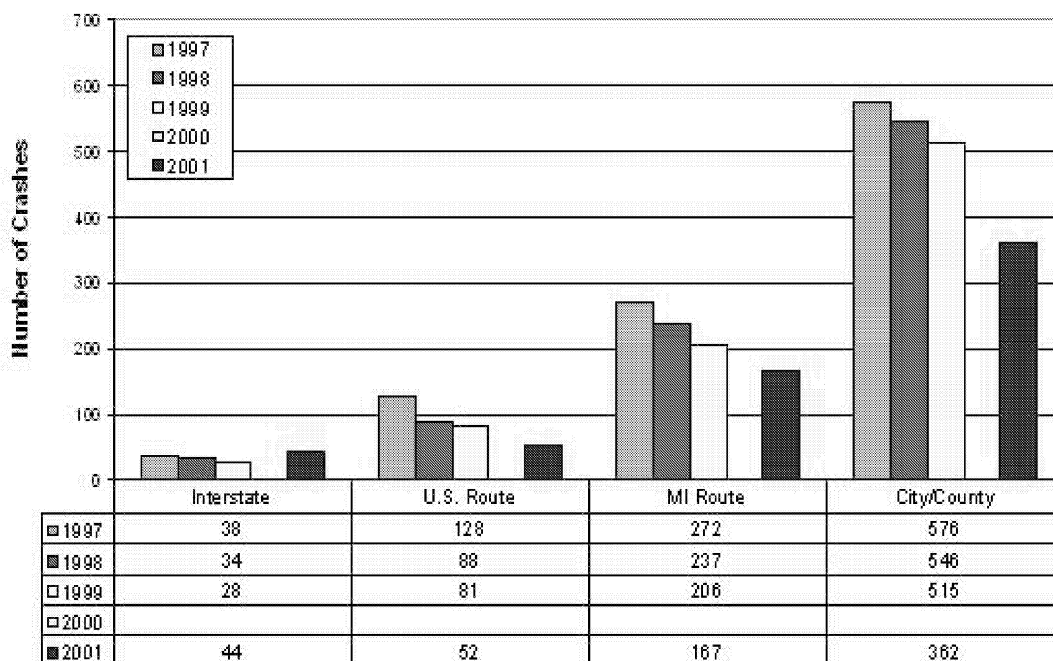
## Drivers Age 35-54



## Drivers Age 55-69

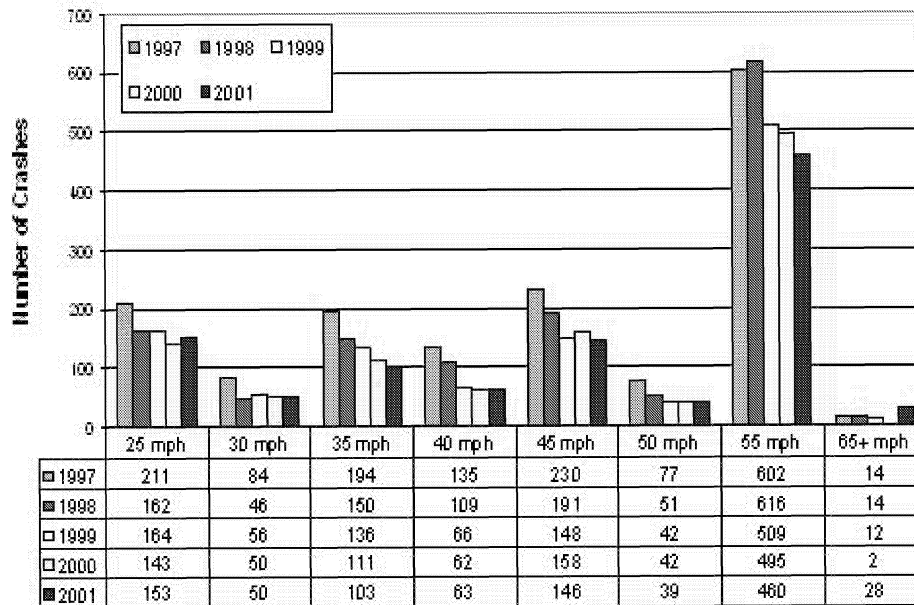


