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*Summary  
and Problem  
Analysis*

1988 Traffic Collisions in  
Washington State

June 1989

**Washington Traffic Safety  
Commission**  
1000 South Cherry Street  
MS-PD11  
Olympia, WA 98504

# Highway Safety Plan

## Data Summary and Problem Analysis

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# Statewide Summary

## I. Explanation of Problem Analysis Process

In developing the problem identification section for the 1990 Highway Safety Plan (HSP), problem areas were classified into two basic types: impact problems and system support problems.

Impact problems consist of factors that contribute directly to the occurrence of collisions, fatalities, and/or injuries and may be corrected through the implementation of countermeasures designed to reduce the effects of these factors.

System support problems are those deficiencies within vital traffic safety programs that when corrected may not directly reflect a reduction of traffic collisions, injuries, or fatalities.

There are two bases for impact and system support problem identification, analysis, and selection for inclusion into the HSP.

1. Impact problem areas were selected based on appropriate statewide experience of impact areas (where information was available) as outlined in the federal safety standards. Various statewide automated and manual traffic information systems were inventoried and analyzed. The data sources included: Traffic Accident Records, Fatal Accident Reporting System, Driver's Licensing Records, Vehicle Registration Records, and Highway/Roadway Information. In most instances, data from four years were gathered as a baseline to serve as a point of comparison to the current year's activity level.
2. The second source for problem identification inclusion in the HSP consisted of data analyzed by and for various state and local agencies with an interest in highway safety. The WTSC made it known that the two main emphasis areas in FY 1990 were the non-use of occupant-restraint systems, and alcohol-related collisions.

## II. Data Analyses and Statistical Techniques

Data analysis was a key factor in the identification and selection of the traffic safety problem areas included in this plan. The analyses were performed to ensure that the conclusions drawn from the data were valid and credible.

The most common data sources in the HSP were the statewide traffic collision records, which were used for identifying the specific traffic problem areas. Four continuous years (1984-1987) of collision experience were used to serve as a baseline in analyzing the traffic collision data. This baseline was used to obtain a

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better perspective to assess the current year's (1988) experience with traffic problem areas. The baseline also serves to negate short-term changes in collision patterns.

The development of over/under-representation ratios were the most frequently used methods of analysis. Where relevant exposure data were available, the generation of over-representation ratios allow for the comparisons of different subgroups relative to the percentage of the population they comprise. Additionally, counties and cities were ranked by different problem areas to compare geographical and political subdivisions.

### **Analysis of Selected Traffic Problems**

The following areas were included for analyses of selected traffic safety problems:

- Alcohol Involvement
  - Youth Involvement
  - Safety-Restraint Usage
  - Motorcycle Collisions
  - Pedalcycles
  - Pedestrians
  - Heavy Trucks
  - Pupil Transportation
  - Contributory Driver Violations
  - Vehicle Defects
  - Senior Driver Involvement
-

## Statewide Overview

The number of persons killed on Washington's highways in 1988 totaled 785, a 4.2% increase from the 1985-1987 three-year baseline average of 753. The total number of fatal collisions increased 5.2% in 1988 compared to the average for 1985-1987. Total collisions, injury collisions, and total number of persons injured also increased in 1988 over the three-year averages in these categories (Table 1-1).

Table 1-1

SEVERITY OF COLLISIONS Four-Year Comparison						
Impact	Years				Previous 3 Year Average (85-87)	% of Change 88 - 3 Year Average
	1988	1987	1986	1985		
Total Collisions	125,920	126,807	122,918	120,056	123,260	2.2%
Fatal Collisions	706	699	658	656	671	5.2%
Total Killed	785	790	714	756	753	4.2%
Injury Collisions	49,482	46,968	46,090	44,373	45,810	8.0%
Total Injured	72,449	67,665	66,707	63,806	66,059	9.7%
Property Damage Only Collisions*	75,732	79,140	76,170	75,027	76,779	-1.4%

\* Oct. 1, 1987 the reporting level for motor vehicle traffic collisions increased from \$300 to \$500. Fatal and injury collisions were not affected by this change in the law, but property damage only collisions were reduced by 4.3% in 1988.

### A. Exposure

Vehicle drivers traveled 14.9% more motor vehicle miles in 1988 than the 1985-1987 baseline average. Motor vehicle registration also jumped 6.0% over the baseline while the number of licensed drivers increased 6.8%. In 1988, the state's population increased 3.1% over the 1985-87 average to a total of 4,565,000 persons (Table 1-2).

Table 1-2

VEHICLES AND DRIVERS Four-Year Comparison						
Exposure	Years				Previous 3 Year Average (85-87)	% of Change 88 - 3 Year Average
	1988	1987	1986	1985		
Motor Vehicle Travel*	41,698	38,520	36,416	33,980	36,305	14.9%
Motor Vehicle Registration	3,896,828	3,833,058	3,651,102	3,546,152	3,676,771	6.0%
Licensed Drivers	3,264,065	3,156,600	3,029,375	2,980,717	3,055,564	6.8%
State's Population	4,565,000	4,481,100	4,419,700	4,384,100	4,428,300	3.1%

\*In Millions

## B. Rates

The 1988 motor vehicle traffic death rate was the lowest in the state's history: down 9.6% from the previous three-year average and down 4.1% from the 1986 rate of 1.96, the previous record low. The rate of 1.74 injuries per one million vehicle miles in 1988 was down slightly from the 1.76 rate for 1987 (Table 1-3).

Table 1-3

DEATH AND INJURY RATES Four-Year Comparison						
Rates	Years				Previous 3 Year Average (85-87)	% of Change 88 - 3 Year Average
	1988	1987	1986	1985		
Death Rate (Deaths per 100M vehicle miles)	1.88	2.05	1.96	2.22	2.08	-9.4%
Injury Rate (Injuries per 1M vehicle miles)	1.74	1.76	1.83	1.88	1.82	-4.6%

## C. Fatalities by Status

Drivers continued to be the most common status of those killed in 1988 as a result of motor vehicle collisions. Fatalities in this classification increased from 386 in 1987 to 394 in 1988. The 1988 figure increased 7.4% from the average of the three previous years. The 206 passengers reported killed in 1988 increased by 2 or 1.0% over 1987 and 9 or 4.7% over the three-year baseline period. The number of motorcycle drivers fatally injured in collisions decreased from 86 in 1987 to 66 last year. Last year's deaths were down 11 from the three-year baseline (Table 1-4).

Table 1-4

PERSONS KILLED BY STATUS Four-Year Comparison						
Status	Years				Previous 3 Year Average (85-87)	% of Change 88 - 3 Year Average
	1988	1987	1986	1985		
Drivers (no motorcyclists)	394	386	353	362	367	7.4%
Passengers	206	204	175	211	197	4.7%
Pedestrians	97	93	94	89	92	5.4%
Pedalcyclists	12	18	12	12	14	-14.3%
Motorcycle Drivers	66	86	71	75	77	-14.7%
Motorcycle Passengers	10	3	9	7	6	57.9%
TOTAL	785	790	714	756	753	4.2%

## D. Traffic Collisions, Deaths, Injuries, Travel, and Death Rate

The 785 traffic fatalities recorded in 1988 reversed last year's increase and reverts to an earlier downward trend experienced in 1985 and 1986. Figure 1-1 indicates that traffic deaths have leveled off during the past four years in the 700 range, reaching a low of 714 in 1986 and a high of 790 in 1987. This differs from the two extremes in recent history of traffic deaths with a high of 1,034 deaths recorded in 1979 and the record low in 1983 with 705 traffic fatalities. Motor

vehicle travel in 1988 increased by 8.3% over 1987 to reach an all-time high of 41.698 billion miles (Figure 1-2).

Figure 1-1

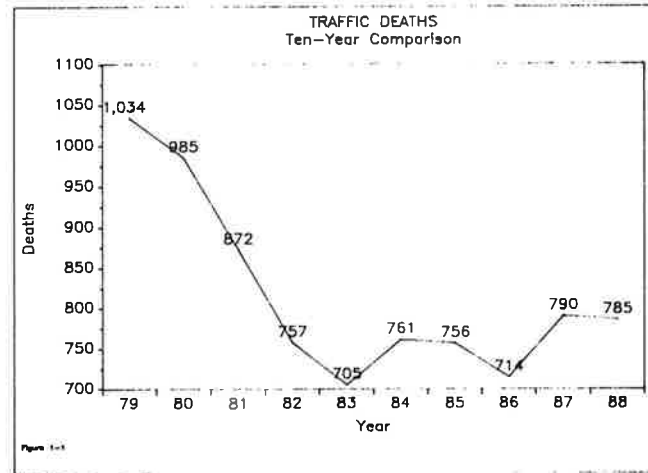
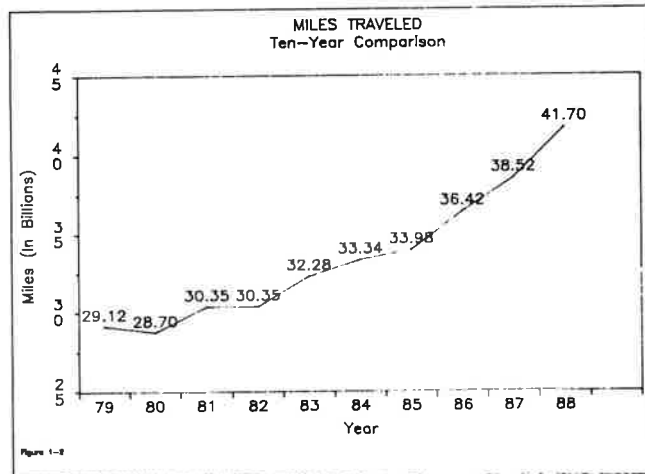


Figure 1-2



The state's 1988 traffic fatality rate of 1.88 deaths per 100 million vehicle miles of travel continues to be well below the national rate of 2.50 for the year. The 1.88 rate is the lowest point in Washington's history and fell from the 2.05 rate recorded in 1987. Total reported motor vehicle traffic collisions and injuries increased over the three-year average. Compared to 1987, total collisions were down slightly while the number of persons injured was up by 7.1% (Figure 1-4).

Figure 1-3

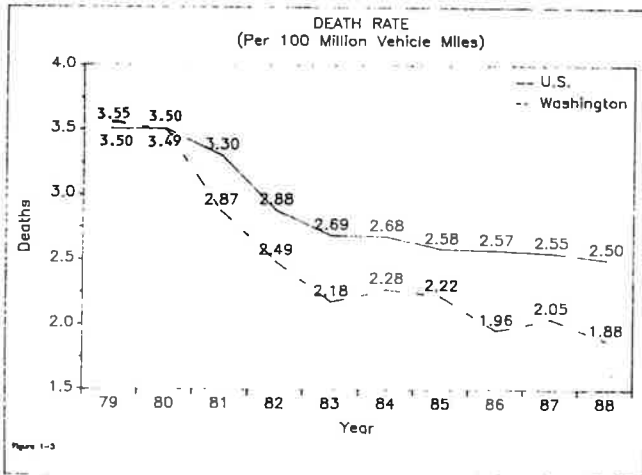
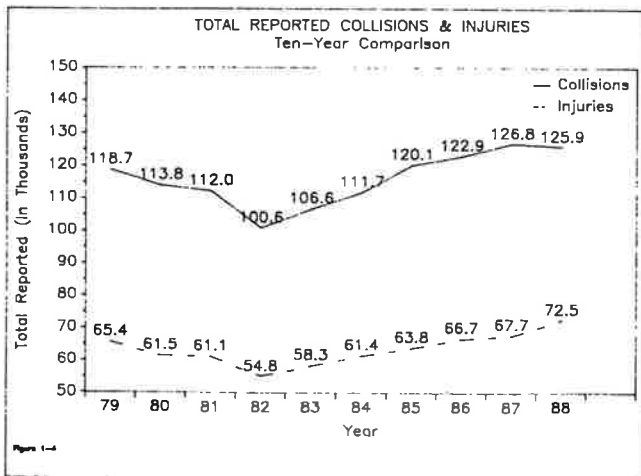


Figure 1-4



**E. Highways, Travel, and Fatalities**

The U.S. and state numbered system (other than the interstate system) was the most-traveled road system in the state with an estimated record of 12.084 billion miles. The interstate system continued to have the lowest death rate per 100 million vehicle miles of all the state systems at 0.98 rate recorded in 1988: an increase of 0.30 from 1987. Estimated travel on city streets increased to 10.619 billion miles in 1988 and resulted in a death rate of 1.17, which is down slightly from 1.20 in 1987. County roads were traveled an estimated 8.869 billion miles and recorded a death rate of 2.85 in 1988; a decrease from the previous year's 3.36 rate. Total motor vehicle travel in the state increased from 38.520 billion miles to 41.698 billion in 1988 (Table 1-5).



Table 1-5

HIGHWAYS, TRAVEL, AND COLLISIONS By Type of Highway							
Type of Highways	Highways		Vehicle Miles Traveled+		Collisions		
	Miles	% of Total	Miles (Millions)	% of Total	Total Collisions	Total Fatalities	Death Rate for CHVM*
Interstate System**	762	0.93%	10,028	24.05%	12,814	98	0.98
All Other State Highways	6,220	7.63%	12,084	28.98%	28,817	294	2.43
County Roads	41,748	51.20%	8,869	21.27%	27,777	253	2.85
City Streets	11,382	13.96%	10,619	25.47%	55,573	124	1.17
All Other Traffic Ways***	21,433	26.28%	98	0.24%	939	16	16.33
<b>TOTAL</b>	<b>81,545</b>	<b>100.00%</b>	<b>41,698</b>	<b>100.00%</b>	<b>125,920</b>	<b>785</b>	<b>1.88</b>

+Preliminary Estimates

\*Fatalities per hundred million vehicle miles, based on roadway travel as reported by the Dept. of Transportation.

\*\*Does not include traveled way.

\*\*\*Does not include (all terrain vehicle) trails.

Table 1-6

PERSONS KILLED AND INJURED By Age By Status								
Age	Total		Occupants		Pedestrians		Pedalcyclists	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
0 - 4	20	1,292	10	1,172	10	97	0	0
5 - 9	17	1,990	8	1,545	4	234	5	4
10 - 14	14	2,291	9	1,706	3	197	2	1
15 - 19	113	12,175	103	11,732	10	190	0	0
20 - 24	117	11,477	114	12,169	3	149	0	0
25 - 34	192	17,031	175	16,577	15	295	2	2
35 - 44	120	11,124	106	10,831	12	210	2	2
45 - 54	45	5,257	38	5,122	7	95	0	0
55 - 64	48	3,554	41	3,436	7	96	0	0
65 - 74	40	2,432	31	2,348	8	74	1	1
75/Older	50	1,445	35	1,349	15	91	0	0
Not Stated	9	2,381	6	2,230	3	92	0	0
<b>TOTAL*</b>	<b>785</b>	<b>72,449</b>	<b>676</b>	<b>70,217</b>	<b>97</b>	<b>1,820</b>	<b>12</b>	<b>10</b>

\*Total Injured includes 402 injured where the status of the injured was unknown.

Table 1-7

COMPARISON OF TRAFFIC DEATHS BY MONTH Three-Year Comparison								
Month	1988		1987		1986		% Change 87 to 88	
	Month Total	Year To Date	Month Total	Year To Date	Month Total	Year To Date	Month Total	Year To Date
January	40	40	54	54	42	42	-25.9%	-25.9%
February	42	82	52	106	28	70	-19.2%	-22.6%
March	70	152	62	168	56	126	12.9%	-9.5%
April	55	207	55	223	60	186	0.0%	-7.2%
May	69	276	50	273	73	259	38.0%	1.1%
June	82	358	77	350	73	332	6.5%	2.3%
July	86	444	73	423	70	402	17.8%	5.0%
August	79	523	84	507	69	471	-6.0%	3.2%
September	70	593	90	597	51	522	-22.2%	-0.7%
October	66	659	69	666	67	589	-4.3%	-1.1%
November	66	725	73	739	64	653	-9.6%	-1.9%
December	60	785	51	790	61	714	17.6%	-0.6%

Table 1-8

COLLISIONS By Time									
Time Hour Reporting	Total			Monday - Thursday			Friday - Sunday		
	All	Injury	Fatal	All	Injury	Fatal	All	Injury	Fatal
Midnight	3,039	1,236	45	1,079	425	21	1,960	811	24
1:00	2,995	1,270	43	968	393	14	2,027	877	29
2:00	2,842	1,254	50	892	367	18	1,950	887	32
3:00	1,415	559	24	430	158	8	985	401	16
4:00	1,011	392	13	385	131	1	626	261	12
5:00	1,262	468	10	625	229	3	637	239	7
6:00	2,769	1,065	13	1,816	699	6	953	366	7
7:00	5,460	2,103	15	3,942	1,536	9	1,518	567	6
8:00	4,689	1,698	13	3,075	1,141	8	1,614	557	5
9:00	4,177	1,503	19	2,515	912	10	1,662	591	9
10:00	4,846	1,725	13	2,854	999	7	1,992	726	6
11:00	6,300	2,293	21	3,673	1,309	11	2,627	984	10
Noon	7,264	2,786	22	4,024	1,494	13	3,240	1,292	9
1:00	7,247	2,767	23	4,094	1,550	16	3,153	1,217	7
2:00	8,486	3,242	27	4,885	1,863	10	3,601	1,379	17
3:00	10,078	3,941	43	5,962	2,292	24	4,116	1,649	19
4:00	10,932	4,400	36	6,615	2,659	20	4,317	1,741	16
5:00	10,803	4,445	45	6,568	2,681	17	4,235	1,764	28
6:00	7,578	3,113	45	4,265	1,727	23	3,313	1,386	22
7:00	5,895	2,422	38	3,090	1,245	16	2,805	1,177	22
8:00	4,577	1,842	33	2,338	938	17	2,239	904	16
9:00	4,428	1,781	39	2,198	883	22	2,230	898	17
10:00	3,976	1,603	30	1,848	748	14	2,128	855	16
11:00	3,851	1,574	46	1,560	655	15	2,291	919	31
TOTAL	125,920	49,482	706	69,701	27,034	323	56,219	22,448	383

Table 1-9

COMPARISON OF DRIVERS INVOLVED TO NUMBER LICENSED Driver Age Distribution					
Driver Age	Involved in Collisions		Licensed Drivers	% of Licensed Drivers	Over/Under Ratio
	Number	% of Total			
Under 16	585	0.30%	0	0.00%	---
16	4,725	2.41%	26,719	0.82%	2.94
17-18	16,164	8.23%	102,486	3.14%	2.62
19-20	14,927	7.60%	117,835	3.61%	2.11
21-22	12,779	6.51%	117,533	3.60%	1.81
23-24	12,100	6.16%	132,954	4.07%	1.51
25-29	28,546	14.54%	387,057	11.86%	1.23
30-34	24,743	12.60%	418,138	12.81%	0.98
35-39	20,747	10.57%	398,802	12.22%	0.86
40-44	15,917	8.11%	344,830	10.56%	0.77
45-49	10,634	5.42%	256,806	7.87%	0.69
50-54	7,912	4.03%	197,826	6.06%	0.66
55-59	6,805	3.47%	176,368	5.40%	0.64
60-64	5,982	3.05%	172,487	5.28%	0.58
65-69	5,097	2.60%	159,989	4.90%	0.53
70 & Over	8,700	4.43%	254,235	7.79%	0.57

**F. Traffic Deaths and Vehicle Registration Death Rates by County**

In 1988, fatalities ranged from a high of 174 in King County, with a death rate of 1.42 (traffic deaths per 10,000 registered vehicles), to a low of zero deaths in Wahkiakum county. Ferry county recorded the highest death rate at 18.97 computed from 7 fatalities, followed by Adams county that recorded a 8.00 death rate based on 11 traffic deaths, and Kittitas county that experienced 17 traffic deaths for a registration death rate of 7.77 (Figure 1-5).

**E. Comparison of Drivers Involved to Number of Licensed Drivers.**

Drivers 20 years old and under comprised 7.6% of all licensed drivers in the state last year, yet this age group was involved in 18.2% of the total 1988 collisions. This was a collision over-representation rate 2.41 times higher than the percentage of licensed drivers comprising this group. The 21-24 age group was involved in 12.7% of the total collisions while comprising 7.7% of all licensed drivers, producing an over-representation factor of 1.65. The 25-29 age group, comprising 14.5% of all licensed drivers, was involved in 11.9% of all collisions for an over-representation ratio of 1.23. All other age groups were under-represented when their percentages of collision involvement were compared to their percentages of total licensed drivers (Table 1-9).

**Figure 1-5**

Traffic Deaths and Vehicle Registration Death Rate  
by County

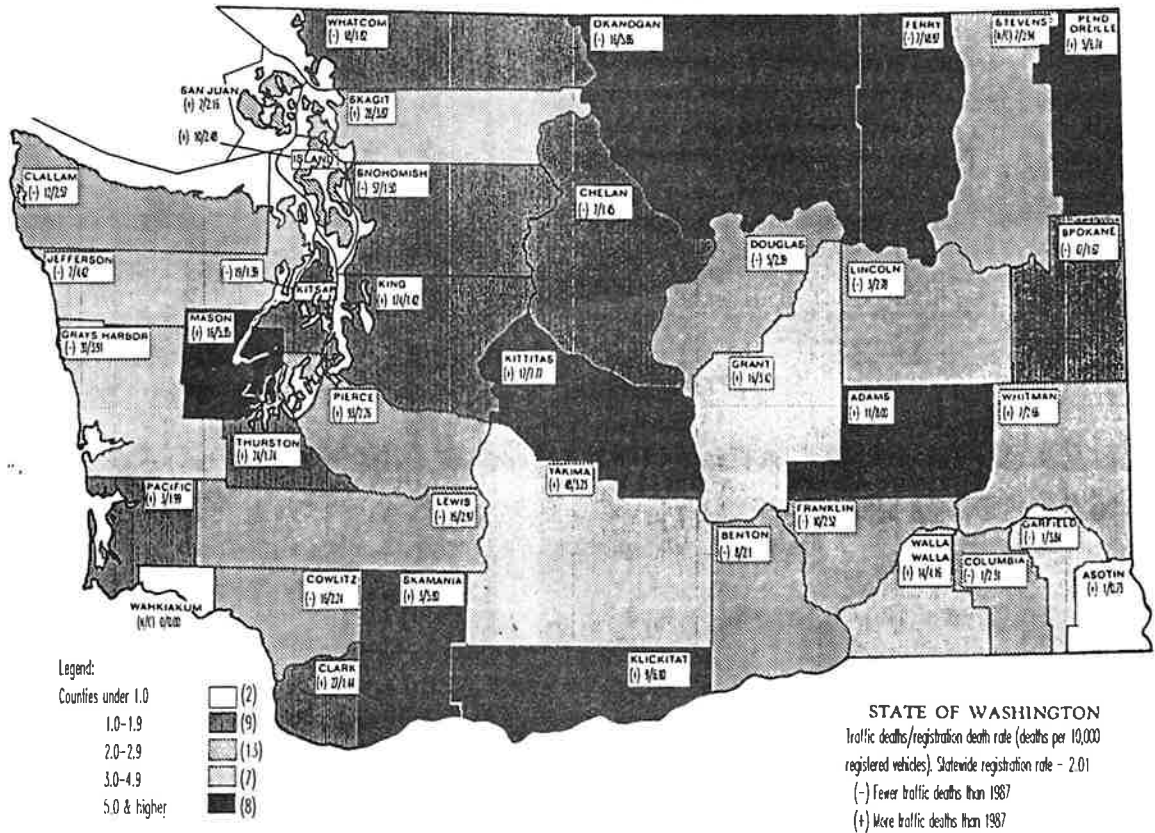


Figure 1-6

### Traffic Fatalities

In 1988 and Percent of Change from 1987

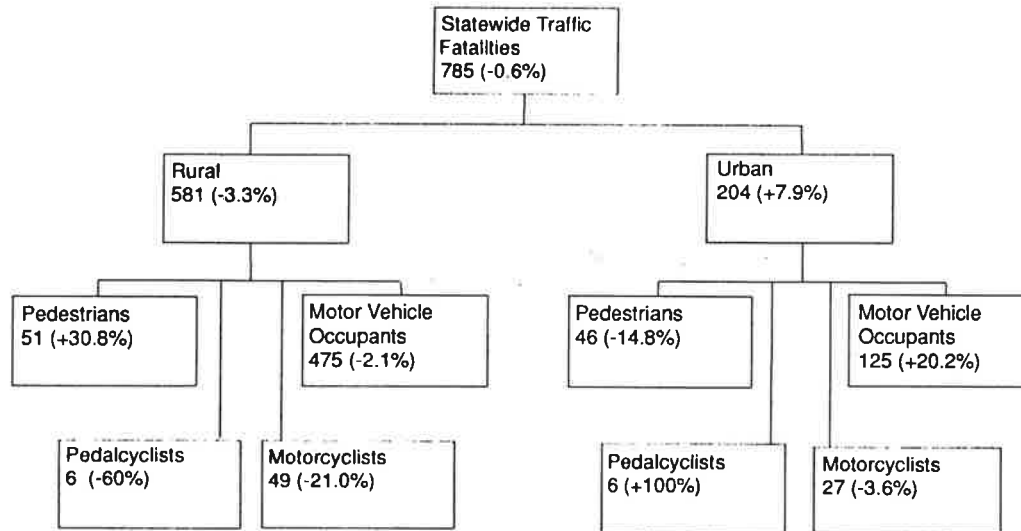


Figure 1-7

### Traffic Fatalities by Age and Sex

1988

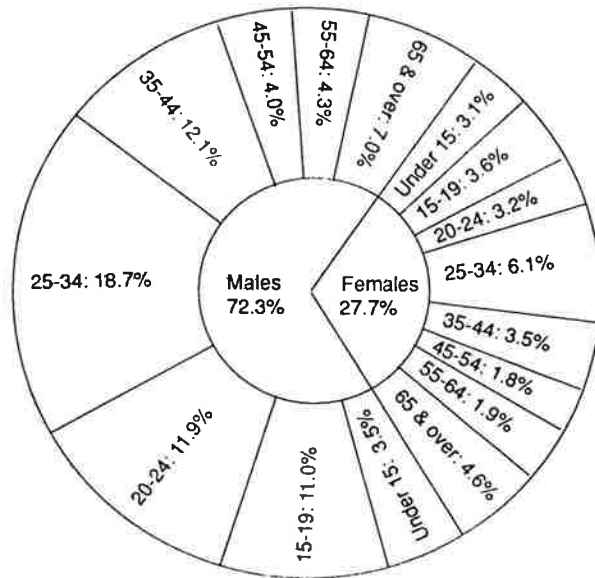


Table 1-10

COLLISION RATES BY COUNTY POPULATION 1988							
County	1988 Population	Traffic Deaths		Traffic Injuries		Total Collisions	
		Number	Rate*	Number	Rate**	Number	Rate*
Over 1,000,000							
1. King	1,413,900	174	12.31	26,255	18.57	47,484	33.58
250,000 to 750,000							
1. Pierce	547,700	93	16.98	10,585	19.33	16,149	29.49
2. Snohomish	409,500	57	13.92	6,494	15.86	10,813	26.41
3. Spokane	354,100	47	13.27	5,354	15.12	8,969	25.33
100,000 to 250,000							
1. Clark	214,500	27	12.59	2,925	13.64	4,882	22.76
2. Yakima	186,300	48	25.76	2,098	11.26	4,253	22.83
3. Kitsap	177,300	19	10.72	2,259	12.74	3,614	20.38
4. Thurston	149,300	24	16.08	2,087	13.98	3,857	25.83
5. Whatcom	119,100	18	15.11	1,720	14.44	3,003	25.21
6. Benton	104,100	8	7.68	987	9.48	2,049	19.68
50,000 to 100,000							
1. Cowlitz	80,500	16	19.88	1,083	13.45	1,958	24.32
2. Skagit	70,800	28	39.55	1,097	15.49	1,893	26.74
3. Grays Harbor	63,400	20	31.55	951	15.00	1,838	28.99
4. Lewis	57,400	16	27.87	909	15.84	1,540	26.83
5. Clallam	54,400	12	22.06	574	10.55	1,165	21.42
6. Island	53,400	10	18.73	459	8.60	823	15.41
7. Grant	52,600	16	30.42	567	10.78	995	18.92
25,000 to 50,000							
1. Chelan	49,700	7	14.08	689	13.86	1,404	28.25
2. Walla Walla	48,300	14	28.99	493	10.21	937	19.40
3. Whitman	39,000	7	17.95	378	9.69	668	17.13
4. Mason	36,800	16	43.48	518	14.08	884	24.02
5. Franklin	35,500	10	28.17	446	12.56	863	24.31
6. Okanogan	31,700	16	50.47	419	13.22	708	22.33
7. Stevens	30,200	7	23.18	326	10.79	473	15.66
8. Kittitas	25,000	17	68.00	679	27.16	1,323	52.92
10,000 to 25,000							
1. Douglas	24,100	5	20.75	264	10.95	464	19.25
2. Jefferson	18,600	7	37.63	263	14.14	442	23.76
3. Pacific	17,600	3	17.05	274	15.57	427	24.26
4. Asotin	17,400	1	5.75	113	6.49	231	13.28
5. Klickitat	16,600	9	54.22	198	11.93	331	19.94
6. Adams	14,000	11	78.57	211	15.07	346	24.71
Under 10,000							
1. Lincoln	9,700	3	30.93	130	13.40	176	18.14
2. San Juan	9,600	2	20.83	88	9.17	136	14.17
3. Pend Oreille	8,800	5	56.82	140	15.91	201	22.84
4. Skamania	8,000	3	37.50	150	18.75	209	26.13
5. Ferry	6,100	7	114.75	97	15.90	151	24.75
6. Columbia	4,100	1	24.39	49	11.95	103	25.12
7. Wahkiakum	3,500	0	0.00	83	23.71	103	29.43
8. Garfield	2,400	1	41.67	37	15.42	55	22.92
TOTAL	4,565,000	785	17.20	72,449	15.87	125,920	27.58

\*Frequency per 100,000 population

\*\*Frequency per 1,000 population

Table 1-11

COLLISION RATES BY CITY POPULATION 1988							
City	1988 Population	Traffic Deaths*		Traffic Injuries*		Total Collisions*	
		Number	Rate**	Number	Rate***	Number	Rate**
250,000 and Over							
1. Seattle	495,900	46	9.28	9,285	18.72	18,511	37.33
100,000 to 250,000							
1. Spokane	170,200	14	8.23	3,166	18.60	5,716	33.58
2. Tacoma	161,400	23	14.25	3,765	23.33	6,176	38.27
50,000 to 100,000							
1. Bellevue	85,180	4	4.70	1,045	12.27	2,223	26.10
2. Everett	60,920	2	3.28	1,199	19.68	2,156	35.39
25,000 to 50,000							
1. Yakima	49,470	5	10.11	748	15.12	1,797	36.33
2. Bellingham	46,610	0	0.00	617	13.24	1,323	28.38
3. Vancouver	43,290	4	9.24	730	16.86	1,578	36.45
4. Kennewick	37,180	2	5.38	363	9.76	837	22.51
5. Bremerton	37,050	1	2.70	563	15.20	1,064	28.72
6. Renton	36,940	3	8.12	716	19.38	1,590	43.04
7. Kirkland	35,820	1	2.79	424	11.84	927	25.88
8. Kent	32,350	5	15.46	940	29.06	1,584	48.96
9. Redmond	31,710	1	3.15	469	14.79	889	28.04
10. Auburn	30,790	4	12.99	629	20.43	1,114	36.18
11. Olympia	30,270	5	16.52	570	18.83	1,266	41.82
12. Richland	30,140	1	3.32	278	9.22	571	18.94
13. Longview	29,560	2	6.77	511	17.29	880	29.77
14. Edmonds	28,500	0	0.00	311	10.91	540	18.95
15. Walla Walla	25,440	3	11.79	241	9.47	550	21.62
15,000 to 25,000							
1. Pullman	23,579	1	4.24	111	4.71	277	11.75
2. Lynnwood	22,641	0	0.00	693	30.61	1,319	58.26
3. Puyallup	20,840	1	4.80	350	16.79	698	33.49
4. Mercer Island	20,690	0	0.00	85	4.11	214	10.34
5. Wenatchee	18,860	1	5.30	254	13.47	574	30.43
6. Pasco	18,430	1	5.43	240	13.02	560	30.39
7. Port Angeles	17,350	3	17.29	190	10.95	450	25.94
8. Aberdeen	17,130	3	17.51	217	12.67	654	38.18
9. Lacey	16,380	0	0.00	234	12.45	483	23.87
10. Mountlake Terrace	16,290	0	0.00	124	7.61	254	15.59
10,000 to 15,000							
1. Mount Vernon	14,590	0	0.00	204	11.65	391	23.17
2. Oak Harbor	14,410	0	0.00	84	12.42	218	26.51
3. Des Moines	14,120	0	0.00	170	5.95	338	15.44
4. Centralia	11,850	1	8.44	179	5.57	382	14.68
5. Ellensburg	11,500	0	0.00	66	14.61	174	31.22
6. Kelso	10,880	0	0.00	168	11.40	359	25.64
7. Moses Lake	10,650	1	9.39	124	11.64	279	26.20
8. Anacortes	10,320	0	0.00	53	5.14	141	13.66
9. Bothell	10,205	0	0.00	94	9.21	215	21.07
TOTAL	1,799,435	138	7.67	30,210	16.79	59,272	32.94

\*Does not include collisions on limited access roads or freeways

\*\*Frequency per 100,000 population

\*\*\*Frequency per 1,000 population

### F. Collisions By Type

Multiple-vehicle collisions dropped ever so slightly in 1988 to 94,304 from 94,433 in 1987 (Figure 1-8). Single-vehicle collisions also decreased slightly (Figure 1-9). Vehicle-pedestrian collisions decreased 1.0% from 1987 (Figure 1-10). Vehicle-pedalcycle collisions dropped by 14.4% in 1988, reversing a five-year trend of increases in pedalcycle collisions (Figure 1-11).

Figure 1-8

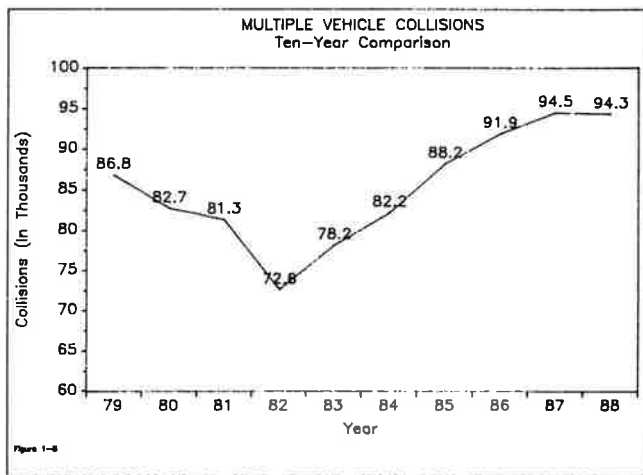


Figure 1-9

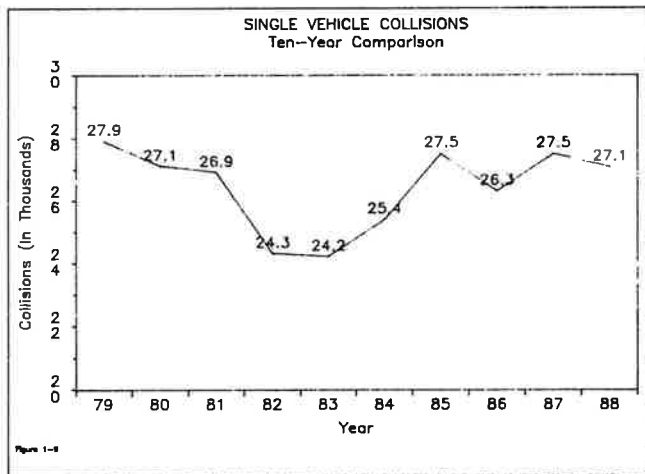


Figure 1-10

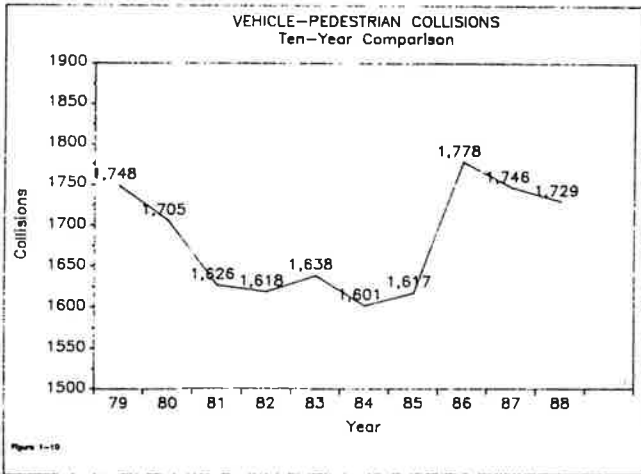


Figure 1-11

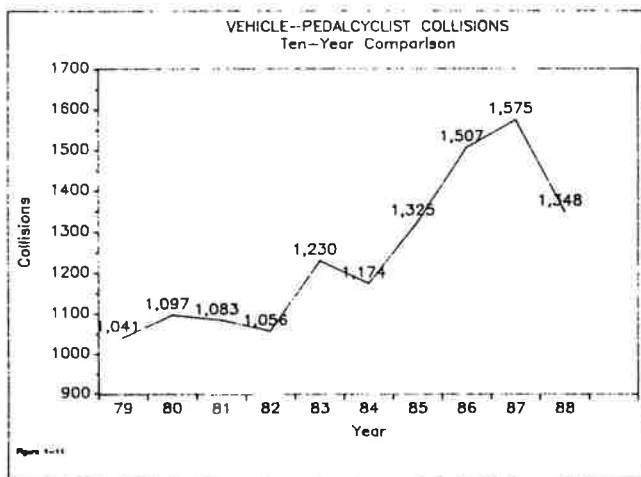
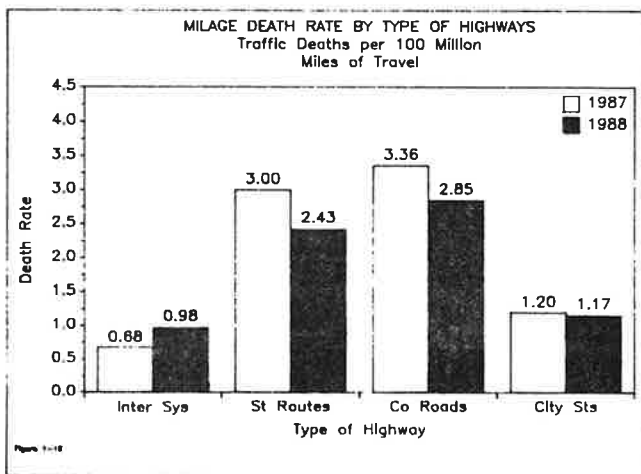


Figure 1-12

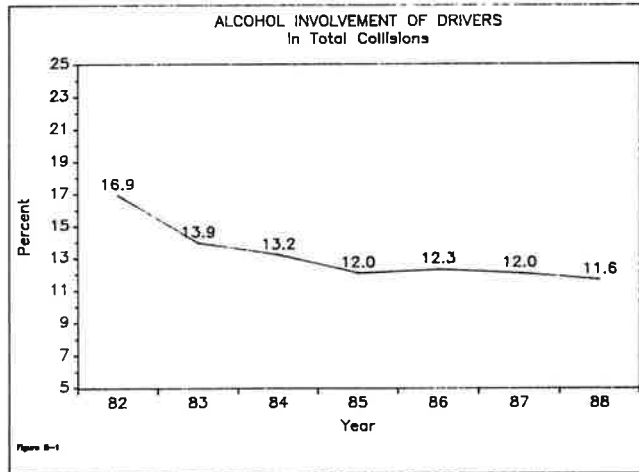




## I. Alcohol Involvement

In 1988, 11.6% of all drivers involved in traffic collisions had been drinking alcohol. This is a 1.3% decrease from 1987 and continues a downward trend (Figure 2-1).

Figure 2-1



### A. Drivers Involved In Fatal Collisions

In 1988, 40.6% of the drivers involved in statewide fatal collisions had been drinking intoxicants. This increased from the 36.4% involvement recorded in 1987 and from the 38.4% baseline period (Table 2-1). In rural areas, 42.0% of the drivers in fatal collisions had been drinking, up 7.05% from the 1984-87 average. In urban areas, 36.7 drivers out of every 100 had been drinking prior to being involved in a fatal collision. This is up 1.8% from the baseline period.

Table 2-1

Condition of Driver (Sobriety)	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
Had been drinking - ability impaired	340	296	306	292	307	300	13.24%
Had been drinking - ability not impaired	45	40	51	43	52	47	-3.23%
Had been drinking - sobriety unknown	15	24	13	11	11	15	1.69%
Had not been drinking	586	630	546	577	574	582	0.73%
Not stated	41	46	35	45	41	42	-1.80%
<b>Total drivers drinking</b>	<b>400</b>	<b>360</b>	<b>370</b>	<b>346</b>	<b>370</b>	<b>362</b>	<b>10.65%</b>
Total drivers - excluding not stated	986	990	916	923	944	943	4.53%
Total drivers	1,027	1,036	951	968	985	985	4.26%
<b>No. drinking drivers per 100 involved</b>	<b>40.6</b>	<b>36.4</b>	<b>40.4</b>	<b>37.5</b>	<b>39.2</b>	<b>38.4</b>	<b>5.76%</b>
No. drunk drivers per 100 involved	34.5	29.9	33.4	31.6	32.5	31.9	8.21%

### B. Alcohol Involvement By Age Group

Drivers under 30 years of age continue to be over-represented in alcohol-related collision. The 16- to 20-year-old group composed 7.6% of all licensed drivers in the state in 1988 but were involved in 14.7% of all alcohol-related collisions. This age group was involved in nearly two times more alcohol-related collisions than the percentage of licensed drivers it represented by a ratio of 1.94 (Figure 2-2). The over-involvement ratio for drivers aged 21-24 was 2.46 in 1988. This continues a steady decrease over the past several years (Figure 2-3). Last year, the 25- to 29-year-age group was involved in 1.74 times more alcohol-related collisions than the percentage of licensed drivers the group represented (Figure 2-4). The age group 30-54 was under represented by a ratio of .76 (Figure 2-5), as were the age groups 55-64 by a ratio of .33 (Figure 2-6), and 65 years and older by a ratio of .17 (Figure 2-7).