## Drivers 70+

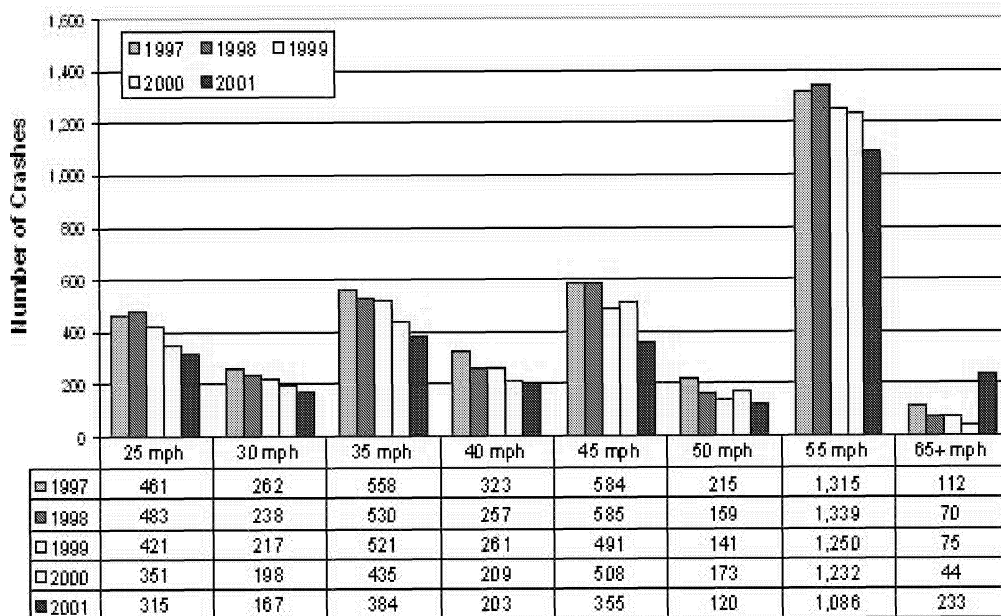




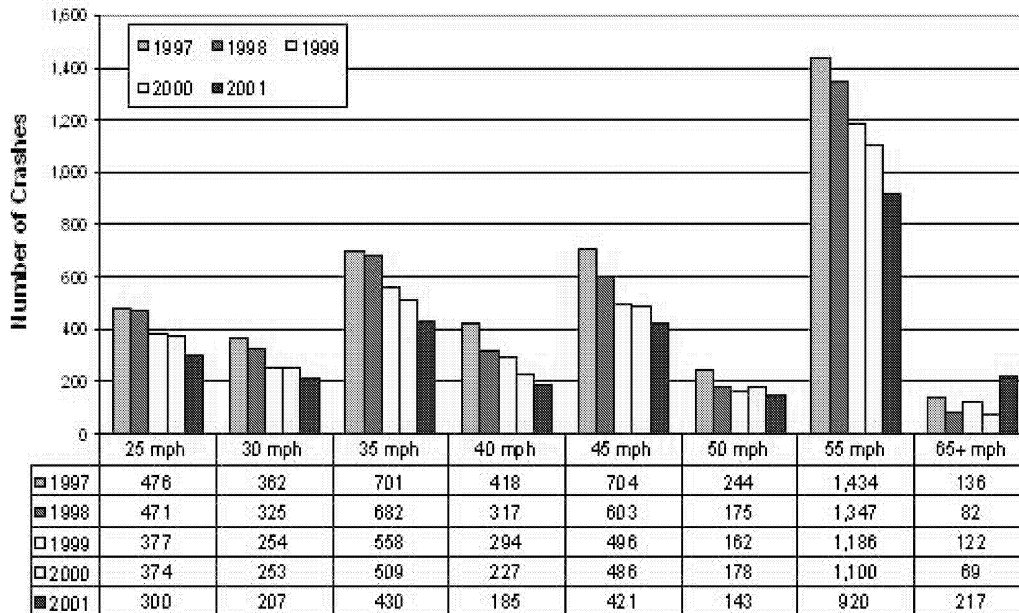
## Number of KA Crashes by Speed Limit Drivers < Age 18



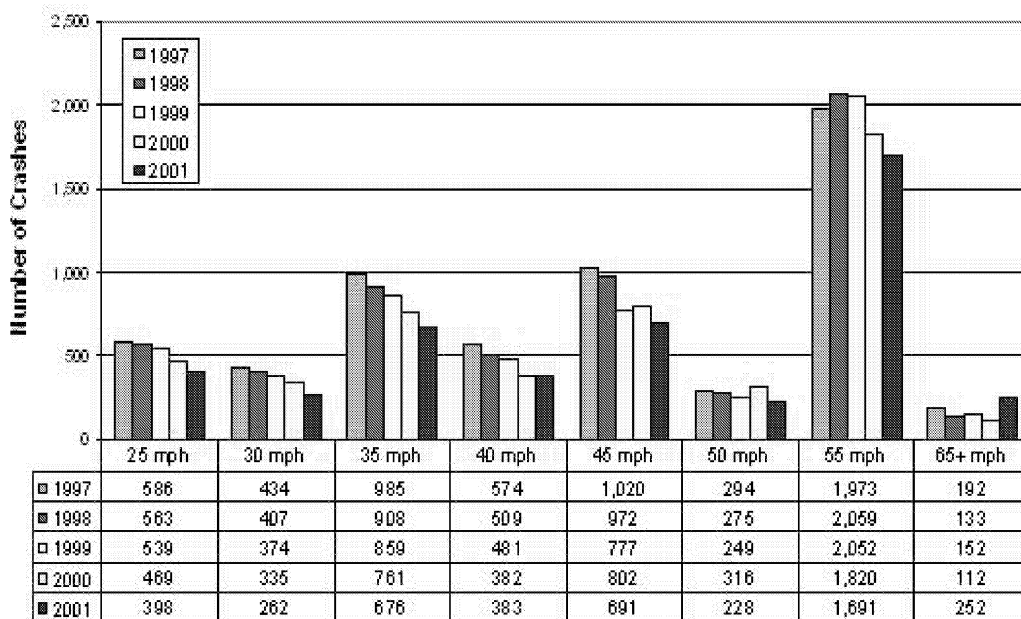
## Drivers Age 18-24



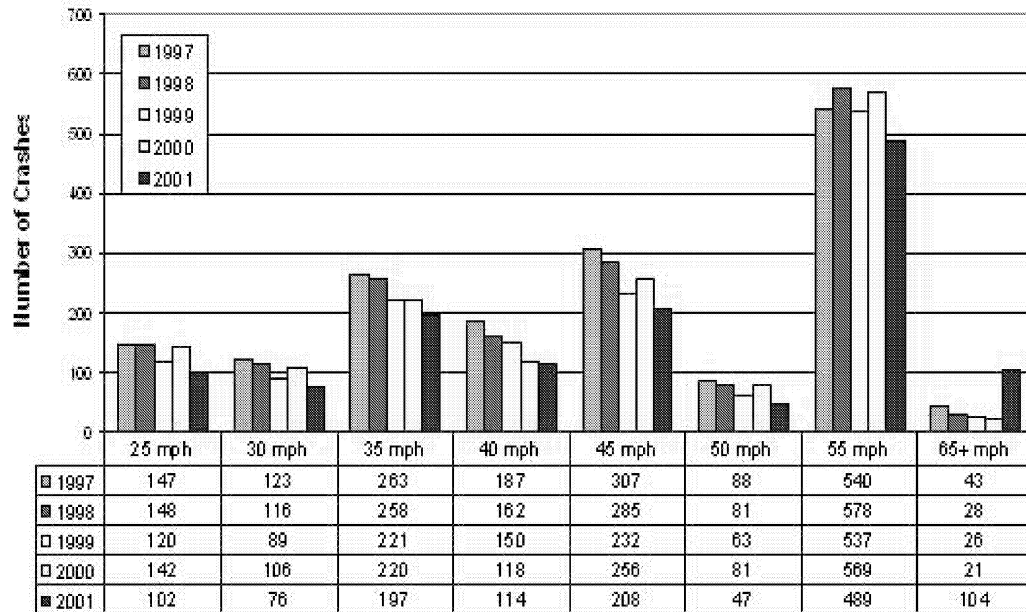
## Drivers Age 25-34



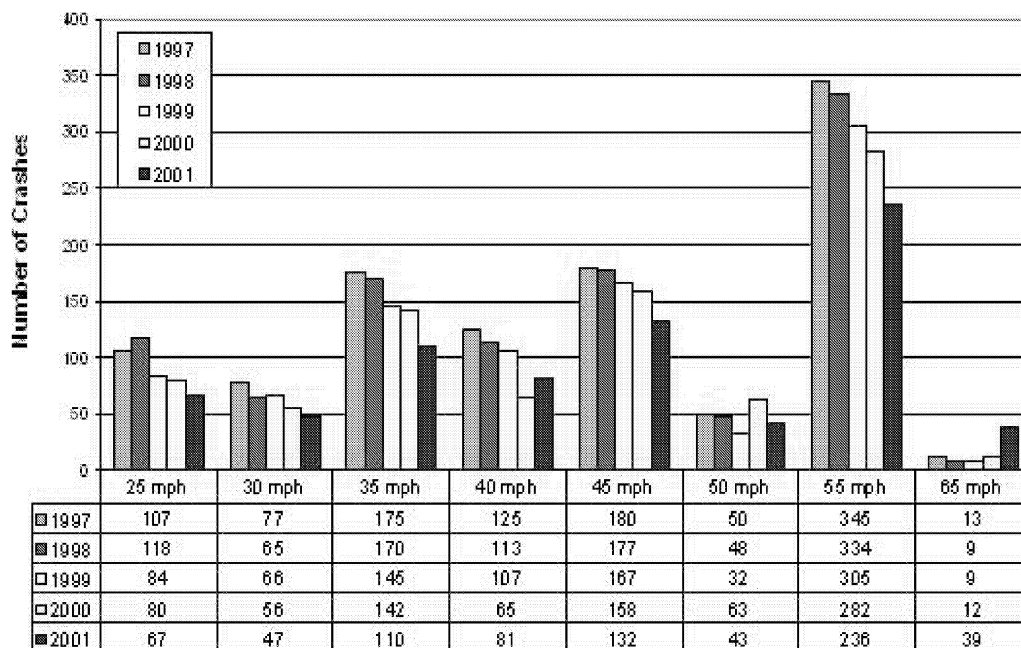
## Drivers Age 35-54



## Drivers Age 55-69



## Drivers 70+



**KA Crashes by Vehicle Type  
Drivers Under Age 18**

Number of Vehicles Involved in KA Injury Crashes for Drivers Under 18 by Vehicle Type and Year												
	Car		Heavy Truck		Light Truck		Motorcycle		Pickup		Van	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1997	1,216	75.0%	2	0.1%	18	1.1%	28	1.7%	200	12.3%	76	4.7%
1998	1,045	73.5%	0	0.0%	22	1.5%	26	1.8%	190	13.4%	58	4.2%
1999	910	75.8%	0	0.0%	17	1.4%	15	1.2%	138	11.5%	48	4.0%
2000	818	70.8%	2	0.2%	14	1.2%	17	1.5%	122	10.6%	35	3.0%
2001	719	63.7%	0	0.0%	11	1.0%	26	2.3%	108	9.6%	43	3.8%

Note: Percentages are calculated based on all vehicle types, not just those reported here.

**Drivers Age 18-24**

Number of Vehicles Involved in KA Injury Crashes for Drivers 18-24 by Vehicle Type and Year												
	Car		Heavy Truck		Light Truck		Motorcycle		Pickup		Van	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1997	3,076	75.0%	38	0.9%	51	1.2%	133	3.2%	588	14.3%	153	3.7%
1998	2,925	74.2%	42	1.1%	56	1.4%	140	3.6%	580	14.7%	131	3.3%
1999	2,478	67.5%	33	0.9%	58	1.6%	112	3.0%	535	14.6%	119	3.2%
2000	2,500	71.7%	35	1.0%	67	1.9%	110	3.2%	543	15.6%	140	4.0%
2001	2,107	69.1%	29	1.0%	40	1.3%	127	4.2%	516	16.9%	100	3.3%

Note: Percentages are calculated based on all vehicle types, not just those reported here.