Figure 2-2

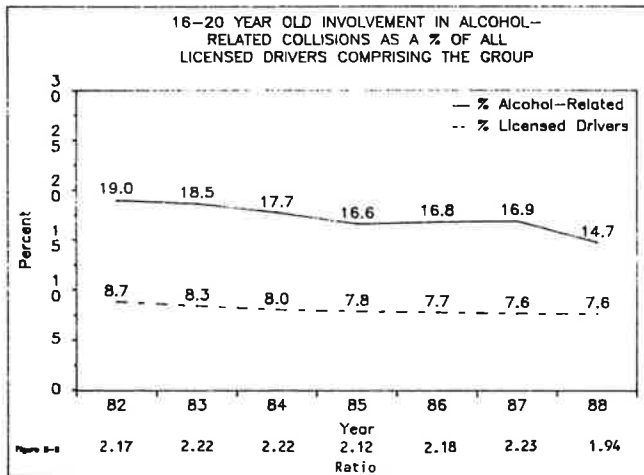


Figure 2-3

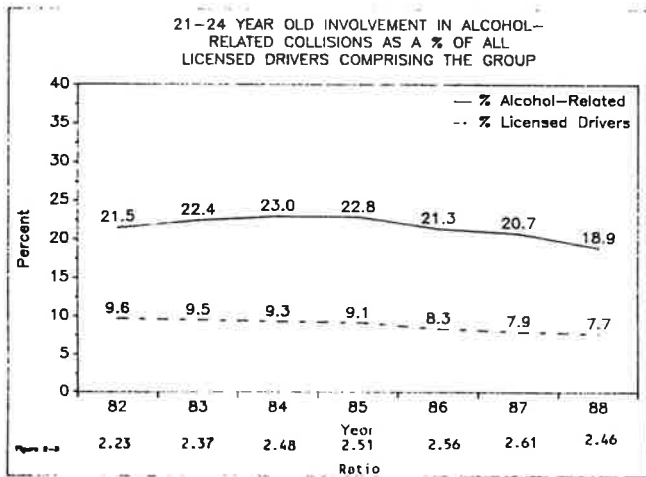


Figure 2-4

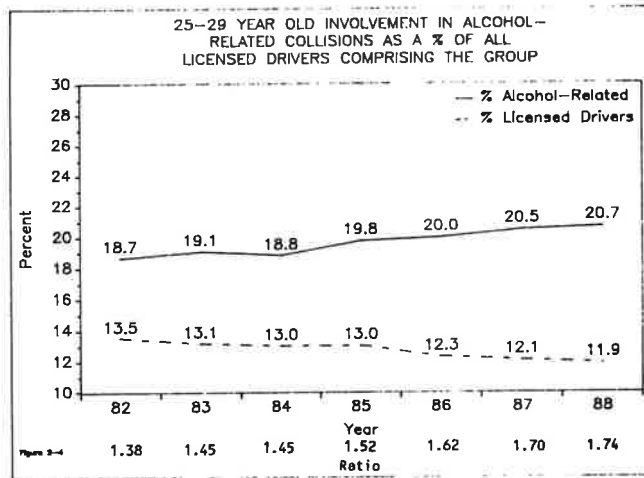


Figure 2-5

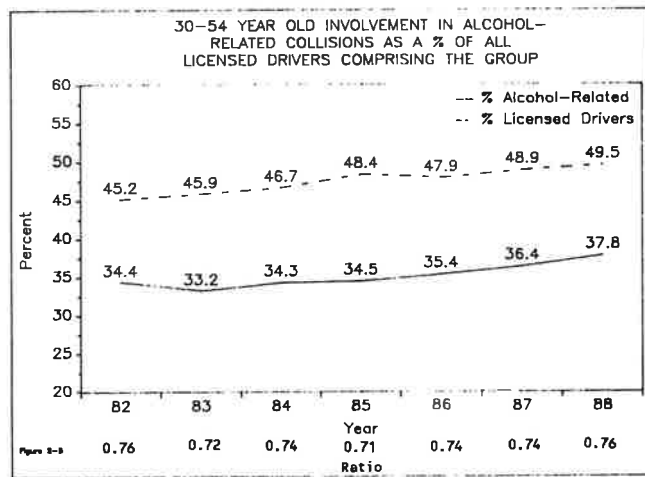


Figure 2-6

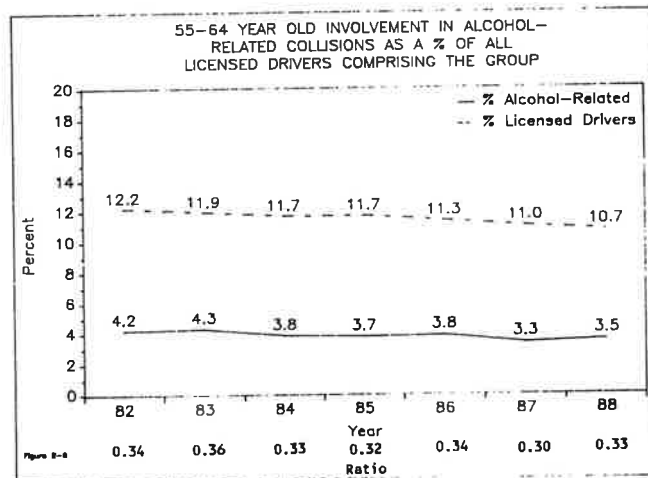
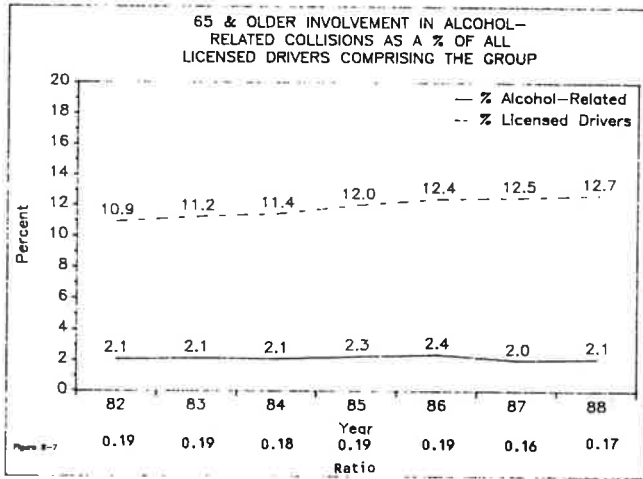


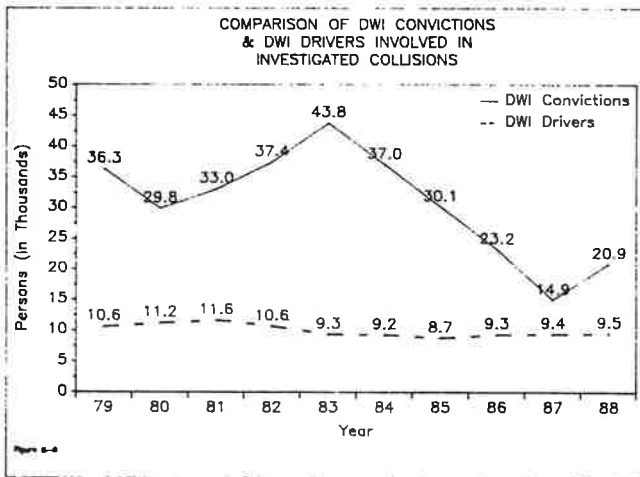
Figure 2-7



**C. Ratio of Drinking and Drunk Drivers by Age and Severity**

In 1988, the number of convictions for alcohol-related traffic offenses reversed a four-year downward trend starting in 1984. The 20,897 convictions in 1988 for DWI/Physical Control violations represented a drop of 52.3% from the 43,835 convictions recorded for the year of 1983. The number of DWI drivers involved in investigated collisions last year increased to 9,532, the highest number recorded since 1982 when 10,609 drivers were involved (Figure 2-8).

Figure 2-8



Data for all collision involvement by driver's age and percent of vehicle miles traveled for each age group reveal that the 16-17 year olds have the greatest over-representation in all reported collisions at 4.34. The 18-20 year olds were the second most over-represented group. The age group with the greatest under-representation based on miles traveled was the 55-64 category. Those in the 16- to 17-year-old bracket also displayed the greatest over-representation in alcohol-related collisions based on miles traveled. Second in this ranking was

again the 18- to 20-year-old group. The age group 55-64 recorded the greatest under-representation in alcohol-involved collisions with a 0.31 ratio (Table 2-2).

Table 2-2

ALL REPORTED COLLISIONS & ALCOHOL-RELATED COLLISIONS Comparison of Miles Traveled					
Driver Age	% of Vehicle Miles Traveled*	Drivers in All Collisions		Alcohol-Related Collisions	
		%	Over/Under Ratio	%	Over/Under Ratio
16-17	1.44	6.25%	4.34	3.40%	2.36
18-20	5.55	12.04%	2.17	11.65%	2.10
21-24	12.58	12.71%	1.01	19.32%	1.54
25-34	29.24	27.22%	0.93	36.92%	1.26
35-44	21.18	18.73%	0.88	16.72%	0.79
45-54	12.97	9.47%	0.73	6.19%	0.48
55-64	11.58	6.53%	0.56	3.63%	0.31
65 & Over	5.34	7.05%	1.32	2.17%	0.41

Table 2-3 presents a summary of the number of persons killed and injured, number of property damage collisions, and total investigated collisions for drivers under the influence (legally drunk), all drinking drivers (had been drinking but not legally drunk), and non-drinking drivers. Of the non-drinking driver collisions, there were 10.7% fewer persons killed and 2.2% fewer received disabling injuries. Property-damage-only collisions also decreased, while persons with non-disabling and possible injuries increased in 1988. Of the drivers under the influence, persons killed and all levels of injury severity increased over last year. Property-damage-only collisions recorded a 4.3% increase, most likely due to the change in the reporting level. Total "DUI" collisions increased 0.4% overall. Alcohol-related (drivers who had been drinking) collisions showed a similar increase when compared to the previous year.

Table 2-3

SUMMARY OF PERSONS KILLED & INJURED IN ALCOHOL-RELATED COLLISIONS Two-Year Comparison									
Status	Drivers Under the Influence			Drivers Who Had Been Drinking*			Non-Drinking Driver Collisions		
	1988	1987	% of Change	1988	1987	% of Change	1988	1987	% of Change
Persons Killed	376	337	11.6%	433	396	9.3%	352	394	-10.7%
Persons Injured	8,359	7,970	4.9%	13,724	13,539	1.4%	49,348	45,600	8.2%
Disabling	1,832	1,788	2.5%	2,665	2,665	0.0%	5,470	5,595	-2.2%
Non-Disabling	3,986	3,897	2.3%	6,418	6,573	-2.4%	17,835	17,288	3.2%
Possible Injury	2,541	2,285	11.2%	4,641	4,301	7.9%	26,043	22,717	14.6%
Property Damage Collisions**	3,867	4,040	-4.3%	8,129	8,496	-4.3%	48,517	50,078	-3.1%
TOTAL COLLISIONS**	9,436	9,398	0.4%	17,299	17,590	-1.7%	81,789	81,676	0.1%

\*Including Drivers Under the Influence

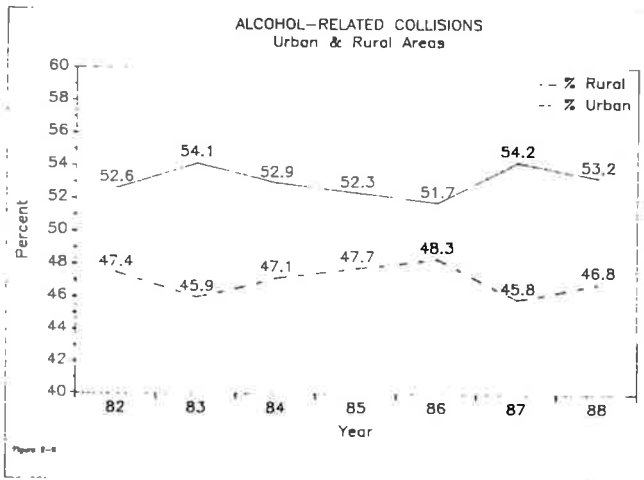
\*\*Minimum damage for a reportable collision was increased from \$300 to \$500 on 10-1-87.

\*\*\*Investigated Collisions Only

**D. Location of Alcohol-Related Collisions**

Alcohol-related collisions continued to decrease in rural areas and an increase in the urban areas, a trend established in 1984. The exception was in 1987 when urban alcohol-related collisions recorded a decrease and the rural area collisions recorded an increase compared to 1986. In 1988, 53.2% of the alcohol-related collisions occurred in rural areas and 46.8% in urban areas (Figure 2-9).

**Figure 2-9**



**E. Multiple- and Single-Vehicle Collisions**

The predominant type of alcohol-related vehicle collisions continued to be multiple-vehicle mishaps in urban areas (Figure 2-10) and single-vehicle collisions in rural areas (Figure 2-11). In urban areas, 67.1% of the collisions involved two or more vehicles as apposed to only 33.7% on rural roads.

**Figure 2-10**

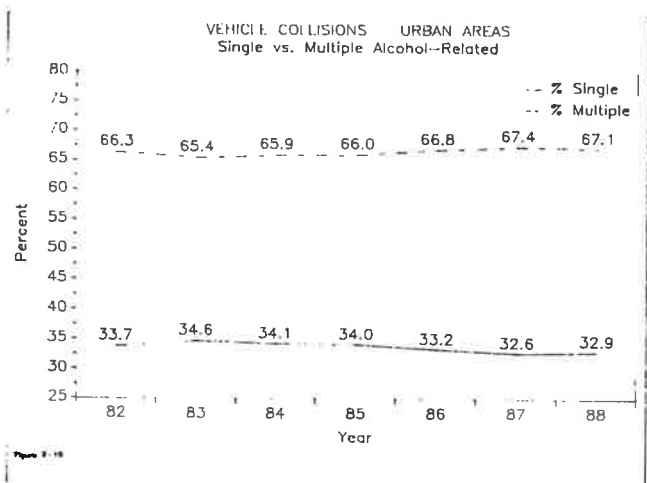
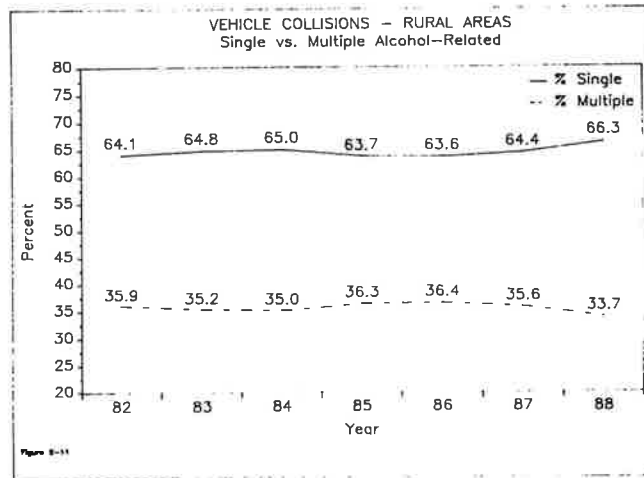


Figure 2-11



The percentage of all single-vehicle collisions where the driver had been drinking remained relatively stable at nearly half of the total alcohol-involved collisions for 1988. In comparison, single-vehicle collisions represented only 21.5% of the total collisions in 1988 (Figure 2-12). To express the over-representation of alcohol in single vehicle collisions the percentage of alcohol involvement in single-vehicle collisions is compared to the percentage of single-vehicle collisions in total vehicle collisions. This ratio increased slightly from 2.26 in 1987 to 2.27 in 1988.

Figure 2-12

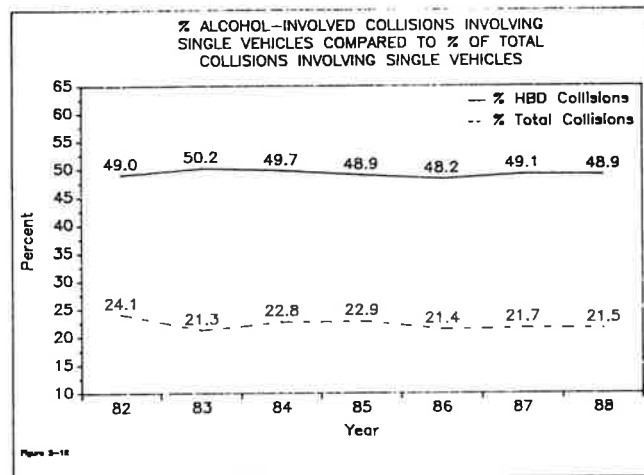
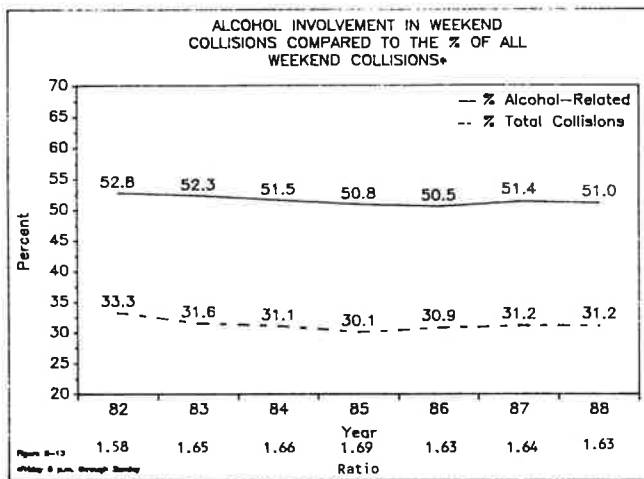


Figure 2-12 shows over-involvement of single-vehicle alcohol-involved collisions compared to single-vehicle collisions in total collisions.

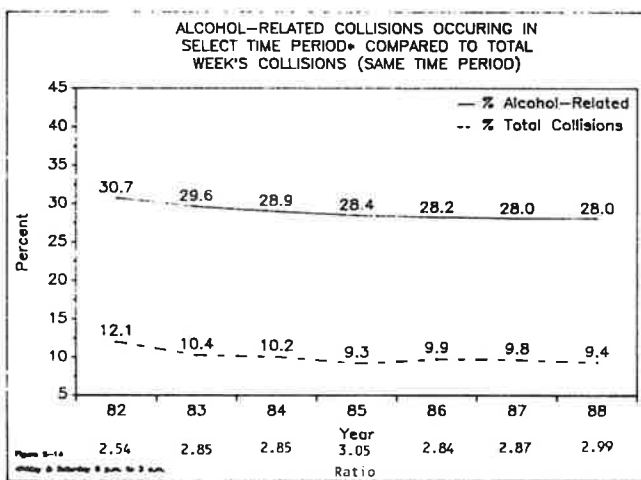
**F. Weekend Alcohol Involvement**

The percentage of alcohol-related collisions occurred at 1.63 times more than all weekend collisions (Friday 6 p.m. to Sunday midnight). This dropped only slightly from the over-representation ratio registered for the previous four years (Figure 2-13). A further breakdown compares the percentage of alcohol-involved collisions occurring Friday and Saturday between the hours of 8 p.m. to 3 a.m. to the percentage of the total week's collisions occurring in the same time frame; the alcohol-related collisions are nearly 3 times over-represented. This is slightly above the over-representation ratio registered for the previous four years (Figure 2-14).

**Figure 2-13**



**Figure 2-14**

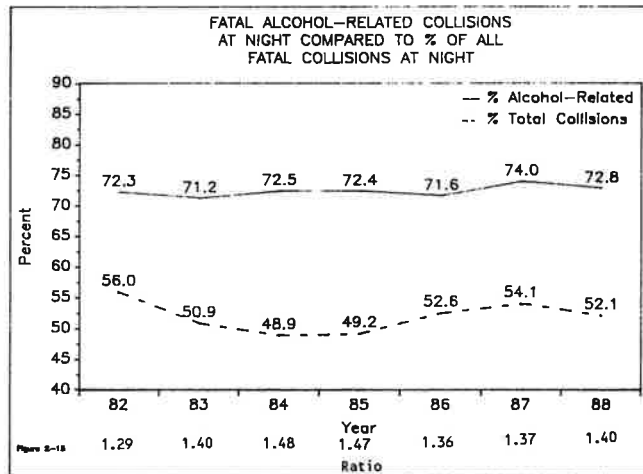




**G. Fatal Alcohol-Involved Collisions Occurring At Night**

The percentage of all nighttime fatal collisions involving alcohol to all alcohol-related fatal collisions increased during 1988 compared to the previous year and the four-year baseline, as did the percentage of all nighttime fatal collisions. All nighttime fatal collisions composed 52.1% of the year's total fatal collisions while alcohol-related nighttime fatal collisions reached 72.8% of the nighttime fatalities. Alcohol-related fatal collisions at night over-represent all nighttime fatal collisions by a ratio of 1.40, down from the previous four-year period ratio (Figure 2-15).

Figure 2-15



**H. Ratio of Drinking and Drunk Drivers Involved In Fatal Traffic Collisions and Roadway Type**

Slightly over forty percent (40.6%) of all drivers in fatal collisions in 1988 had been drinking prior to the collision. This is a substantial increase from 36.4% the previous year and up slightly from the previous five-year average of 38.6% (Figure 2-16). Nearly twelve percent (11.6%) of the drivers involved in all investigated collisions had been drinking prior to the collision; a considerable drop from the 18.2 percent reported in 1981 (Figure 2-17).

Figure 2-16

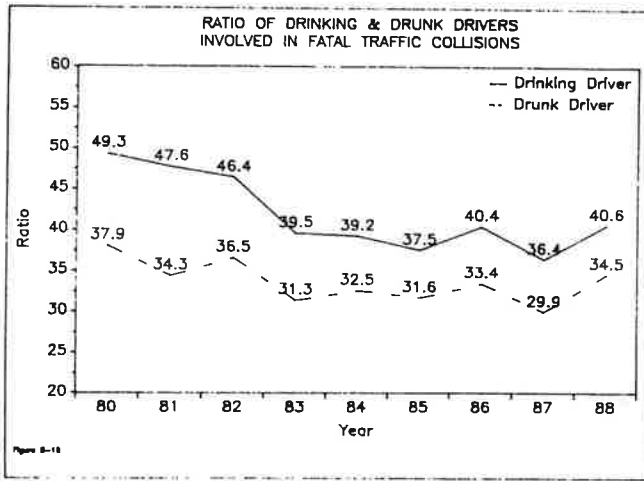
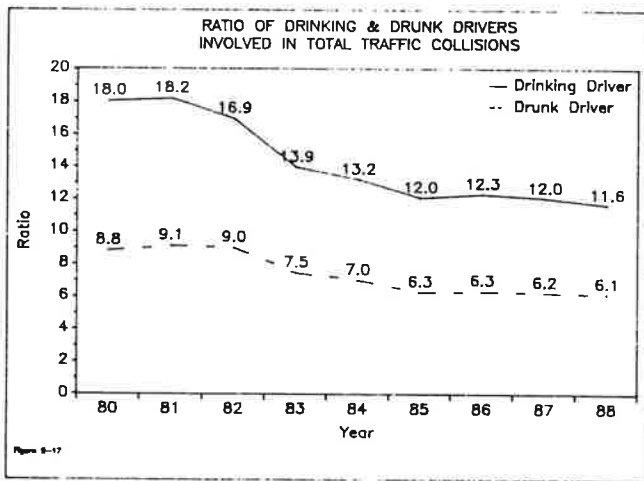


Figure 2-17



The total frequency of particular blood alcohol concentration (BAC) level in fatal and serious injury collisions from 1984 through 1988 by age group is presented in Table 2-4. The 16-20 and 21-24 age groups evidenced the greatest incidence of involvement for .05-.19 BAC levels. At the .15-.19 BAC range, the 21-24 age group had the greatest frequency of occurrences. At the .20-.24 BAC level, the 21-24 and 25-29 age groups had the greatest frequency of occurrences. At the .25-.29 BAC level, the 25-29 age group had the greatest frequency of occurrence followed closely by the 30-34 age group. Overall, the 16-20, 21-24, 25-29, and 30-34 age groups displayed the highest incidence of involvement at all BAC levels.

An analysis of roadway type by day of week on which alcohol-involved fatal and serious injury collisions occurred is given in Table 2-5. County roads accounted for 35.6% of the total weekly collisions compared to 27.2% for city streets. U.S. and state routes totaled 25.4% while the interstates and full-control

access roads contributed to 10.5% of the weekly total of fatal and serious alcohol-involved collisions during 1988. The table also reveals that during this period of time, Saturday was the weekday with the greatest frequency of fatal and serious injury collisions involving alcohol. Sunday and Friday were the next highest days in that order. County roads recorded an increase in fatal and serious injury alcohol-related collisions since 1979, while city streets and U.S. and state routes recorded decreases (Figure 2-18).

Table 2-4

CHEMICAL TEST FOR INTOXICATION IN FATAL & SERIOUS INJURY COLLISIONS										
Age	Alcohol Level							Test Given No Results	Test Refused	Total Tested
	.00-.04	.05-.09	.10-.14	.15-.19	.20-.24	.25-.29	.30 & Up			
16-20	155	421	799	612	201	42	8	418	210	2,866
21-24	122	358	861	944	417	92	30	489	471	3,784
25-29	81	263	714	867	430	150	41	462	553	3,561
30-34	48	135	460	576	368	137	38	365	484	2,611
35-39	34	82	277	393	283	97	38	191	296	1,691
40-44	22	54	164	224	184	71	35	133	193	1,080
45-49	11	30	96	173	125	49	20	72	115	691
50-54	8	24	73	139	87	34	14	47	70	496
55-59	6	28	63	97	78	28	10	41	55	406
60-64	13	14	44	84	48	19	6	30	31	289
65-69	9	10	43	41	30	12	2	18	17	182
Over 69	9	17	44	30	22	7	0	20	9	158
<b>TOTAL</b>	<b>518</b>	<b>1,436</b>	<b>3,638</b>	<b>4,180</b>	<b>2,273</b>	<b>738</b>	<b>242</b>	<b>2,286</b>	<b>2,504</b>	<b>17,815</b>

Table 2-5

FATAL & SERIOUS INJURY COLLISIONS INVOLVING ALCOHOL Roadway Type by Day of Week										
Roadway Type	Day of Week								% of Total Weekly Collisions	% of Previous 4 Year Average
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total		
County Roads	223	196	226	227	435	590	454	2,351	35.6%	34.8%
City Streets	174	196	165	209	310	459	288	1,801	27.2%	30.0%
U.S. & State Routes	165	135	158	199	289	417	319	1,682	25.4%	24.5%
Interstate & Full Control	49	64	73	89	123	165	130	693	10.5%	9.8%
Other Routes	11	6	5	7	12	23	20	84	1.3%	1.0%
<b>Total</b>	<b>622</b>	<b>597</b>	<b>627</b>	<b>731</b>	<b>1,169</b>	<b>1,654</b>	<b>1,211</b>	<b>6,611</b>	<b>100.0%</b>	<b>100.0%</b>
% of Total	9.4%	9.0%	9.5%	11.1%	17.7%	25.0%	18.3%	100.0%		
% of Change 88 - 4 Year Average	9.4%	9.4%	10.4%	11.6%	15.8%	24.7%	18.8%	100.0%		

Figure 2-18

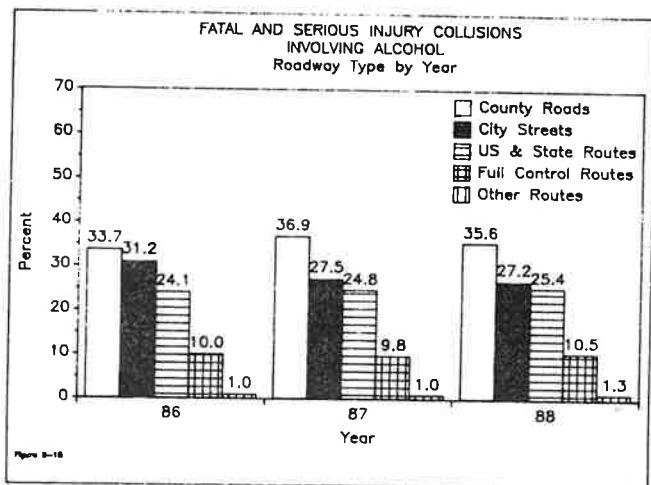


Table 2-6 depicts the number of persons killed and injured by drivers "under the influence" and who "had been drinking" by month for 1986, 1987, and 1988. The summer months typically show a higher incidence of persons killed and injured for both categories of alcohol-involved drivers. The exception was the month of March when 47 persons were killed by drivers who had been drinking, 42 of whom were killed by drivers under the influence.

Table 2-6

Month	Drivers "Under the Influence"						Drivers Who "Had Been Drinking"					
	Persons Killed			Persons Injured			Persons Killed			Persons Injured		
	1988	1987	1986	1988	1987	1986	1988	1987	1986	1988	1987	1986
January	17	16	18	491	523	505	18	19	21	866	861	832
February	27	25	9	554	488	475	28	27	11	876	849	816
March	42	26	25	669	617	702	47	31	31	1,053	1,061	1,112
April	27	24	30	684	656	574	36	31	33	1,130	1,110	1,006
May	39	28	38	785	748	647	47	32	41	1,284	1,257	1,142
June	47	44	32	722	662	606	50	47	40	1,133	1,130	1,093
July	37	29	37	842	715	723	45	40	40	1,372	1,266	1,306
August	30	41	36	715	823	760	35	46	39	1,170	1,405	1,407
September	35	33	22	687	730	664	38	39	31	1,173	1,151	1,241
October	27	34	36	756	690	744	32	36	39	1,321	1,194	1,219
November	30	27	28	684	710	786	35	31	31	1,126	1,181	1,294
December	18	10	20	770	608	637	22	17	25	1,220	1,090	1,049
TOTAL	376	337	331	8,359	7,970	7,823	433	396	382	13,724	13,555	13,517

## II. Youth Involvement

Youthful drivers 24 years and younger were involved in 60,695 reported collisions, of which 290 were fatal collisions, and 25,809 were injury collisions during 1988. This was a 0.4% increase in reported collisions and an 8.1% increase in injury collisions, but a 4.1% decrease in fatal collisions compared to the four-year baseline. There were 497,527 licensed drivers 24 years old and younger in 1988: down slightly from the baseline period. The total collision rate (total

collisions per 1,000 licensed drivers) of 12.20 for 1988 was up slightly from the 12.16 rate for the baseline average (Table 3-1).

Table 3-1

YOUTHFUL DRIVERS (24 YEARS & YOUNGER) INVOLVED IN COLLISIONS Five-Year Comparison							
Collisions & Rates	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
Youthful drivers involved in							
Total Collisions	60,695	63,531	61,568	59,465	57,361	60,481	0.4%
Fatal Collisions	290	286	283	316	324	302	-4.1%
Injury Collisions	25,809	22,834	25,462	23,951	23,242	23,872	8.1%
Licensed Drivers	497,527	490,144	485,889	504,107	512,407	498,137	-0.1%
Fatal Collision Ratio*	4.78	4.50	4.60	5.31	5.65	5.02	-4.7%
Fatal Rate**	0.58	0.58	0.58	0.63	0.63	0.61	-3.9%
Total Collision Rate***	12.20	12.96	12.67	11.80	11.19	12.16	0.4%

\* Fatal Collisions per 1,000 total collisions  
 \*\* Fatal Collisions per 1,000 licensed drivers  
 \*\*\* Youthful drivers involved per 100 licensed

**A. Youthful Drivers Involvement In Collisions By First Harmful Event**

In 1988, 74.9% of those drivers age 24 years and younger involved in collisions collided with other moving vehicles. This type of collision also resulted in the greatest percentage of fatal collisions (43.5%) and injury collisions (71.7%). Single-vehicle collisions with fixed objects led to the second highest percentage of youthful driver involvement in total, fatal and injury collisions: at 15.3%, 28.4% and 16.1% respectively (Table 3-2).

Table 3-2

COLLISIONS INVOLVING YOUTHFUL DRIVERS By First Harmful Event						
Type of Collision	Total Collisions		Fatal Collisions		Injury Collisions	
	Number	% of Total	Number	% of Total	Number	% of Total
Collision with other moving motor vehicles	39,969	74.9%	118	43.5%	16,217	71.7%
Collision with parked vehicle	1,682	3.2%	5	1.8%	467	2.1%
Collision with fixed/other object	8,170	15.3%	77	28.4%	3,651	16.1%
Overturning & other non-collision	2,548	4.8%	39	14.4%	1,517	6.7%
Collisions with pedestrians & pedalcyclists	714	1.3%	29	10.7%	679	3.0%
Other collisions - animal & R.R. train	292	0.5%	3	1.1%	76	0.3%
<b>TOTAL</b>	<b>53,375</b>	<b>100.0%</b>	<b>271</b>	<b>100.0%</b>	<b>22,607</b>	<b>100.0%</b>

**B. Youthful Collision Involvement By Age Group**

The 16- to 20-year-old age group was involved in 18.2% of all collisions. This group's over-representation ratio of 2.41 dropped from the 2.51 ratio for 1987. However, it is still the highest over-representation ratio for any age group (Figure 3-1). The 21- to 24-year-old age group decreased its over-representation ratio slightly from 1.67 to 1.65 (Figure 3-2). The 25-29 age group posted an over-representation ratio of 1.23, up from the previous year's 1.19 (Figure 3-3). The 30-54 age group continued to be under-represented in total collisions compared to this group's percentage of all licensed drivers, as is the 55-year-old and older age group (Figure 3-4 and 3-5).

Figure 3-1

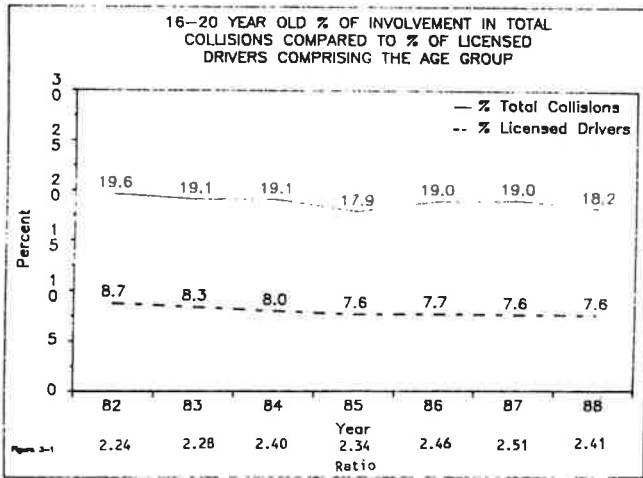


Figure 3-2

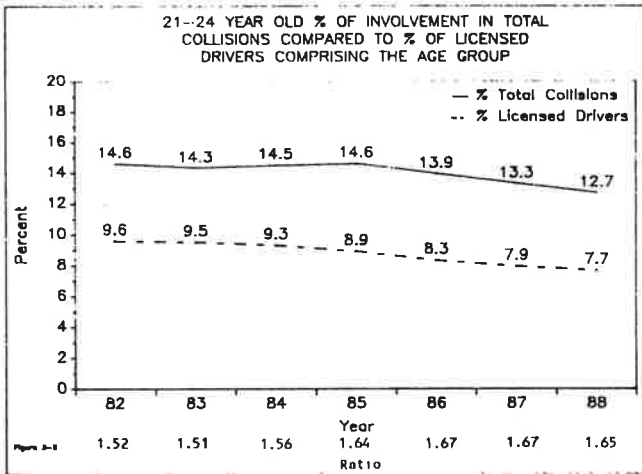


Figure 3-3

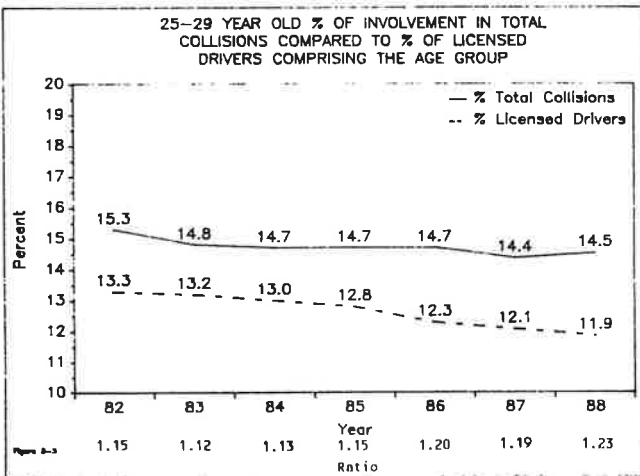


Figure 3-4

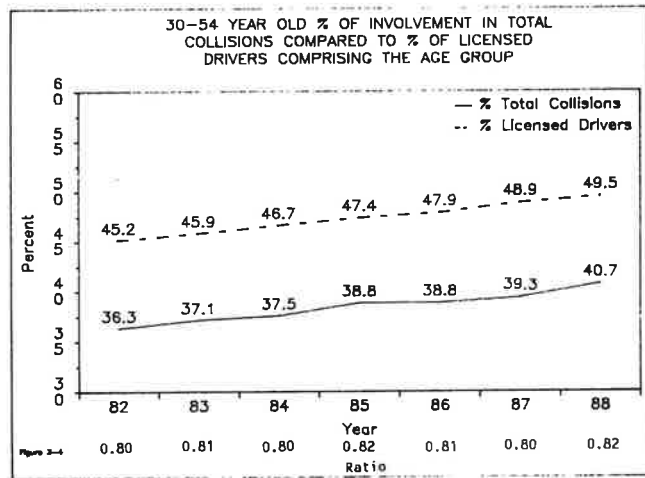
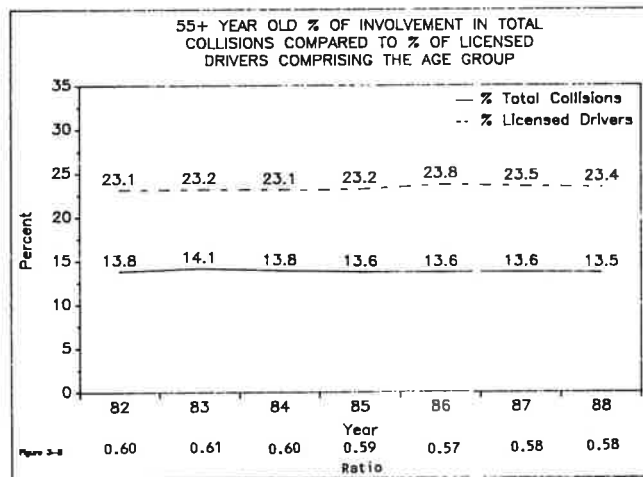


Figure 3-5



### C. Collision Severity By Area For Youthful Drivers

In 1988, the urban and rural area collision mix remained virtually unchanged with the urban areas recording 59.9% of collisions involving youthful drivers (24 years old and younger). The rural areas contributed to 42.1% (Figure 3-6). Youthful driver injury collisions also remained unchanged in urban areas at 53.5% and rural areas at 46.5% (Figure 3-7). Youthful driver fatal collisions continued to be far more common in rural areas. In 1988, 76.8% of the fatal collisions involving youthful drivers occurred in rural areas, slightly lower than the 77.9% recorded in 1987 but higher than the 1982-1986 average. The urban areas recorded 23.2% of the fatal crashes, up from the 22.1% of the year earlier (Figure 3-8).

Figure 3-6

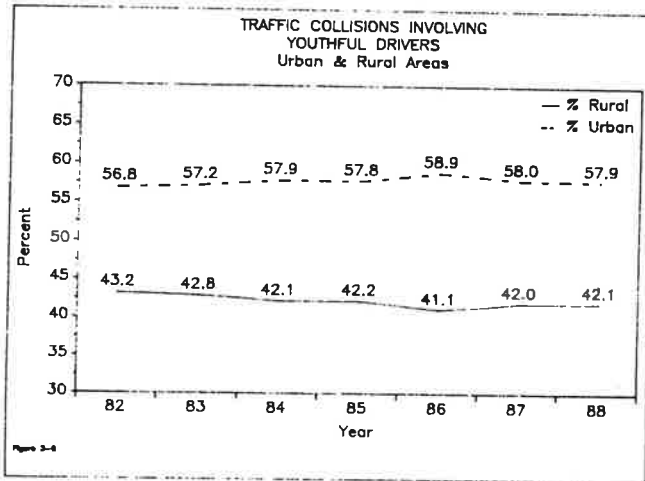


Figure 3-7

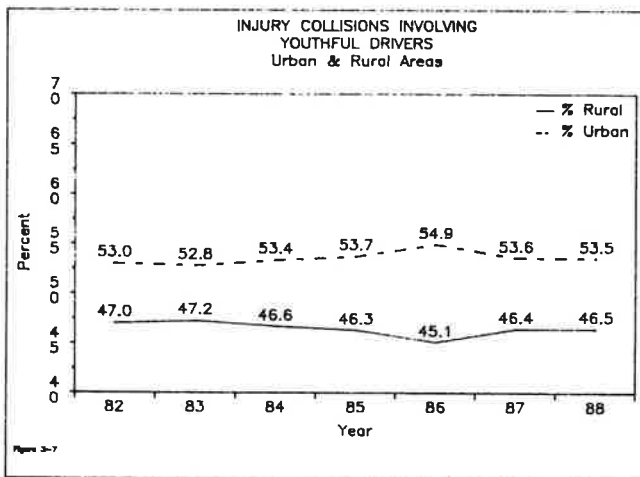
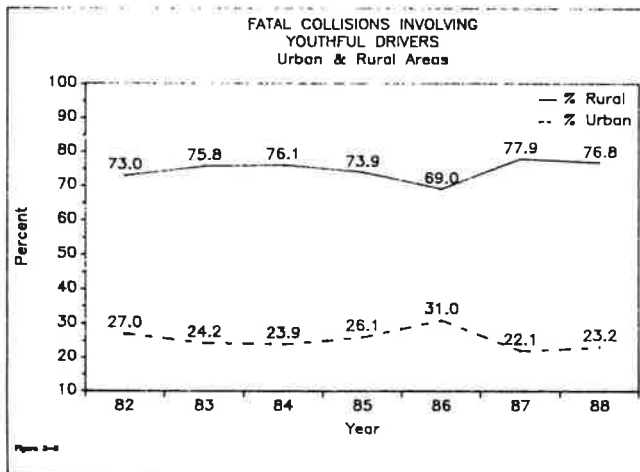


Figure 3-8

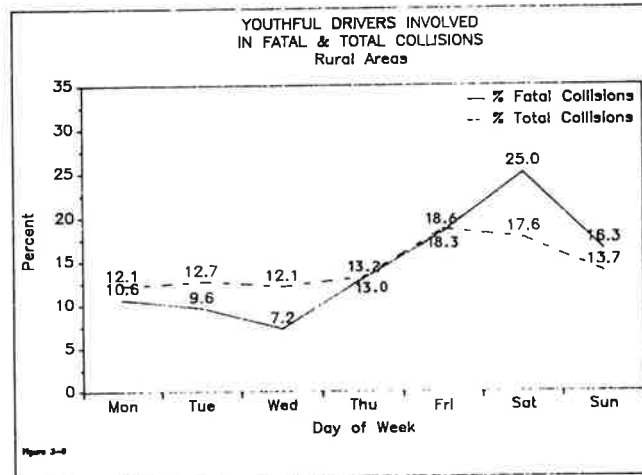




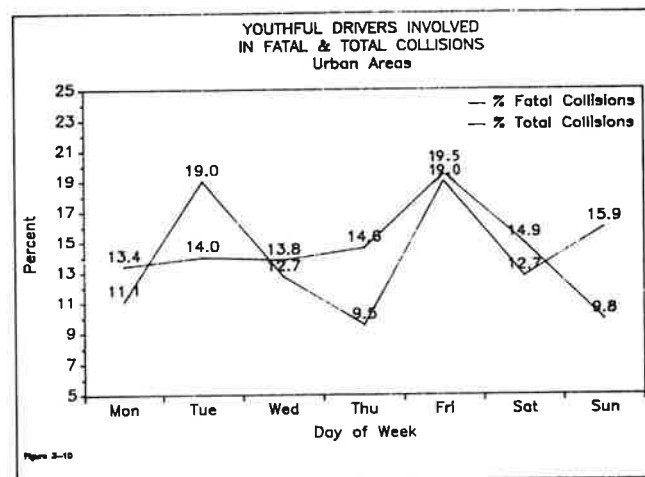
**D. Youthful Driver Involvement By Time**

In 1988, 19% of all the rural fatal collisions involving youthful drivers occurred on both Friday and Tuesday. The highest frequency, 19.5%, of all reported collisions also occurred on Friday (Figure 3-9). In urban areas, Friday also had the highest occurrence of fatal and all reported collisions involving youthful drivers (19%). Tuesday recorded 19% of the urban fatal collisions but only 14% of the total collisions for 1988 (Figure 3-10).

**Figure 3-9**



**Figure 3-10**



In rural areas, the greatest percentage (24.3%) of youthful driver involvement in fatal collisions occurred from 3:00 p.m. to 6:00 p.m.. The greatest percentage of total collision involvement (20.7%) for these drivers in rural collisions was from midnight to 3 a.m. (Figure 3-11). In the urban areas, the greatest youthful involvement by time period in fatal collisions was 23.8% from midnight to 3 a.m.. The 3 p.m. to 6 p.m. time period recorded 27.5% of the youthful drivers involved in total urban collisions (Figure 3-12).