**Drivers Age 25-34**

Number of Vehicles Involved in KA Injury Crashes for Drivers 25-34 by Vehicle Type and Year												
	Car		Heavy Truck		Light Truck		Motorcycle		Pickup		Van	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1997	3,236	67.3%	174	3.6%	73	1.5%	163	3.4%	730	15.2%	322	6.7%
1998	2,802	64.3%	160	3.7%	89	2.0%	166	3.8%	720	16.5%	300	6.9%
1999	2,408	63.6%	138	3.6%	93	2.5%	169	4.5%	651	17.2%	257	6.8%
2000	2,167	61.6%	123	3.5%	93	2.6%	170	4.8%	598	17.0%	243	6.9%
2001	1,810	60.7%	95	3.2%	89	3.0%	175	5.9%	423	14.2%	233	7.8%

Note: Percentages are calculated based on all vehicle types, not just those reported here.

## Drivers Age 35-54

Number of Vehicles Involved in KA Injury Crashes for Drivers 35-54 by Vehicle Type and Year												
	Car		Heavy Truck		Light Truck		Motorcycle		Pickup		Van	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1997	4,006	61.7%	313	4.8%	116	1.8%	256	3.9%	1,011	15.6%	657	10.1%
1998	3,796	59.6%	325	5.1%	146	2.3%	290	4.6%	1,017	16.0%	688	10.7%
1999	3,445	57.6%	344	5.8%	144	2.4%	285	4.8%	1,011	16.9%	617	10.3%
2000	3,059	55.5%	298	5.4%	173	3.1%	301	5.5%	942	17.1%	574	10.4%
2001	2,736	55.2%	214	4.3%	130	2.6%	301	6.1%	791	16.0%	500	10.1%

Note: Percentages are calculated based on all vehicle types, not just those reported here.

## Drivers Age 55-69

Number of Vehicles Involved in KA Injury Crashes for Drivers 55-69 by Vehicle Type and Year												
	Car		Heavy Truck		Light Truck		Motorcycle		Pickup		Van	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1997	1,265	69.5%	59	3.2%	25	1.4%	36	2.0%	257	14.1%	153	8.4%
1998	1,163	65.3%	68	3.8%	34	1.9%	42	2.4%	274	15.4%	175	9.8%
1999	1,018	65.1%	46	2.9%	32	2.0%	49	3.1%	257	16.4%	138	8.8%
2000	1,007	61.5%	64	3.9%	46	2.8%	62	3.8%	272	16.6%	155	9.5%
2001	856	61.1%	46	3.3%	26	1.9%	58	4.1%	218	15.6%	135	9.6%

Note: Percentages are calculated based on all vehicle types, not just those reported here.

## Drivers 70+

Number of Vehicles Involved in KA Injury Crashes for Drivers Over 70 by Vehicle Type												
	Car		Heavy Truck		Light Truck		Motorcycle		Pickup		Van	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1997	961	86.0%	2	0.2%	6	0.5%	2	0.2%	75	6.7%	62	5.6%
1998	917	84.3%	3	0.3%	12	1.1%	2	0.2%	86	7.9%	56	5.1%
1999	807	83.4%	4	0.4%	4	0.4%	3	0.3%	91	9.4%	55	5.7%
2000	719	79.7%	3	0.3%	7	0.8%	6	0.7%	90	10.0%	63	7.0%
2001	646	81.0%	4	0.5%	4	0.5%	3	0.4%	76	9.5%	39	4.9%

Note: Percentages are calculated based on all vehicle types, not just those reported here.