Figure 3-11

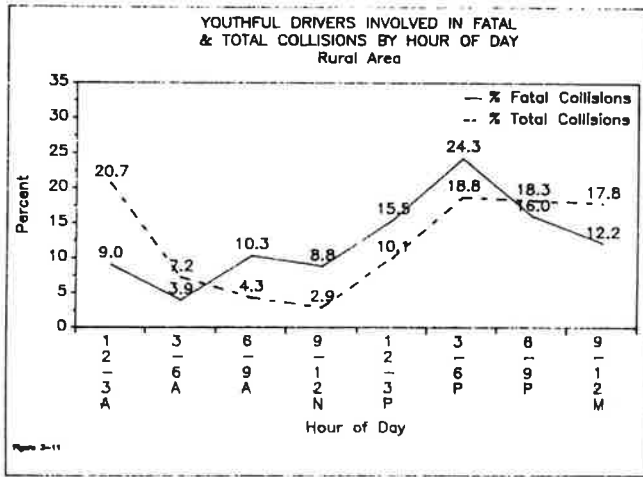
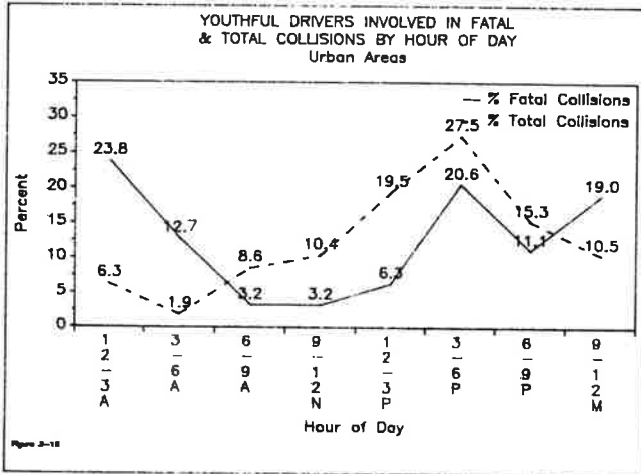


Figure 3-12



### III. Safety-Restraint Usage

Out of a total of 202,054 occupants involved in total investigated collisions, 161,667 were using safety restraints. This is a usage rate of 80.0% and marks the fourth consecutive year of increases in safety-restraint usage since 1984 (Table 4-1).

Table 4-1

Status	1988		1987		1986		1985		1984	
	Count	%	Count	%	Count	%	Count	%	Count	%
Restraints Used	161,667	80.0%	152,413	77.6%	102,751	54.5%	60,392	35.1%	45,214	28.0%
No Restraints Used	40,387	20.0%	44,081	22.4%	85,669	45.5%	111,885	64.9%	116,299	72.0%
TOTAL	202,054	100.0%	196,494	100.0%	188,420	100.0%	172,277	100.0%	161,513	100.0%

Note: Usage rate is the percent of occupants using the restraints among all occupants involved in collisions for whom the usage is known.

Last year, 398 occupants who were not using any type of restraint died and 2,866 non-restrained occupants were seriously injured. Based on 1988 collision data, it is estimated that an occupant who does not "buckle up" is nine times as likely to be killed and over four times as likely to be seriously injured than one who does "buckle up" (Table 4-2).

Table 4-2

RESTRAINT USAGE & INJURIES SUSTAINED* By Type								
Type	Restraints Used		Child Restraints**		No Restraints		Total Occupants	
	Number	%	Number	%	Number	%	Number	%
Deaths	152	0.1%	4	0.1%	405	1.0%	557	0.3%
Disabling Injuries	2,698	1.7%	22	0.8%	2,866	7.1%	5,564	2.8%
Evident Injuries	11,630	7.2%	147	5.4%	7,608	18.8%	19,238	9.5%
Possible Injuries	21,316	13.2%	172	6.3%	5,766	14.3%	27,082	13.4%
No Injuries	125,820	77.9%	2,375	87.3%	23,720	58.8%	149,540	74.0%
<b>TOTAL</b>	<b>161,616</b>	<b>100.0%</b>	<b>2,720</b>	<b>100.0%</b>	<b>40,365</b>	<b>100.0%</b>	<b>201,981</b>	<b>100.0%</b>

\*Excludes cases where injury severity was not stated or where restraint use was unknown.

\*\*Included with Restraints Used Category.

### A. Restraint Usage by Sex and Age

In 1988 collisions, 85.5% of the female drivers used their restraints, while 80.3% of the male drivers used theirs. Female passengers used restraints at a rate of 78.5% compared to 70.9% for male passengers. The 0-5 age group had the highest restraint usage of any age group at 86.6%. The age group with the lowest usage rate was the 6-15 year olds at 74.2% (Table 4-3 and 4-4).

Examination of restraint usage by occupant age for 1988 reveals that the one-year-old and younger age group had the highest usage rate at 91.1%. The lowest rate of restraint usage (66.9%) was for 14-year-old occupants. Teenage occupants recorded the lowest usage rate of any group with 75.3% (Table 4-5).

Table 4-3

USAGE RATES BY SEX* Five-Year Comparison					
Occupant	Percent Used Restraints				
	1988	1987	1986	1985	1984
Male Driver	80.3	77.8	54.0	34.3	27.3
Female Driver	85.5	83.3	59.6	38.8	31.4
Male Passenger	70.9	69.0	46.7	29.4	26.4
Female Passenger	78.5	75.9	55.0	36.0	28.4

\*Excludes occupants where restraint use was unknown

Table 4-4

USAGE RATES BY AGE*					
Five-Year Comparison					
Occupant	Percent Used Restraints				
	1988	1987	1986	1985	1984
Age 0-5	86.6	85.6	81.0	73.1	66.8
Age 6-15	74.2	72.5	51.5	31.3	24.9
Age 16-19	74.5	71.6	44.2	25.4	19.6
Age 20-24	75.8	72.7	47.5	28.5	22.0
Age 25-34	79.5	77.4	55.3	36.6	29.5
Age 35-64	85.0	82.9	60.6	39.7	32.0
Age 65 & Up	84.5	82.6	58.2	34.7	27.6

\*Excludes occupants where restraint use was unknown

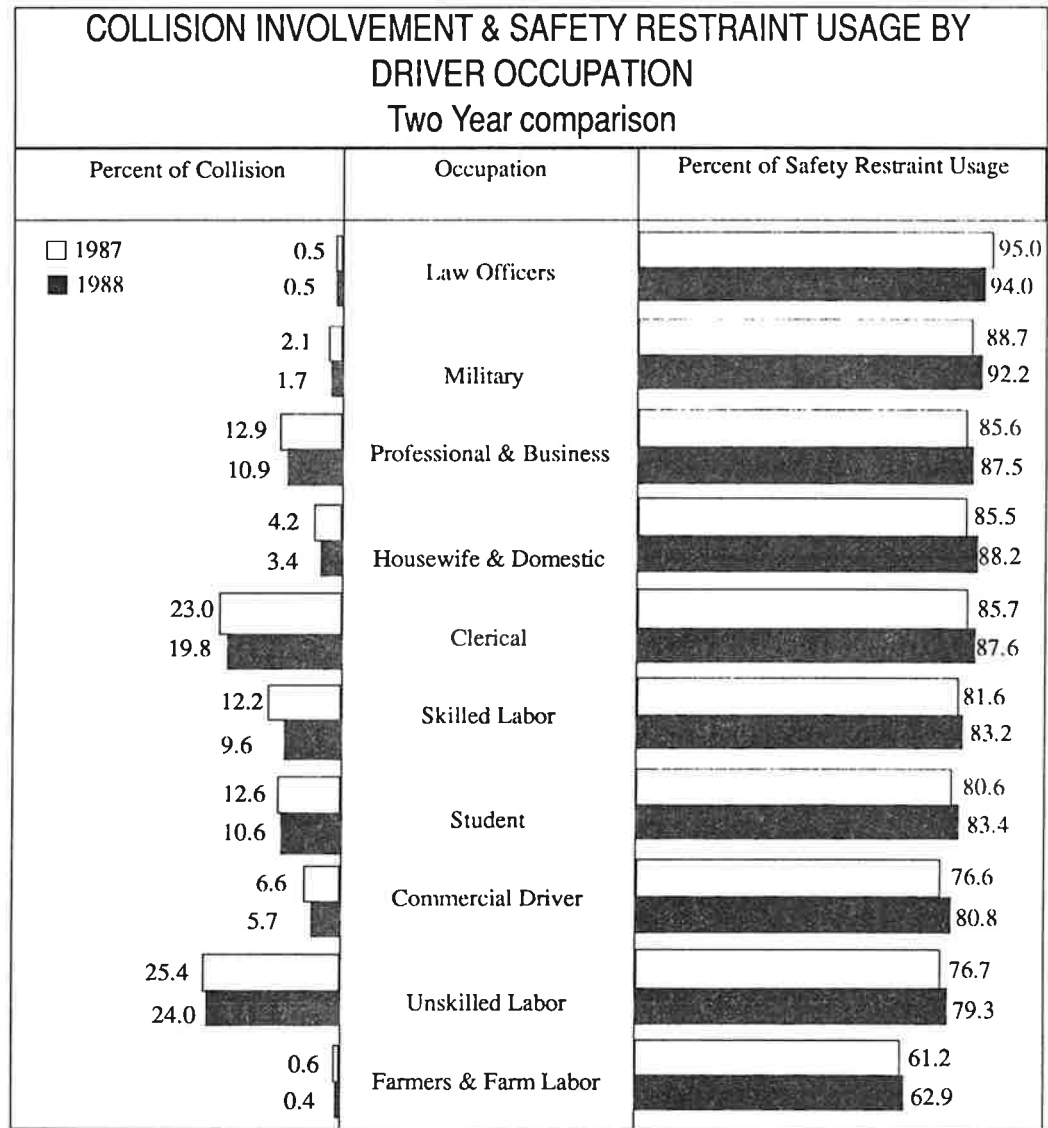
Table 4-5

RESTRAINT USAGE By Occupant Age									
Age	Seat Belt Type					Total Restraints Used		Restraints Not Used	
	Lap Belt	Shoulder Belt	Lap & Shoulder Belt	Child Restraint	Air Bag Activated	Number	% of Total	Number	% of Total
Under 1	29	2	79	454	2	566	89.4%	67	10.6%
1	106	12	131	774	0	1,023	91.1%	100	8.9%
2	331	19	270	609	0	1,229	85.8%	204	14.2%
3	448	25	331	320	0	1,124	86.3%	178	13.7%
4	513	20	375	134	0	1,042	82.9%	215	17.1%
5	556	28	408	53	0	1,045	85.4%	178	14.6%
6	478	18	386	19	1	902	80.6%	217	19.4%
7	428	21	356	--	0	805	79.4%	209	20.6%
8	401	18	316	--	0	735	79.2%	193	20.8%
9	365	17	318	--	0	700	78.9%	187	21.1%
10	339	13	318	--	0	670	77.8%	191	22.2%
11	290	11	344	--	0	645	77.2%	190	22.8%
12	275	18	341	--	0	634	74.9%	212	25.1%
13	284	9	377	--	0	670	72.9%	249	27.1%
14	366	15	510	--	0	891	66.9%	441	33.1%
15	617	46	1,045	--	0	1,708	68.3%	795	31.7%
16	1,259	190	3,504	--	0	4,953	75.2%	1,636	24.8%
17	1,565	268	4,799	--	1	6,633	75.0%	2,211	25.0%
18	1,622	259	4,940	--	0	6,821	73.8%	2,425	26.2%
19	1,251	231	4,547	--	0	6,029	74.1%	2,106	25.9%
20	1,099	167	4,052	--	1	5,319	75.4%	1,731	24.6%
21 - 24	3,294	650	13,969	--	1	17,914	75.8%	5,719	24.2%
25 - 29	3,566	646	15,546	--	2	19,760	78.5%	5,419	21.5%
30 - 64	11,083	2,211	51,033	--	11	64,338	83.7%	12,529	16.3%
65 & Over	1,802	421	8,563	--	1	10,787	86.9%	1,626	13.1%
Age Unknown	657	114	2,044	245	0	3,060	77.4%	896	22.6%
TOTAL	33,024	5,449	118,902	2,608	20	160,003	80.0%	40,122	20.0%

## B. Restraint Usage by Driver Occupation

The usage rate of safety restraints by occupation of driver ranges from a high of 94.3% for law officers to a low of 62.9% for farmers and farm laborers. Usage rates for all occupations with the exception of law officers showed modest increases for 1988 (Figure 4-1).

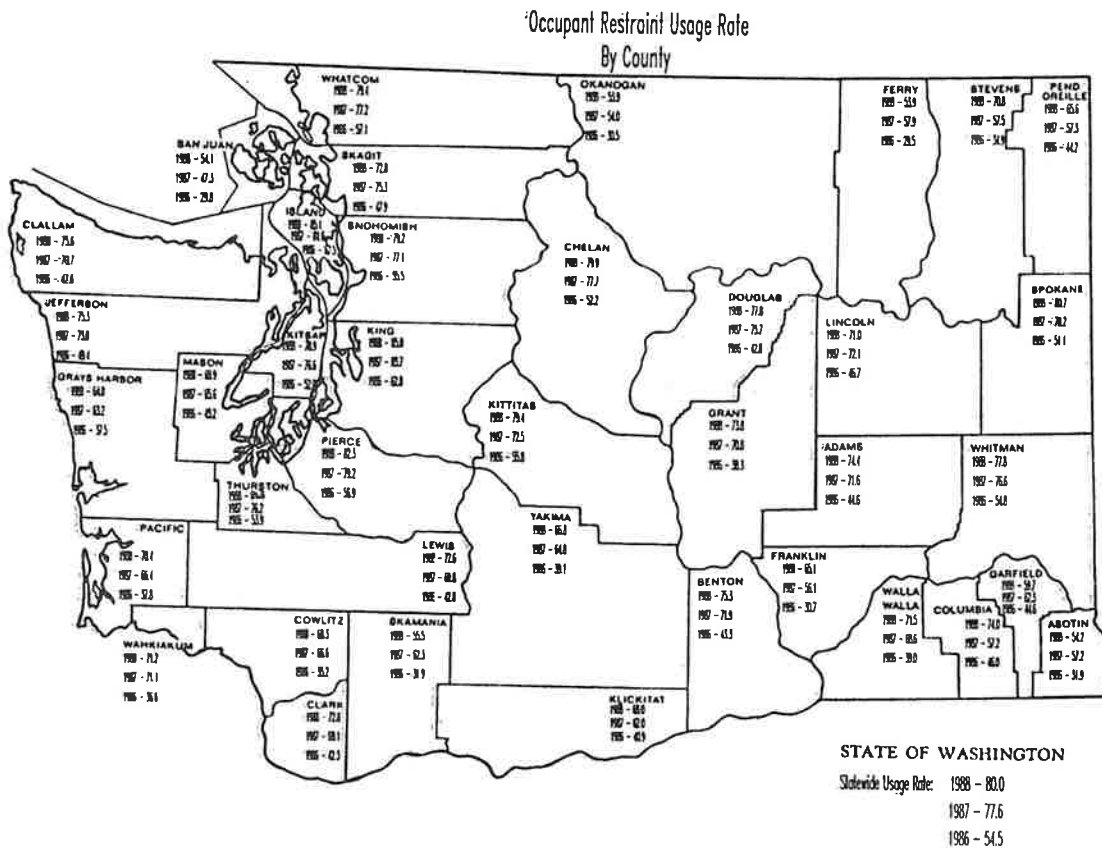
Figure 4-1



**C. Restraint Use by County**

A graphic depiction of restraint use by county is presented in Figure 4-2. Island County, at 85.1%, had the highest usage rate of all counties in the state in 1988. King County had the next highest usage rate at 85.0%. The two counties with the lowest usage rate was Ferry County and Okanogan County, each recording a usage rate of 53.9%: both down from the previous year.

Figure 4-2



**E. Restraint Use by Road and Vehicle Type**

Freeway travel (interstates) and other controlled access routes had the highest usage rate by vehicle occupants at 86.5%. Occupants of vehicles traveling on all other roadways, which include forest service roads and recreational roads that are open to the public, recorded the lowest usage rate at 64.7%. (Table 4-6).

Table 4-6

RESTRAINT USAGE By Functional Class of Roadway					
Functional Class	1988	1987	1986	1985	1984
Interstate & limited	86.5%	84.6%	66.8%	49.6%	41.0%
Other state routes	79.8%	82.0%	56.0%	34.9%	28.9%
County Roads	75.0%	72.5%	50.5%	31.6%	24.3%
City Streets	80.7%	77.9%	52.6%	32.1%	26.4%
All others	64.0%	63.6%	41.8%	29.7%	24.8%

Examination of safety-restraint usage by vehicle type reveals modest increases in usage rates for all types of vehicles. Passenger cars recorded the highest usage rate at 81.6%. The classification of all other vehicles recorded the lowest rate at 68.3% (Table 4-7).

Table 4-7

RESTRAINT USAGE RATE BY TYPE OF VEHICLE DRIVERS Five-Year Comparison					
Type of Vehicle	1988	1987	1986	1985	1984
Passenger car	81.6%	78.9%	56.6%	36.8%	29.8%
Light Trucks	76.2%	73.1%	48.8%	29.8%	22.2%
Heavy Trucks	71.7%	67.7%	49.9%	27.3%	20.1%
All others	68.3%	69.5%	52.9%	34.6%	30.9%

government (federal agency) registered vehicles" involved in collisions. This is up 7.8% from the preceding year. The next highest usage rate was the 87.8% reported for "state government registered vehicles." Occupants of county registered vehicles had the lowest usage rate of occupants in all government owned vehicles at 75.8%, down from the 78.2% rate of the previous year (Table 4-8).

Table 4-8

RESTRAINT USAGE RATE BY TYPE OF GOVERNMENT VEHICLE Five-Year Comparison					
Type of Government Vehicle	1988	1987	1986	1985	1984
State registered vehicles	87.8%	93.8%	76.3%	77.4%	68.3%
County registered vehicles	75.8%	78.2%	63.8%	49.5%	43.6%
Municipal registered vehicles	79.4%	85.9%	66.3%	49.9%	41.4%
Other government registered vehicles	93.8%	87.6%	84.1%	68.3%	58.6%

### E. Usage Rate by Proximity

Drivers residing within 15 miles of the collision scene recorded the lowest safety-restraint usage rate at 81.9%. Instate drivers residing over 15 miles of the collision scene recorded the highest usage rate of 84.0%. All categories continued to record increases in restraint usage over previous years (Table 4-9).

Table 4-9

RESTRAINT USAGE RATE BY PROXIMITY OF DRIVER RESIDENCE Five-Year Comparison					
Residence Proximity	1988	1987	1986	1985	1984
Resided within 15 miles of collision	81.9%	79.7%	55.5%	35.3%	28.2%
Resided over 15 miles	84.0%	80.4%	58.1%	38.9%	31.1%
Residing in other state	83.4%	79.1%	60.0%	41.3%	35.1%

### F. Restraint Use by Seat Position

An examination of restraint usage by seat position reveals that drivers were the most frequent users at 82.1%. Occupants in the right front position were the next most frequent restraint users at 78.0%. Occupants riding in the mid-front used restraints the least at 54.8% (Table 4-10).

Table 4-10

RESTRAINT USAGE RATE BY OCCUPANT SEAT POSITION Five-Year Comparison					
Occupants	1988	1987	1986	1985	1984
Driver	82.1%	79.7%	55.9%	35.8%	28.6%
Mid-front	54.8%	51.8%	34.0%	21.2%	17.1%
Right-front	78.0%	74.9%	51.9%	31.9%	24.6%
Left-back	77.7%	74.9%	58.1%	42.6%	36.5%
Mid-back	66.7%	62.4%	44.4%	33.3%	25.7%
Right-back	77.8%	74.1%	58.0%	40.8%	34.6%
Other	29.0%	28.8%	21.5%	20.3%	13.0%
TOTAL	80.1%	77.6%	54.5%	35.1%	27.9%

Table 4-11 presents 1988 restraint usage by occupant age and seat position. Children aged 0-4 sitting in the right-back and left-back seats recorded the highest usage rate at 92.9% and 92.8% respectively. The 5-9 age group also used safety-restraints most frequently in the right-back (87.0%) and left-back (86.9%) seat positions. The seat position with the lowest reported usage rate for most age groups was the mid-front seat. The other seat position showing the second least restraint usage was the mid-back. The driver continued to "buckle up" more than any other occupant for those aged 15 through 64. The right-front occupant was the most frequent restraint user at 88.4% in the 65 and over age group.

Table 4-11

RESTRAINT USAGE RATE By Occupant Age & Seat Position								
Seat Position	Age							
	0-4	5-9	10-14	15-20	21-24	25-29	30-64	65 & Over
Driver	-	-	-	78.2%	78.5%	80.0%	84.7%	86.9%
Mid-front	77.1%	69.4%	55.5%	39.4%	39.4%	44.8%	55.5%	65.7%
Right-front	84.1%	85.2%	70.6%	72.4%	71.6%	75.7%	81.7%	88.4%
Left-back	92.8%	86.9%	76.1%	65.5%	58.1%	65.5%	73.1%	79.9%
Mid-back	88.8%	77.1%	67.6%	43.0%	34.7%	48.9%	50.3%	62.8%
Right-back	92.9%	87.0%	79.0%	67.4%	63.6%	64.1%	72.9%	84.5%
Other	49.0%	33.2%	31.5%	19.2%	15.2%	18.4%	28.1%	54.5%
Seat location unknown	60.0%	53.3%	56.6%	41.5%	40.4%	54.4%	47.5%	66.7%

### F. Restraint Use by Severity of Collision

A more detailed breakdown of types of restraints used by injury severity is presented for 1988 in Table 4-12. Of 557 occupants killed in vehicle collisions, 405 (72.7%) were not using restraints. Of the 5,564 persons sustaining disabling



injuries by collisions, 51.5% were using no restraints. No injuries were reported in investigated collisions for 62.2% of the occupants who were restrained with the combination lap/shoulder belts, an increase from the 57.9% reported for 1987 and 38.6% reported for 1986.