## Hazardous Actions, Drivers Under Age 18

<b>Numbers of Hazardous Actions Recorded for Single-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	68	51	47	56	40
Speed too Fast	227	220	185	118	124
Speed too Slow	2	1	2	1	0
Fail to Yield	8	9	6	12	22
Traffic Control	2	2	1	3	5
Wrong Way	0	0	0	0	0
Left of Center	9	7	6	3	3
Improper Passing	5	3	0	1	0
Improper Lane Use	1	2	3	0	1
Improper Turn	1	0	2	1	2
Improper Signal	0	1	0	0	0
Improper Backing	0	2	0	0	2
Clear Distance	16	12	13	10	8
Other	98	95	109	52	47
Unknown	14	22	16	23	18

<b>Numbers of Hazardous Actions Recorded for Multiple-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	363	319	274	258	209
Speed too Fast	93	62	47	45	51
Speed too Slow	0	3	1	4	2
Fail to Yield	286	251	218	207	196
Traffic Control	117	75	63	44	63
Wrong Way	2	1	7	1	3
Left of Center	33	32	17	25	19
Improper Passing	10	13	14	11	3
Improper Lane Use	14	11	2	11	6
Improper Turn	21	24	10	18	9
Improper Signal	1	1	2	0	1
Improper Backing	1	3	2	1	0
Clear Distance	115	86	77	72	59
Other	60	67	39	45	44
Unknown	14	18	17	17	10

## Hazardous Actions, Drivers Age 18-24

<b>Numbers of Hazardous Actions Recorded for Single-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	170	154	117	148	113
Speed too Fast	424	425	398	430	318
Speed too Slow	2	2	3	1	1
Fail to Yield	16	11	9	11	14
Traffic Control	13	10	9	10	11
Wrong Way	0	3	0	0	1
Left of Center	13	11	13	19	7
Improper Passing	4	8	4	3	1
Improper Lane Use	8	5	11	4	6
Improper Turn	0	4	1	1	0
Improper Signal	0	1	0	0	0
Improper Backing	2	7	4	1	2
Clear Distance	31	48	38	27	15
Other	253	269	286	153	164
Unknown	59	51	48	53	43

<b>Numbers of Hazardous Actions Recorded for Multiple-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	1331	1274	1141	1102	844
Speed too Fast	256	181	191	156	116
Speed too Slow	4	7	6	2	3
Fail to Yield	471	464	428	368	317
Traffic Control	258	258	214	252	169
Wrong Way	6	5	7	9	4
Left of Center	107	92	85	67	48
Improper Passing	26	30	22	18	20
Improper Lane Use	30	39	32	24	22
Improper Turn	32	44	39	25	22
Improper Signal	2	6	3	2	0
Improper Backing	2	1	1	2	2
Clear Distance	278	242	260	200	162
Other	140	145	163	114	91
Unknown	57	50	47	43	46

## Hazardous Actions, Drivers Age 25-34

<b>Numbers of Hazardous Actions Recorded for Single-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	189	172	173	164	129
Speed too Fast	399	344	319	261	211
Speed too Slow	2	1	0	3	1
Fail to Yield	17	11	17	16	8
Traffic Control	7	11	12	3	7
Wrong Way	2	0	0	1	1
Left of Center	12	12	12	7	6
Improper Passing	7	4	4	0	2
Improper Lane Use	8	8	9	10	3
Improper Turn	2	3	2	0	1
Improper Signal	0	0	0	0	0
Improper Backing	0	6	4	2	2
Clear Distance	42	30	28	20	19
Other	266	241	134	134	130
Unknown	51	52	51	51	56

<b>Numbers of Hazardous Actions Recorded for Multiple-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	1,977	1,845	1,525	1,476	1,142
Speed too Fast	193	157	148	138	106
Speed too Slow	6	6	2	3	2
Fail to Yield	437	397	329	251	270
Traffic Control	238	208	169	177	136
Wrong Way	14	11	10	10	5
Left of Center	100	98	80	66	62
Improper Passing	32	19	24	12	11
Improper Lane Use	43	28	27	19	21
Improper Turn	44	31	34	20	15
Improper Signal	6	4	1	0	0
Improper Backing	5	5	5	4	6
Clear Distance	339	277	264	214	160
Other	184	164	143	108	101
Unknown	73	86	49	65	49