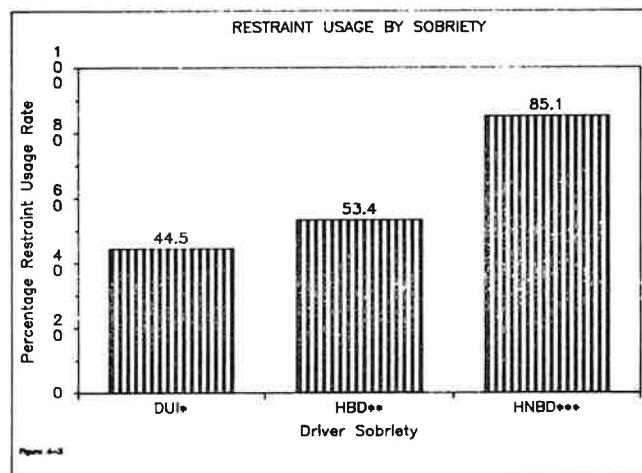
Table 4-12

TYPES OF RESTRAINTS USED By Severity of Injury												
Type	Number Used		Deaths		Disabling Inj		Evident Inj		Possible Inj		No Injury	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Lap Belt	33,241	16.5%	34	6.1%	570	10.2%	2,747	14.3%	3,826	14.1%	26,064	17.4%
Shoulder Belt	5,477	2.7%	5	0.9%	96	1.7%	383	2.0%	588	2.2%	4,405	2.9%
Lap & Shoulder Belt	120,158	59.5%	109	19.6%	2,009	36.1%	8,350	43.4%	16,727	61.8%	92,963	62.2%
Child Restraint	2,720	1.3%	4	0.7%	22	0.4%	147	0.8%	172	0.6%	2,375	1.6%
Air Bag (Activated)*	20	0.0%	0	0.0%	1	0.0%	3	0.0%	3	0.0%	13	0.0%
No Restraints	40,365	20.0%	405	72.7%	2,866	51.5%	7,608	39.5%	5,766	21.3%	23,720	15.9%
<b>TOTAL OCCUPANTS</b>	<b>201,981</b>	<b>100.0%</b>	<b>557</b>	<b>100.0%</b>	<b>5,564</b>	<b>100.0%</b>	<b>19,238</b>	<b>100.0%</b>	<b>27,082</b>	<b>100.0%</b>	<b>149,540</b>	<b>100.0%</b>

\*Less than 1/10 of 1 percent  
 \*\*There were 73 cases where the injury was not stated.

Of all collision-involved drivers in 1988, those who had been drinking displayed a greater tendency not to use restraints than those drivers who had not been drinking. The latter category revealed a restraint-usage rate of 85.1% compared to a usage rate of 44.5% for drivers under the influence and 53.4% for drivers who had been drinking but were not under the influence (Figure 4-3).

Figure 4-3



### IV. Motorcycle Collisions

Motorcycle fatal collisions decreased 10.0% in 1988, when compared to the previous four-year baseline average and 18.2% from the previous year. Total reported collisions decreased at even a greater rate, recording a 21.1% decrease from the baseline average. Injury collisions decreased 19.7% from the baseline average. 1988 registration totaled 117,155 motorcycles, a decrease of 6.1% from the baseline period. The motorcycle collision rate of 2.37 for 1988 was down

16.0% from the baseline rate of 2.82 motorcycle collisions per every 100 registered (Table 5-1).

Table 5-1

MOTORCYCLE COLLISIONS SUMMARY Five-Year Comparison							
Collision Severity/Exposure & Rates	Year					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
Total Collisions	2,773	3,379	3,508	3,699	3,477	3,516	-21.13%
Fatal Collisions	72	88	80	82	69	80	-9.72%
Injury Collisions	2,393	2,816	3,003	3,139	2,965	2,981	-19.72%
Motorcycle Registration	117,155	124,215	122,751	125,224	126,703	124,723	-6.07%
Fatal Collision Ratio*	26.0	26.0	22.8	22.2	19.8	22.7	14.30%
Fatal Registration Rate**	0.615	0.708	0.652	0.655	0.545	0.640	-3.96%
Total Collision Registration Rate***	2.37	2.72	2.86	2.95	2.74	2.82	-16.04%

\* Fatal Collisions per 1,000 motorcycle collisions  
 \*\* Fatal Collisions per 1,000 motorcycles registered  
 \*\*\* Motorcycle involved per 100 registered

### A. Motorcycle Collisions By Age Group

The 16- to 29-year-old motorcycle rider continues to be over-represented in the accident population compared to the percentage of licensed motorcycle drivers comprising that age group. The 16-18 year olds were involved in 10.6% of the total collisions, but comprise less than 1% of the motorcycle-endorsed drivers. The 25- to 29-year-old motorcycle riders were involved in the largest percentage of fatal, injury, and total reported collisions (22.2%, 16.6%, and 16.8% respectively). However, they made up 14.7% of the licensed operators with motorcycle endorsements. From age 30 on up, motorcycle riders are under-represented (Table 5-2).

Table 5-2

MOTORCYCLE DRIVERS Comparison of Collisions to Licensed Drivers								
Age	Fatal Collisions		Injury Collisions		Total Collisions		% of Endorsed Drivers	Over/Under Ratio in Total Collisions
	Number	%	Number	%	Number	%		
Under 16	0	0.0%	51	2.2%	55	2.1%	0.00	---
16	1	1.4%	31	1.3%	37	1.4%	0.04	35.14
17-18	9	12.5%	218	9.3%	243	9.2%	0.55	16.79
19-20	7	9.7%	354	15.1%	400	15.2%	1.77	8.59
21-22	2	2.8%	282	12.0%	303	11.5%	2.83	4.07
23-24	6	8.3%	219	9.3%	250	9.5%	3.87	2.45
25-29	16	22.2%	390	16.6%	441	16.8%	14.68	1.14
30-34	11	15.3%	268	11.4%	307	11.7%	20.69	0.56
35-39	6	8.3%	223	9.5%	241	9.2%	18.80	0.49
40-44	8	11.1%	152	6.5%	174	6.6%	13.44	0.49
45-54	4	5.6%	100	4.3%	115	4.4%	13.57	0.32
55-64	2	2.8%	44	1.9%	48	1.8%	6.55	0.28
65 & over	0	0.0%	18	0.8%	18	0.7%	3.20	0.21

### B. Motorcycle Collisions By Location

Table 5-3 displays a breakdown of motorcycle collision data totals for urban and rural areas as well as statewide for 1988 and 1987. In 1988, rural areas again led urban areas in the total number of fatal collisions, 47 to 25, while urban areas led rural areas in total number of injury collisions, 1,247 to 1,146.

Table 5-3

MOTORCYCLE COLLISIONS BY LOCATION Two-Year Comparison						
Severity of Collision	1988			1987		
	Urban	Rural	Statewide	Urban	Rural	Statewide
Total Collisions	1,468	1,305	2,773	1,845	1,534	3,379
Fatal Collisions	25	47	72	27	61	88
Injury Collisions	1,247	1,146	2,393	1,486	1,330	2,816
Property-damage-only Collisions	196	112	308	332	143	475
Total Fatalities	28	49	77	27	63	90
All Persons Injured	1,481	1,415	2,896	1,821	1,676	3,497
Motorcyclists Killed	28	49	77	27	63	90
Motorcyclists Injured	1,396	1,341	2,737	1,702	1,586	3,288

A further breakdown of 1988 motorcycle collisions by road type indicates that 49.7% of the total collisions, 48.7% of the injury collisions, and 27.8% of the fatal collisions occurred on city streets. County roads accounted for 36.1% of the fatal collisions, 29.8% of the injury collisions, and 29.1% of the total collisions. All state routes (interstates, U.S. and state routes, and numbered roads) recorded 31.9% of the fatal, 20.3% of the injury and 19.9% of the total reported motorcycle collisions (Table 5-4).

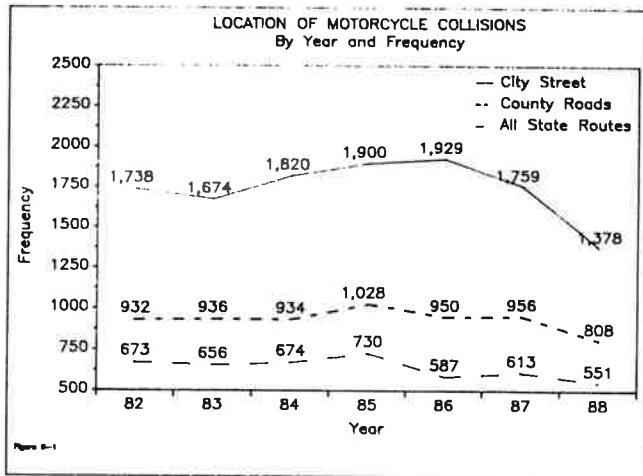
Table 5-4

MOTORCYCLE COLLISIONS By Location						
Location	Collisions				Persons	
	Total	Fatal	Injury	P.D. Only*	Killed	Injured
Interstate System	171	5	149	17	5	178
Other Full Control	43	1	37	5	1	42
U.S. Route No.**	69	5	59	5	5	78
State Route No.**	268	12	241	15	14	317
County Roads	808	26	713	69	26	860
City Streets***	1,378	20	1,165	193	23	1,386
Other Traffic Ways	36	3	29	4	3	35
<b>Total</b>	<b>2,773</b>	<b>72</b>	<b>2,393</b>	<b>308</b>	<b>77</b>	<b>2,896</b>

\* Property Damage Only  
 \*\* Excluding city streets  
 \*\*\* Including U.S. and State Routes in Cities

Total frequency of motorcycle collisions occurring on city streets, county roads, and all state routes decreased during 1988. This continues a three-year trend. Motorcycle collisions occurring on state routes continued a downward trend, with a seven-year low of 551 collisions in 1988. County roads also recorded a seven-year low after a slight increase in 1985 and 1987 (Figure 5-1).

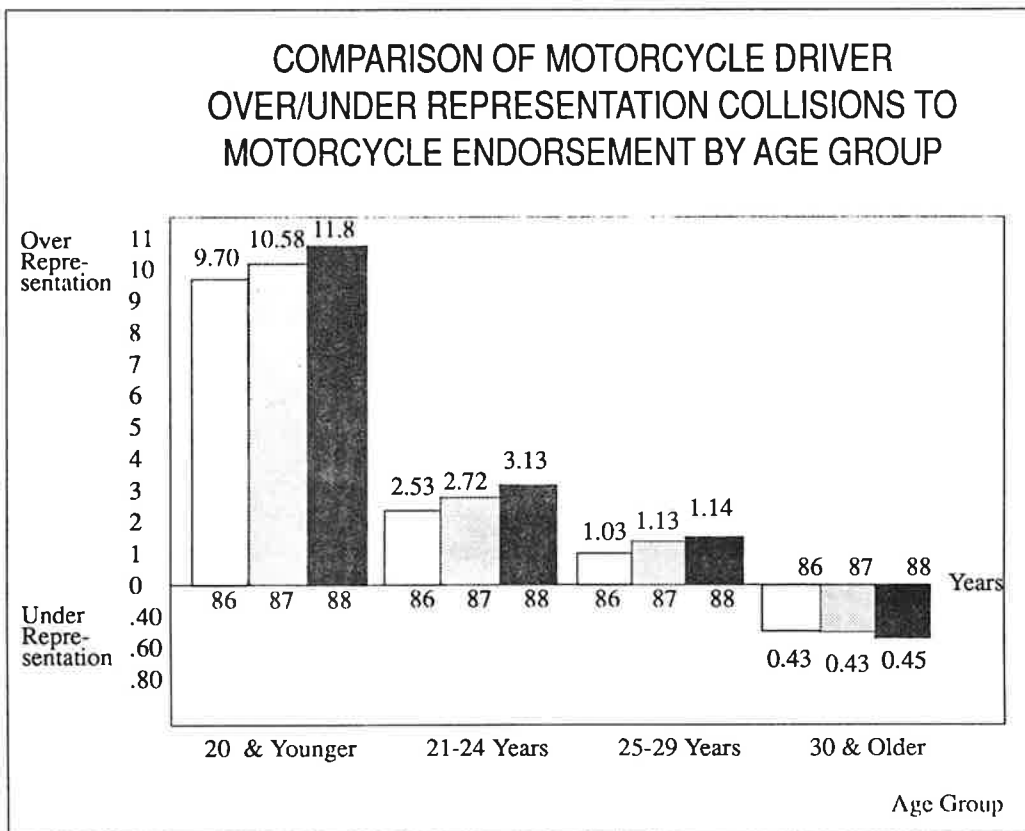
Figure 5-1



**C. Principal Violations in Collisions By Age Groups**

Figure 5-2 shows that motorcycle riders under 29 years of age, and particularly those 20 years old and younger, are over-represented in total motorcycle collision involvement when compared to the percentages of licensed motorcycle riders comprising these age groups. The 30 year old and over age group continue to be under-represented.

Figure 5-2



Speed too fast for conditions caused most of the motorcycle collisions for all age groups contributing to 28.9% of the year's motorcycle violations and was the prominent driver violation in all age groups. Driving while intoxicated was the second most prominent violation, contributing 14.1% to total motorcycle driver violations. Motorcyclists driving over the speed limit was the third leading violation, contributing to 12.2% of the violation total (Table 5-5).

Table 5-5

MOTORCYCLIST VIOLATIONS BY AGE Investigated Collisions Only										
Violation	Violations		Age of Violator							Number Not Stated
	Total	%	20 & Under	21-24	25-29	30-34	35-44	45-54	55 & Over	
Speed - Conditions	595	28.9%	194	131	92	58	70	15	14	21
Speed - Over Legal	252	12.2%	77	57	39	35	30	8	0	6
Failed to Yield	121	5.9%	43	22	19	7	8	3	4	15
D.W.I.	291	14.1%	41	57	70	58	48	8	4	5
Following Too Closely	126	6.1%	44	27	16	11	12	7	4	5
Improper Passing	134	6.5%	41	26	25	17	13	3	3	6
Operating Defective Equipment	96	4.7%	27	22	15	4	16	6	3	3
Disregard Signs/Signals	85	4.1%	23	19	15	11	10	1	1	5
Over Centerline	57	2.8%	16	12	9	5	10	1	1	3
Other Violations	305	14.8%	83	61	48	32	46	9	6	20
<b>Total</b>	<b>2,062</b>	<b>100.0%</b>	<b>589</b>	<b>434</b>	<b>348</b>	<b>238</b>	<b>263</b>	<b>61</b>	<b>40</b>	<b>89</b>

### D. Motorcycle Collisions By First Harmful Event

The most common first harmful event causing collisions involving a single motorcycle was overturning. This cause predominated for all age groups. In multiple vehicle collisions involving motorcycles, the rear-end collision was most prevalent (15.1%). Angular collisions constituted the next most common event (13.9%) in multiple vehicle motorcycle collisions. Collisions occurring while entering or leaving a driveway contributed to 12.6% of all motorcycle collisions. (Table 5-6).

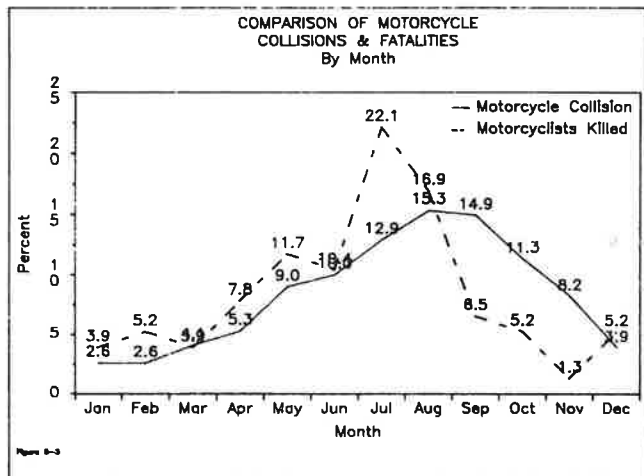
Table 5-6

MOTORCYCLISTS INVOLVED IN TRAFFIC COLLISIONS By First Harmful Event										
Type of Collision	Collisions		Age of Motorcyclist							
	Total	%	20 & Under	21-24	25-29	30-34	35-44	45-54	55 & Over	
<b>Single Motorcycle Collision</b>										
Struck Fixed Object	326	12.4%	82	65	66	42	59	6	6	6
Struck Other Object	21	0.8%	5	8	2	3	3	0	0	0
Overturned	636	24.2%	174	129	95	69	114	34	21	21
Motorcycle-Pedestrian	14	0.5%	4	4	2	0	1	2	1	1
Motorcycle-R.R. Train	0	0.0%	0	0	0	0	0	0	0	0
Motorcycle-Pedalcyclist	10	0.4%	2	4	1	1	1	1	0	0
Motorcycle-Animal	54	2.1%	14	9	8	2	12	6	3	3
Non-Collision	17	0.6%	6	4	3	2	1	1	0	0
<b>Total Single Motorcycle Collisions</b>	<b>1,078</b>	<b>41.0%</b>	<b>287</b>	<b>223</b>	<b>177</b>	<b>119</b>	<b>191</b>	<b>50</b>	<b>31</b>	
<b>Multiple Vehicle Collision</b>										
Head-on	35	1.3%	12	5	7	3	7	1	0	0
Rear-end	398	15.1%	120	77	63	53	54	22	9	9
Sideswipe	139	5.3%	34	28	23	18	22	8	6	6
Angular Direction	366	13.9%	100	73	78	37	50	19	9	9
Enter/Leave Driveway	332	12.6%	103	72	54	40	50	8	5	5
One Left/One Straight-Opp. Dir.	189	7.2%	47	53	27	25	27	6	4	4
Other Multiple Vehicle Collision	95	3.6%	32	22	12	12	14	1	2	2
<b>Total Multiple Vehicle Collisions</b>	<b>1,554</b>	<b>59.0%</b>	<b>448</b>	<b>330</b>	<b>264</b>	<b>188</b>	<b>224</b>	<b>65</b>	<b>35</b>	
<b>TOTAL MOTORCYCLE COLLISIONS</b>	<b>2,632</b>	<b>100.0%</b>	<b>735</b>	<b>553</b>	<b>441</b>	<b>307</b>	<b>415</b>	<b>115</b>	<b>66</b>	

**E. Time of Motorcycle Collision Occurrence**

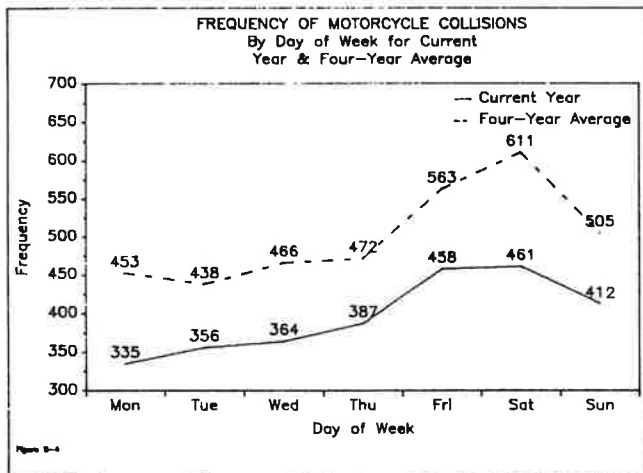
As one would expect, the milder weather months (June-October) of 1988 recorded the greatest percentage of motorcycle collisions. The highest frequency of fatalities occurred May through August (Figure 5-3).

Figure 5-3



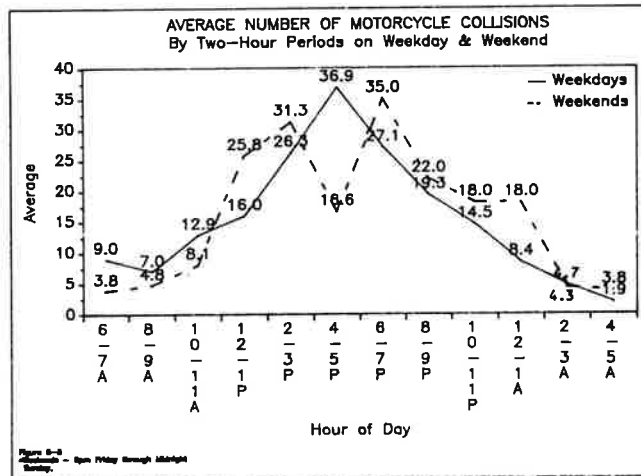
Friday and Saturday experience the greatest numbers of motorcycle collisions compared to other days of the week. This trend has been consistent throughout the four-year baseline period and continued in 1988 as well (Figure 5-4).

Figure 5-4



A further breakdown of motorcycle collisions by hour of day in 1988 reveals that the weekday hours from 2 p.m. to 8 p.m. constituted the most dangerous period of the day. The noon to 10 p.m. time frame proved to be the highest risk period for weekend motorcycling (Figure 5-5).

Figure 5-5



### V. Pedalcycles

Total pedalcycle accidents decreased 3.4% from the previous four-year average in 1988. The number of pedalcyclists killed decreased from 18 deaths in 1987 to 12 in 1988 and was also down 9.4% from the baseline period. In addition, fewer persons received injuries than the previous year and from the previous four-year average (Table 6-1).

Table 6-1

PEDALCYCLE TRAFFIC COLLISIONS Five-Year Comparison							
Severity	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
Total Collisions	1,348	1,575	1,507	1,325	1,174	1,395	-3.39%
Persons Killed	12	18	12	12	11	13	-9.43%
Persons Injured	1,375	1,584	1,538	1,354	1,204	1,420	-3.17%

#### A. Pedalcyclists Killed - By Age

In 1988, 41.7% of the pedalcyclists killed were in the 5-9 age bracket. This increased by two from the previous four-year average and by one from the previous year (Table 6-2).

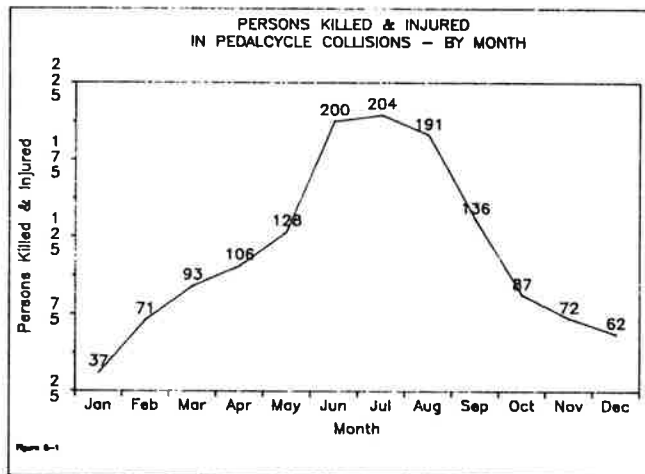
Table 6-2

PEDALCYCLISTS KILLED BY AGE Five-Year Comparison							
Age	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
0-4	0	0	2	0	0	1	-100.00%
5-9	5	4	2	3	1	3	100.00%
10-14	2	3	3	2	2	3	-20.00%
15-19	0	2	1	2	1	2	-100.00%
20-24	0	2	1	0	0	1	-100.00%
25-34	2	3	3	1	0	2	14.29%
35-44	2	1	0	1	3	1	60.00%
45-54	0	2	0	2	0	1	-100.00%
55-64	0	1	0	1	1	1	-100.00%
65-74	1	0	0	0	2	1	100.00%
75 & Older	0	0	0	0	1	0	-100.00%
Not Stated	0	0	0	0	0	0	---
TOTAL	12	18	12	12	11	13	-9.43%

**B. Persons Killed and Injured in Pedalcycle Collisions**

The months of May through September accounted for 61.9% of the persons killed and injured in pedalcycle-related collisions for 1988. (Figure 6-1).

Figure 6-1



The city of Walla Walla experienced the highest pedalcycle collision rate in the state during 1988 with 98.27 collisions per 100,000 population. Bellingham recorded the second highest collision rate in the state with 77.24 collisions per 100,000 population, followed by Olympia with 75.98 and Longview with 71.04 pedalcycle collisions per 100,000 population (Table 6-3).



Table 6-3

PEDALCYCLE COLLISION RATE BY POPULATION Cities 15,000 Population & Greater							
City	1988 Population	Pedalcycle Deaths		Pedalcycle Injuries		Total Ped Collision	
		Number	Rate*	Number	Rate*	Number	Rate*
250,000 and Over							
1. Seattle	495,900	1	0.20	215	43.36	220	44.36
100,000 to 250,000							
1. Spokane	170,200	0	0.00	100	58.75	96	56.40
2. Tacoma	161,400	0	0.00	85	52.66	82	50.81
50,000 to 100,000							
1. Bellevue	85,180	0	0.00	33	38.74	32	37.57
2. Everett	60,920	0	0.00	33	54.17	32	52.53
25,000 to 50,000							
1. Yakima	49,470	0	0.00	14	28.30	14	28.30
2. Bellingham	46,610	0	0.00	36	77.24	36	77.24
3. Vancouver	43,290	2	4.62	26	60.06	25	57.75
4. Kennewick	37,180	0	0.00	11	29.59	11	29.59
5. Bremerton	37,050	0	0.00	17	45.88	17	45.88
6. Renton	36,940	0	0.00	7	18.95	7	18.95
7. Kirkland	35,820	0	0.00	9	25.13	8	11.17
8. Kent	32,350	0	0.00	17	52.55	14	43.28
9. Redmond	31,710	0	0.00	15	47.30	15	47.30
10. Auburn	30,790	0	0.00	16	51.96	16	51.96
11. Olympia	30,270	0	0.00	22	72.68	23	75.98
12. Richland	30,140	0	0.00	3	9.95	3	9.95
13. Longview	29,560	1	3.38	20	67.66	21	71.04
14. Edmonds	28,500	0	0.00	9	31.58	9	31.58
15. Walla Walla	25,440	1	3.93	26	102.20	25	98.27
15,000 to 25,000							
1. Pullman	23,579	0	0.00	7	29.69	7	33.93
2. Lynnwood	22,641	0	0.00	10	44.17	10	22.08
3. Puyallup	20,840	0	0.00	13	62.38	10	33.59
4. Mercer Island	20,690	0	0.00	5	24.17	5	48.33
5. Wenatchee	18,860	0	0.00	7	37.12	7	21.21
6. Pasco	18,430	0	0.00	4	21.70	4	48.83
7. Port Angeles	17,350	1	5.76	8	46.11	9	34.58
8. Aberdeen	17,130	0	0.00	4	23.35	4	46.70
9. Lacey	16,380	0	0.00	8	48.84	8	48.84
10. Mountlake Terrace	16,290	0	0.00	6	36.83	6	36.83

\*Frequency per 100,000 population

### C. Rural - Urban Pedalcycle Collisions

Total pedalcycle collisions in 1988 were down in both rural and urban areas of the state. They recorded a 7.3% decrease in the rural areas and a 1.4% decrease in urban areas compared to the four-year baseline. Six persons were killed in rural areas in 1988, down four from the baseline. Six persons also died in urban pedalcycle collisions, an increase of two from the four-year average. Rural injuries from pedalcycle collisions were down 7.5% in 1988 from the baseline, and urban injuries decreased only 1% (Table 6-4).

In 1988, 67.4% of the pedalcycle collisions occurred in urban areas, continuing a slight downward trend from 1982's high of 69.6%. Rural areas experienced a one-year decrease in 1988 and continued a slight upward trend starting in 1982 (Figure 6-2).

### D. Pedalcyclists Injured - By Age

The 10-14 age group received 16.7% of the injuries, as did the 25-34 and 35-44 age groups. Pedalcyclists between the ages of 5 to 19 made up 61.6% of the total

injured, down from the 66.6% for this age group injured in the previous baseline period (Table 6-5).

Table 6-4

RURAL & URBAN PEDALCYCLE COLLISIONS Five-Year Comparison							
Severity by Areas	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
<b>Rural Areas</b>							
Total Collisions	439	550	491	463	391	474	-7.34%
Persons Killed*	6	15	6	9	8	10	-36.84%
Persons Injured*	450	559	510	472	405	487	-7.50%
<b>Urban Areas</b>							
Total Collisions	909	1,025	1,016	862	783	922	-1.36%
Persons Killed*	6	3	6	3	3	4	60.00%
Persons Injured*	925	1,025	1,028	882	799	934	-0.91%

\* In pedalcycle collisions by first harmful event.

Figure 6-2

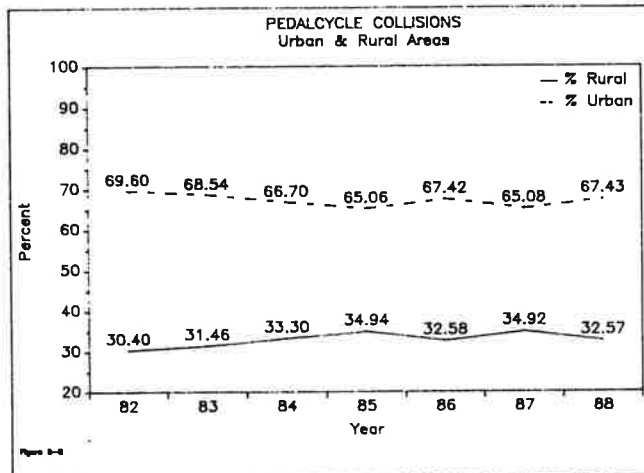


Table 6-5

PEDALCYCLISTS INJURED* BY AGE Five-Year Comparison							
Age	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
0-4	23	23	18	31	19	23	1.10%
5-9	210	284	266	251	171	243	-13.58%
10-14	366	444	443	403	359	412	-11.22%
15-19	253	302	296	241	240	270	-6.21%
20-24	155	155	176	155	122	152	1.97%
25-34	156	166	170	143	147	157	-0.32%
35-44	71	63	56	38	35	48	47.92%
45-54	33	20	18	15	17	18	88.57%
55-64	18	13	12	8	8	10	75.61%
65-74	8	17	7	2	11	9	-13.51%
75 & Older	4	2	2	1	2	2	128.57%
Not Stated	49	63	43	37	41	46	6.52%
<b>TOTAL</b>	<b>1,346</b>	<b>1,552</b>	<b>1,507</b>	<b>1,325</b>	<b>1,172</b>	<b>1,389</b>	<b>-3.10%</b>

## VI. Pedestrians

The 97 pedestrians were killed in 1988, an increase of 5.4% over the four-year average. Pedestrian injuries also increased 3.2% above the four-year baseline to 1,820 (Table 7-1).

Table 7-1

PEDESTRIANS KILLED AND INJURED STATEWIDE - URBAN & RURAL Five-Year Comparison							
Severity	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
Pedestrians Killed	97	93	89	89	97	92	5.43%
Pedestrians Injured	1,820	1,830	1,752	1,763	1,710	1,764	3.19%

### A. Pedestrians Killed And Injured - By Age

In 1988, four more pedestrians were killed than the 93 killed in 1987 and 5 more died than the four-year baseline average. The number of pedestrians aged 9 years and younger who were killed increased from 10 in 1987 to 14 in 1988 and increased by two over the previous four-year average. The number of 75 and older pedestrians injured also increased by two over the previous four-year average. The largest percentage of increase for pedestrian injuries during 1988 occurred in the 35-44 and the 0-4 age brackets, the former recording a 25.9% increase and the latter an 18.7% increase in comparison to the baseline average (Tables 7-2 and 7-3).

Table 7-2

PEDESTRIANS KILLED BY AGE Five-Year Comparison							
Age	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
0-4	10	5	2	3	8	5	122.22%
5-9	4	5	4	11	6	7	-38.46%
10-14	3	6	2	3	8	5	-36.84%
15-19	10	7	10	3	6	7	53.85%
20-24	3	2	7	5	9	6	-47.83%
25-34	15	14	12	11	18	14	9.09%
35-44	12	11	13	9	8	10	17.07%
45-54	7	11	7	7	4	7	-3.45%
55-64	7	11	10	9	11	10	-31.71%
65-74	8	7	8	7	6	7	14.29%
75 & Older	15	14	14	21	13	16	-3.23%
Not Stated	3	0	0	0	0	0	0.00%
TOTAL	97	93	89	89	97	92	5.43%

### B. Pedestrian Collisions By City Population

Table 7-4 presents the 1988 numbers and rates for pedestrian traffic deaths, injuries, and total collisions for cities of 15,000 population or more in Washington. Seattle had the greatest number of fatalities, but Kent had the

highest rate of pedestrian fatalities at 6.18 per 100,000 population based on two pedestrian deaths. Seattle had the greatest number of pedestrian injuries and collisions but had the second highest rate for pedestrian injuries (95.38 per 100,000 population) and pedestrian collisions (94.17 per 100,000). Aberdeen experienced the highest pedestrian injury and collision rate with 99.24 and 105.08 per 100,000 population, respectively.

Table 7-3

PEDESTRIANS INJURED* BY AGE Five-Year Comparison							
Age	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
0-4	97	92	77	83	75	82	18.65%
5-9	234	251	231	203	215	225	4.00%
10-14	197	196	198	195	194	196	0.64%
15-19	190	206	206	208	215	209	-8.98%
20-24	149	166	151	181	167	166	-10.38%
25-34	295	289	290	285	255	280	5.45%
35-44	210	196	176	169	126	167	25.94%
45-54	95	108	111	99	121	110	-13.44%
55-64	96	84	76	90	89	85	13.27%
65-74	74	83	72	92	89	84	-11.90%
75 & Older	91	76	98	82	80	84	8.33%
Not Stated	92	83	66	76	84	77	19.09%
TOTAL	1,820	1,830	1,752	1,763	1,710	1,764	3.19%

\* In all traffic collisions.

### C. Locations and Age Groups Of Pedestrian Collisions

In 1988, pedestrian fatalities in rural areas increased 10.9% from the previous four-year average and injuries were up 8.5%. Pedestrian fatalities in the urban areas remained the same as the baseline, however injuries increased 1.3% (Table 7-5).

### D. Actions Of Pedestrians Killed and Injured

Thirty-six percent of the pedestrians killed or injured in rural areas in the state were struck while crossing the roadway not at an intersection. Another 20.1% were killed or injured while crossing at an intersection. The largest percentage of pedestrians in these groups were in the 5 to 14 year olds (Table 7-6).

### E. Actions Of Pedestrians Killed and Injured

In urban areas, the most frequently involved age group in fatal and injury collisions fell into the 25- to 64-year-old group, which accounted for 38.1% of all pedestrians killed or injured in traffic collisions. The most common contributing action of this age group was "crossing, entering roadway at intersection." Of the 79 pedestrians four years of age or younger, 49 were killed or injured while crossing the roadway between intersections. Nearly one half (48.8%) of the pedestrians age 5-14 were also killed or injured while crossing between intersections (Table 7-7).

Table 7-4

PEDESTRIAN COLLISION RATE BY POPULATION Cities 15,000 Population & Greater							
City	1988 Population	Pedestrian Deaths		Pedestrian Injuries		Total Ped Collision	
		Number	Rate*	Number	Rate*	Number	Rate*
250,000 and Over							
1. Seattle	495,900	16	3.23	473	95.38	467	94.17
100,000 to 250,000							
1. Spokane	170,200	4	2.35	113	66.39	115	67.57
2. Tacoma	161,400	7	4.34	140	86.74	137	84.88
50,000 to 100,000							
1. Bellevue	85,180	0	0.00	24	28.18	24	28.18
2. Everett	60,920	0	0.00	47	77.15	41	67.30
25,000 to 50,000							
1. Yakima	49,470	2	4.04	26	52.56	26	52.56
2. Bellingham	46,610	0	0.00	34	72.95	30	64.36
3. Vancouver	43,290	1	2.31	27	62.37	26	60.06
4. Kennewick	37,180	0	0.00	7	18.83	7	18.83
5. Bremerton	37,050	0	0.00	25	67.48	25	67.48
6. Renton	36,940	0	0.00	14	37.90	12	32.49
7. Kirkland	35,820	0	0.00	8	22.33	7	19.54
8. Kent	32,350	2	6.18	20	61.82	19	58.73
9. Redmond	31,710	0	0.00	10	31.54	9	28.38
10. Auburn	30,790	1	3.25	18	58.46	20	64.96
11. Olympia	30,270	1	3.30	16	52.86	16	52.86
12. Richland	30,140	0	0.00	5	16.59	5	16.59
13. Longview	29,560	0	0.00	16	54.13	15	50.74
14. Edmonds	28,500	0	0.00	11	38.60	11	38.60
15. Walla Walla	25,440	0	0.00	8	31.45	6	23.58
15,000 to 25,000							
1. Pullman	23,579	0	0.00	2	8.48	2	8.48
2. Lynnwood	22,641	0	0.00	14	61.83	13	57.42
3. Puyallup	20,840	1	4.80	13	62.38	13	62.38
4. Mercer Island	20,690	0	0.00	1	4.83	1	4.83
5. Wenatchee	18,860	0	0.00	12	63.63	12	63.63
6. Pasco	18,430	1	5.43	10	54.26	11	59.69
7. Port Angeles	17,350	0	0.00	11	63.40	11	63.40
8. Aberdeen	17,130	1	5.84	17	99.24	18	105.08
9. Lacey	16,380	0	0.00	9	54.95	9	54.95
10. Mountlake Terrace	16,290	0	0.00	3	18.42	3	18.42

\*Frequency per 100,000 population

Table 7-5

RURAL & URBAN PEDESTRIANS KILLED/INJURED Five-Year Comparison							
Severity by Area	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
Rural Areas							
Pedestrians Killed	51	39	49	45	51	46	10.87%
Pedestrians Injured	497	468	432	483	449	458	8.52%
Urban Areas*							
Pedestrians Killed	46	54	40	44	46	46	0.00%
Pedestrians Injured	1,323	1,362	1,320	1,280	1,261	1,306	1.32%

\* 2,500 population and greater

Table 7-6

ACTIONS OF PEDESTRIANS KILLED & INJURED Rural Areas										
Action	Killed		Killed/Injured		Age					Number Not Stated
	Number	%	Number	%	0-4	5-14	15-24	25-64	65+	
Rural:										
Crossing, entering roadway at intersection	6	11.8%	111	20.1%	4	36	22	36	9	4
Not at intersection	19	37.3%	196	35.6%	15	69	32	55	14	11
Walking with traffic	10	19.6%	29	5.3%	0	6	8	12	2	1
Walking against traffic	1	2.0%	12	2.2%	0	1	3	8	0	0
Standing or working in roadway	3	5.9%	45	8.2%	1	2	9	29	2	2
Playing in roadway	0	0.0%	14	2.5%	3	9	2	0	0	0
Lying in roadway	3	5.9%	5	0.9%	0	0	3	2	0	0
Not in roadway	9	17.6%	93	16.9%	5	9	23	48	5	3
Other & Not Stated	0	0.0%	46	8.3%	1	3	9	29	1	3
<b>TOTAL RURAL</b>	<b>51</b>	<b>100.0%</b>	<b>551</b>	<b>100.0%</b>	<b>29</b>	<b>135</b>	<b>111</b>	<b>219</b>	<b>33</b>	<b>24</b>
<b>% of Total Killed or Injured</b>					<b>5.3%</b>	<b>24.5%</b>	<b>20.1%</b>	<b>39.7%</b>	<b>6.0%</b>	<b>4.4%</b>

Table 7-7

ACTIONS OF PEDESTRIANS KILLED & INJURED Urban Areas										
Action	Killed		Killed/Injured		Age					Number Not Stated
	Number	%	Number	%	0-4	5-14	15-24	25-64	65+	
Urban:										
Crossing, entering roadway at intersection	18	39.1%	690	50.1%	17	117	119	301	106	30
Not at intersection	20	43.5%	422	30.6%	49	148	60	113	34	18
Walking with traffic	0	0.0%	17	1.2%	0	4	4	5	1	3
Walking against traffic	0	0.0%	13	0.9%	1	1	4	5	1	1
Standing or working in roadway	3	6.5%	72	5.2%	1	0	17	42	4	8
Playing in roadway	1	2.2%	18	1.3%	6	8	2	1	0	1
Lying in roadway	0	0.0%	0	0.0%	0	0	0	0	0	0
Not in roadway	2	4.3%	68	4.9%	4	7	17	30	5	5
Other & Not Stated	2	4.3%	77	5.6%	1	18	21	27	4	6
<b>TOTAL URBAN</b>	<b>46</b>	<b>100.0%</b>	<b>1,377</b>	<b>100.0%</b>	<b>79</b>	<b>303</b>	<b>244</b>	<b>524</b>	<b>155</b>	<b>72</b>
<b>% OF TOTAL KILLED OR INJURED</b>					<b>5.7%</b>	<b>22.0%</b>	<b>17.7%</b>	<b>38.1%</b>	<b>11.3%</b>	<b>5.2%</b>

**F. Pedestrian Collisions By Day Of Week and Hour Of Day**

In 1988, Friday and Monday were the two days with the highest frequency of pedestrian fatalities, recording 18.5% and 16.0% deaths respectively. Friday also recorded the highest number of reported pedestrian collisions (Figure 7-1). The 6 p.m. to 9 p.m. time period evidenced the greatest percentage of fatal pedestrian collisions at 23.4%. The 3 p.m. to 6 p.m. recorded the greatest number of reported pedestrian collisions at 28.8% (Figure 7-2).

Figure 7-1

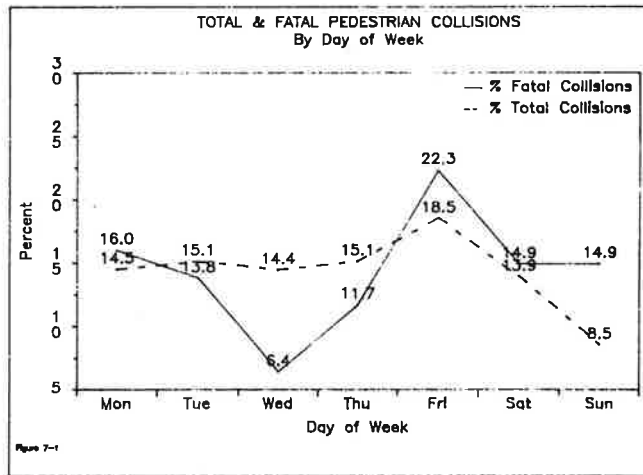
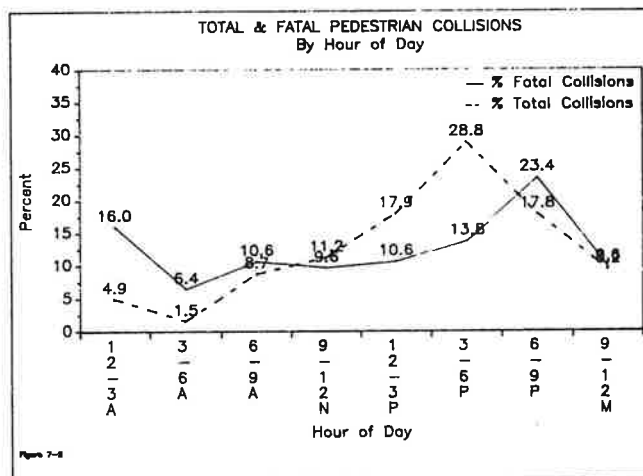


Figure 7-2



## VII. Heavy Trucks

In 1988, 6,149 heavy trucks were involved in collisions, for an 18.8% decrease over the four-year baseline. Registrations in 1988 totaled an estimated 172,000 vehicles, a 7.8% increase over the four-year average. Based on this registration figure, the 1988 collision rate was 357.5 collisions per 10,000 registered trucks, a decrease of 25.1% from the four-year average.