## Hazardous Actions, Drivers Age 35-54

<b>Numbers of Hazardous Actions Recorded for Single-Vehicle KA Crashes by Year</b>					
Hazardous Action	1977	1998	1999	2000	2001
None	279	282	270	309	263
Speed too Fast	379	397	387	282	263
Speed too Slow	3	1	3	3	2
Fail to Yield	24	19	15	25	19
Traffic Control	12	13	15	11	9
Wrong Way	1	3	1	0	2
Left of Center	12	18	27	11	14
Improper Passing	6	1	2	3	3
Improper Lane Use	8	15	18	12	8
Improper Turn	2	6	1	3	2
Improper Signal	0	1	0	0	0
Improper Backing	0	4	3	0	1
Clear Distance	59	44	50	38	25
Other	315	304	348	217	201
Unknown	67	89	83	72	86

<b>Numbers of Hazardous Actions Recorded for Multiple-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	3,118	2,942	2,738	2,589	2,158
Speed too Fast	208	167	135	149	126
Speed too Slow	8	8	5	7	6
Fail to Yield	565	603	528	446	412
Traffic Control	288	294	265	230	185
Wrong Way	8	11	17	13	10
Left of Center	140	139	114	80	93
Improper Passing	21	23	20	26	21
Improper Lane Use	48	69	55	33	33
Improper Turn	52	50	58	34	40
Improper Signal	3	8	5	3	7
Improper Backing	9	11	10	10	3
Clear Distance	360	343	358	315	252
Other	230	248	221	178	148
Unknown	106	103	81	85	74

## Hazardous Actions, Drivers Age 55-69

<b>Numbers of Hazardous Actions Recorded for Single-Vehicle KA Crashes Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	75	99	67	85	85
Speed too Fast	70	66	50	61	60
Speed too Slow	0	1	1	0	0
Fail to Yield	8	11	4	10	6
Traffic Control	3	3	1	1	3
Wrong Way	0	1	1	0	0
Left of Center	4	1	4	5	3
Improper Passing	1	0	1	0	1
Improper Lane Use	3	4	5	0	4
Improper Turn	3	0	0	2	0
Improper Signal	0	0	0	0	0
Improper Backing	0	0	0	0	2
Clear Distance	15	8	7	10	9
Other	57	79	74	44	51
Unknown	24	21	20	26	29

<b>Numbers of Hazardous Actions Recorded for Multiple-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	881	883	712	771	586
Speed too Fast	30	37	28	35	35
Speed too Slow	4	0	1	1	0
Fail to Yield	244	226	210	209	160
Traffic Control	94	79	81	78	66
Wrong Way	2	5	2	2	3
Left of Center	27	42	31	39	25
Improper Passing	6	6	1	9	4
Improper Lane Use	15	16	19	14	13
Improper Turn	19	24	22	17	15
Improper Signal	0	3	2	2	3
Improper Backing	2	2	1	5	1
Clear Distance	100	107	111	79	73
Other	61	46	52	36	27
Unknown	25	24	23	32	39

## Hazardous Actions, Drivers Age 70+

<b>Numbers of Hazardous Actions Recorded for Single-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	40	30	32	28	32
Speed too Fast	32	33	14	20	24
Speed too Slow	0	0	0	0	0
Fail to Yield	2	7	5	10	3
Traffic Control	5	2	2	3	5
Wrong Way	1	0	0	0	0
Left of Center	4	3	2	4	0
Improper Passing	0	0	0	0	0
Improper Lane Use	3	3	1	1	1
Improper Turn	0	0	0	1	0
Improper Signal	0	0	0	0	1
Improper Backing	1	0	3	3	1
Clear Distance	6	5	7	10	5
Other	46	46	41	32	30
Unknown	10	12	15	18	19

<b>Numbers of Hazardous Actions Recorded for Multiple-Vehicle KA Crashes by Year</b>					
Hazardous Action	1997	1998	1999	2000	2001
None	312	310	294	259	211
Speed too Fast	18	11	20	17	10
Speed too Slow	4	11	0	2	2
Fail to Yield	326	322	276	236	214
Traffic Control	80	98	74	74	53
Wrong Way	5	1	5	6	2
Left of Center	27	25	33	23	28
Improper Passing	1	2	5	1	0
Improper Lane Use	13	9	12	11	4
Improper Turn	21	21	14	12	11
Improper Signal	0	0	0	0	2
Improper Backing	2	0	1	2	0
Clear Distance	87	78	51	59	61
Other	37	32	36	24	18
Unknown	14	18	14	13	13