There were 79 heavy trucks involved in fatal collisions during 1988. This was a 2.3% increase compared to the baseline average. While the fatal collision rate was up slightly from the previous year, it was down 5.8% from the previous four-year average rate of 4.9 deaths per 10,000 registered trucks (Table 8-1).

Table 8-1

SUMMARY OF HEAVY TRUCKS Heavy Trucks Involved in Traffic Collisions							
Collision Severity/Exposure & Rates	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
Total Trucks Involved in Collisions	6,149	6,243	7,983	8,605	7,472	7,576	-18.8%
Trucks Involved in Fatal Collisions	79	71	66	85	87	77	2.3%
Registration of Heavy Trucks*	172,000	168,600	164,000	155,000	150,661	159,565	7.8%
Total Collision Rate**	357.5	370.3	486.8	555.2	495.9	477.0	-25.1%
Fatal Collision Rate**	4.6	4.2	4.0	5.5	5.8	4.9	-5.8%

\* Estimated

\*\*Collisions per 10,000 registered trucks

### A. Age of Drivers Involved in Heavy Truck Collisions

The 39-year-old and younger drivers were over-represented in heavy truck collisions compared to the percentage of licensed drivers each group composed. The 19 and under group composed 0.2% of all licensed heavy truck operators. Yet this group was involved in 1.8% of all heavy truck collisions, 1.3% of the heavy truck fatal crashes and 2.4% of the heavy truck injury collisions. The ratio for percent of collision involvement compared to percent of licensed drivers composed by the 19 and under age group resulted in an over-representation ratio of 9.05 for this group. The 20-29 year old age group was involved in 26.2% of the total collisions, 20.2% of the fatal collision and 27.2% of the injury collisions. This group composed 14.2% of all drivers having a classified endorsement on their licenses. Based on the percentage of licensed drivers and collision involvement, this group was over-represented in collisions by a ratio of 1.84. The 30-39 year old age group was involved in 32.2% of the total reported collisions and made up 29.7% of the drivers having a classified endorsement on their license. The representation for this group was nearly equal. The rest of the driver age groups were under-represented in total collisions (Table 8-2).

Table 8-2

DRIVERS INVOLVED IN HEAVY TRUCK COLLISIONS By Age								
Age	All Collisions		Fatal Collisions		Injury Collisions		% of Classified Drivers*	Over/Under Ratio**
	Number	%	Number	%	Number	%		
19 & Under	99	1.8%	1	1.3%	45	2.4%	0.2%	9.05
20-29	1,419	26.2%	15	20.0%	504	27.2%	14.2%	1.84
30-39	1,746	32.2%	28	37.3%	595	32.1%	29.7%	1.08
40-49	1,239	22.9%	22	29.3%	418	22.6%	26.2%	0.87
50-59	674	12.4%	5	6.7%	202	10.9%	16.7%	0.75
60 & Over	244	4.5%	4	5.3%	88	4.8%	13.0%	0.35

\* Classified Endorsement is only required for operators of the larger trucks and truck combinations

\*\* Percent of collision involvement to percent of licensed drivers



**B. Heavy Truck Defects**

Defective brakes accounted for 40.4% of the defects detected in heavy trucks involved in collisions in 1988. Other defects included 12.7% worn or smooth tires, 6.3% defective rear lights, 5.5% defective steering, and 35.1% other defects (Table 8-3).

Table 8-3

DEFECTS OF HEAVY TRUCKS INVOLVED IN COLLISIONS Four-Year Comparison								
Condition of Vehicle	1988		1987		1986		1985	
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
Defective Brakes	236	40.4%	254	39.6%	329	42.1%	325	41.1%
Defective Headlights	6	1.0%	6	0.9%	4	0.5%	7	0.9%
Defective Rear Lights	37	6.3%	27	4.2%	48	6.1%	49	6.2%
Defective Steering Mechanism	32	5.5%	30	4.7%	33	4.2%	37	4.7%
Puncture or Blowout	24	4.1%	23	3.6%	21	2.7%	29	3.7%
Worn or Smooth Tires	74	12.7%	79	12.3%	87	11.1%	101	12.8%
Other Defects	175	30.0%	222	34.6%	259	33.2%	243	30.7%

**C. Location of Heavy Truck Collisions By Severity**

In 1988, 53.5% of the heavy trucks involved in total collisions were in urban areas (Figure 8-1). There were 15 heavy trucks involved in fatal collisions in urban areas, compared to 64 in the rural areas. These figures compose a 19.0% to 81.0% urban/rural proportion of involvement in fatal collisions (Figure 8-2). The 1988 heavy truck involvement in injury collisions was split, 939 urban to 1,027 rural. These figures are 47.8% to 52.2% urban/rural split (Figure 8-3).

Figure 8-1

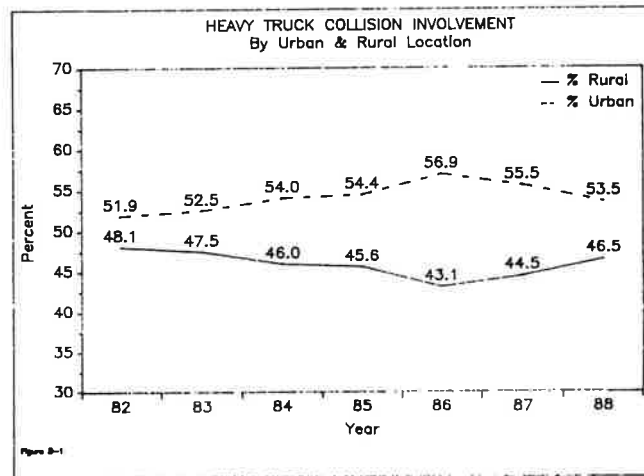


Figure 8-2

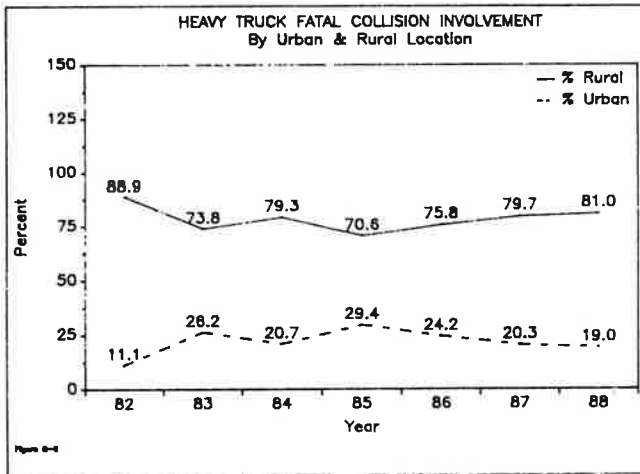
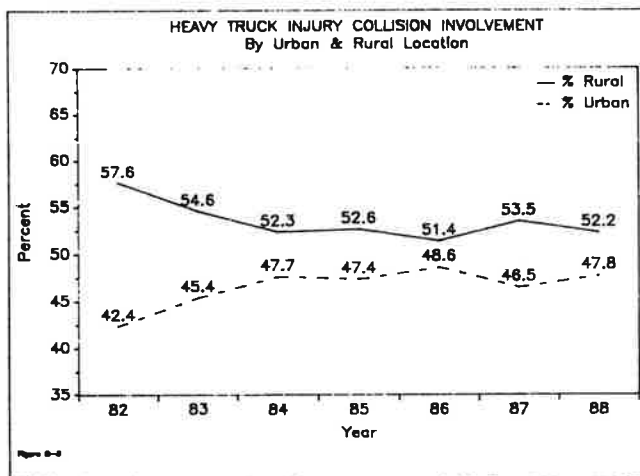


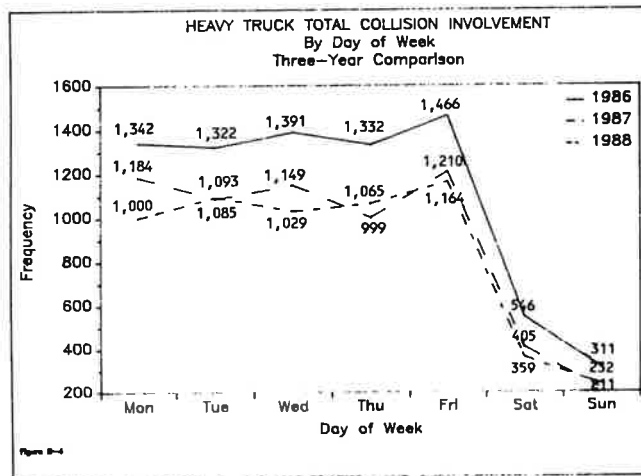
Figure 8-3



**D. Heavy Truck Collision Occurrences By Time**

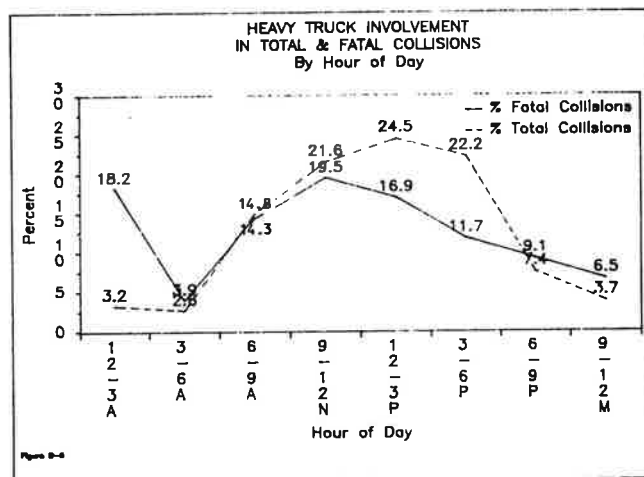
The weekdays showed the highest frequency of heavy truck collision involvement, and Friday recorded the single day high. During the weekend, as expected, there was a substantial decline in the frequency of heavy truck involvement in collisions (Figure 8-4).

Figure 8-4



Last year, the time period from noon to 3 p.m. recorded the highest incidence of heavy truck involvement in collisions. A substantial increase in collisions began during the 6 a.m. to 9 a.m. time period, peaked at the noon to 3 p.m. period, remained high during the 3 p.m. to 6 p.m. period, and then sharply declined (Figure 8-5).

Figure 8-5



**E. Total Collisions - Light Trucks vs. Heavy Trucks**

There were 56,405 light trucks and 6,149 heavy trucks involved in collisions in 1988. This 90.2% to 9.8% ratio between light and heavy trucks continues a trend for an increase in light truck collision ratio started in 1984 (Figure 8-6).

**F. Collisions By First Harmful Event**

Heavy trucks were involved in 4,388 collisions involving other moving motor vehicles. This figure represents 73.8% of all heavy truck collisions for 1988. Heavy trucks also were involved in 353 collisions in which the other vehicle was parked and in 677 collisions with fixed or other objects. Overturning, other

non-collisions, and all other collisions accounted for the remaining heavy-truck involved collisions (Table 8-4).

Figure 8-6

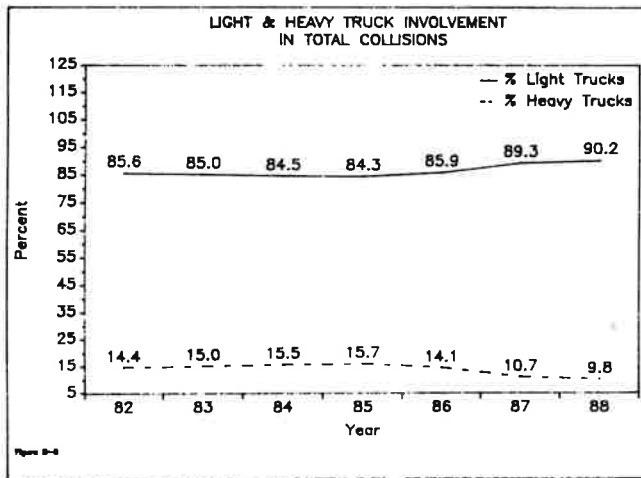


Table 8-4

Type of Collision	1988		1987		1986		1985	
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
Collision with other moving motor vehicles	4,388	73.8%	4,595	73.6%	5,686	73.7%	6,042	73.2%
Collision with parked vehicle	353	5.9%	440	7.0%	600	7.8%	643	7.8%
Collision with fixed/other object	677	11.4%	636	10.2%	792	10.3%	884	10.7%
Overturning	349	5.9%	379	6.1%	386	5.0%	414	5.0%
Other non-collision	105	1.8%	107	1.7%	116	1.5%	153	1.9%
All other collisions*	70	1.2%	86	1.4%	130	1.7%	116	1.4%

\* Pedestrians, pedalcyclists, RR train & animal.

### VIII. Pupil Transportation

During the 1987-88 school year, there were 311 reported school bus collisions in which 268 persons were injured and 1 pedestrian was killed. This represented a 14.6% increase over the previous three-year average in total school bus collisions, a 79.5% increase in the number of persons injured, and a decrease of 4 in the number killed. Injuries to pupils riding in the school buses totaled 116 for the 1987-88 school year; up from the 59 reported for the 1986/87 school year and from the three-year average of 45 pupils injured. There were 6,427 registered school buses in the 1987-88 school year. This marked a 4.8% decrease in registrations from the baseline period. School bus travel increased 18.98% during the 1987-88 school year compared to the previous three-year baseline period (Table 9-1).

During the 1987-88 school year, the school bus mileage collision rate was .43 collisions per 100,000 miles of travel. This rate was down from the 0.45 rate

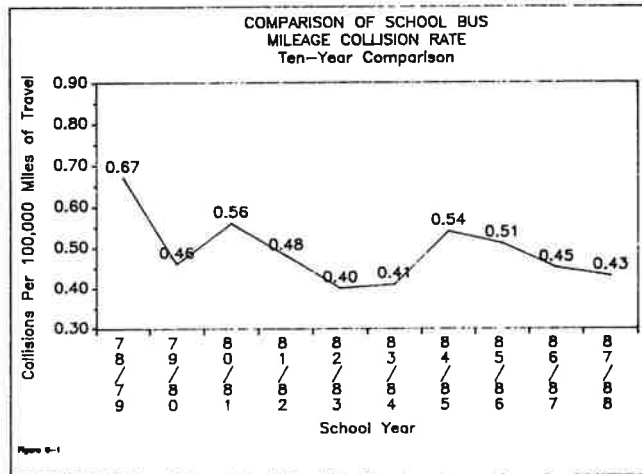
experienced in the 1986-87 school year and the previous three-year baseline (Figure 9-1).

Table 9-1

COLLISIONS INVOLVING SCHOOL BUSES Four-Year Comparison						
Severity, Exposure & Rates	Years				Previous 3 Year Average	% of Change 88 - 3 Year Average
	87-88	86-87	85-86	84-85		
Total Collisions	311	310	338	310	271	14.62%
Fatal Collisions	1	5	0	2	1	-25.00%
Injury Collisions	115	92	95	91	84	37.45%
Property Damage Collisions	195	213	243	217	186	4.65%
Number Killed	1	5	0	2	1	0.00%
Persons Injured						
Pupils	116	59	29	28	45	157.78%
School Bus Drivers	28	9	19	23	15	82.61%
Other Occupants of School Bus	0	1	2	0	2	-100.00%
Pedestrian/Bicyclist	7	7	5	4	4	75.00%
Occupants/Other Vehicles Involved	117	93	92	85	83	40.40%
Total Injured	268	169	147	140	149	79.46%
School Bus Registration	6,427	6,185	6,121	6,107	6,133	4.80%
Registration Collision Rate*	48.4	50.1	55.2	50.8	44.3	9.33%
Miles Traveled (in thousands)	72,816.2	68,658.8	66,586.6	57,849.3	61,201.7	18.98%
Mileage Collision Rate**	0.43	0.45	0.51	0.54	0.446	-4.22%

\* Collisions per 1,000 registered vehicles  
\*\* Collisions per 100,000 miles traveled

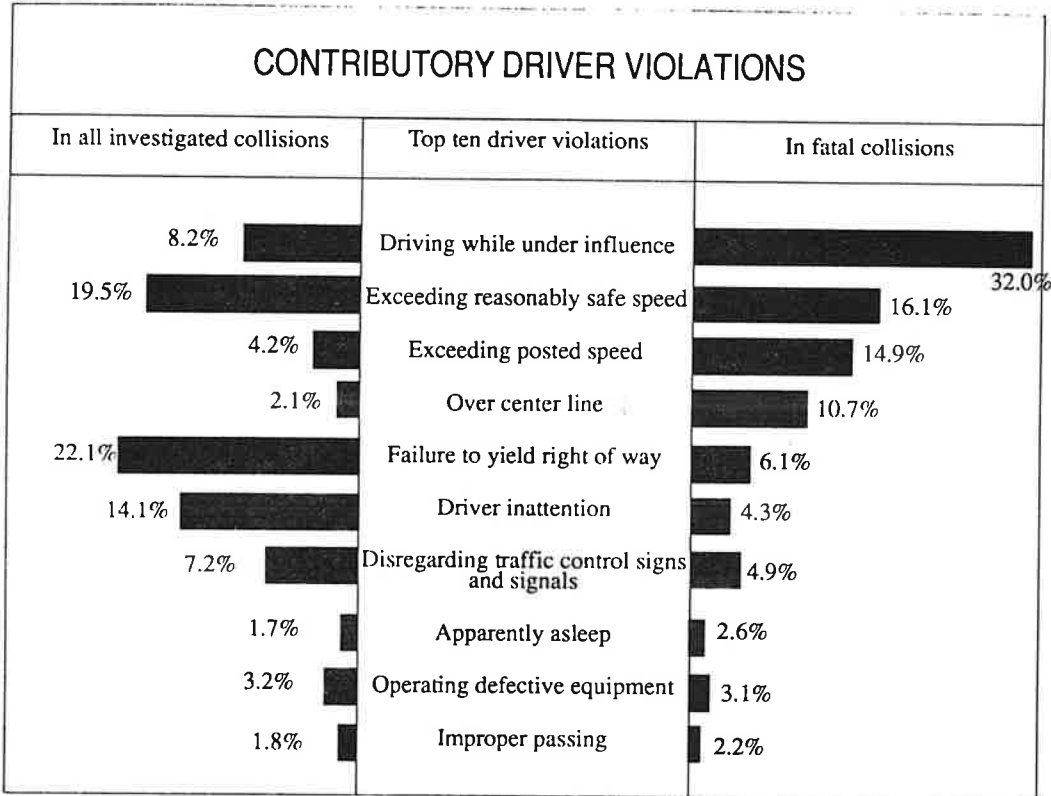
Figure 9-1



## XI. Contributory Driver Violations

Driving while under the influence of intoxicating liquor contributed to 32.0% of the driver violations in fatal collisions and 8.2% of all investigated collisions. Failure to yield right of way contributed to 22.1% of all investigated collisions and 5.9% of the violations in fatal collisions (Figure 10-1).

Figure 10-1



**X. Vehicle Defects**

In investigated collisions during 1988, only 4.4% of the collision involved vehicles were found to have contributory vehicle defects. The most common defect was worn or smooth tires, a defect found in 3,019 vehicles. This represented an 10.7% decrease in this category compared to the previous four-year average. Defective brakes, the second most contributory defect, was found on 1,859 collision-involved vehicles in 1988. This was an increase of 2.3% compared to the baseline (Table 10-1).

Table 10-1

Description	VEHICLE CONDITION* Five-Year Comparison					Previous 4 Year Average	% of Change 88 - 4 Year Average
	Years						
	1988	1987	1986	1985	1984		
Defective Tires:							
Worn or Smooth Tires	2,577	2,806	3,129	3,043	2,996	2,994	-13.9%
Puncture or Blowout	442	469	343	345	367	381	16.0%
Defective Brakes	1,859	1,961	2,026	1,723	1,785	1,874	-0.8%
Defective Lights:							
Headlights	156	144	167	156	143	153	2.3%
Rear Lights	423	331	373	370	394	367	15.3%
Other Lights/Reflectors	106	116	112	97	122	112	-5.1%
Defective Steering	306	339	287	307	381	329	-6.8%
All Other Defects	1,683	2,082	2,026	1,963	1,439	1,878	-10.4%
No Defects	164,102	161,595	156,360	147,591	139,320	151,217	8.5%
<b>TOTAL VEHICLES INVOLVED</b>	<b>171,654</b>	<b>169,843</b>	<b>164,823</b>	<b>155,595</b>	<b>146,947</b>	<b>159,302</b>	<b>7.8%</b>

\* Investigated Collisions

### XI. Senior Driver Involvement

Last year 26,584 senior drivers, 55 years old and older, were involved in 24,540 reported collisions in 1988. There were 137 fatal collisions involving 148 senior drivers and 9,385 injury collisions involving 10,197 senior drivers. This was a 5.4% increase of seniors involved in reported collisions, a 0.3% increase of the number involved in fatal crashes, and a 9.3% increase of those involved in injury collisions compared to the previous four-year baseline period. License registrations of senior drivers also increased 6.9% from the baseline average to 763,079. The fatal collision rate (total collisions per 1,000 licensed drivers) of 0.19 for 1988 was down 5.7% from the baseline period (Table 11-1).

Table 11-1

SENIOR DRIVERS (55 YEARS & OLDER) INVOLVED IN COLLISIONS+ Five-Year Comparison							
Collisions & Rates	Years					Previous 4 Year Average	% of Change 88 - 4 Year Average
	1988	1987	1986	1985	1984		
Senior drivers involved in							
Total Collisions	26,584	26,482	25,842	24,978	23,630	25,233	5.4%
Fatal Collisions	148	157	140	144	149	148	0.3%
Injury Collisions	10,197	9,634	9,560	9,264	8,855	9,328	9.3%
Licensed Drivers	763,079	741,653	719,784	706,719	686,985	713,785	6.9%
Fatal Collision Ratio*	5.57	5.93	5.42	5.77	6.31	5.85	-4.9%
Fatal Rate**	0.19	0.21	0.19	0.20	0.22	0.21	-5.7%
Total Collision Rate***	3.48	3.57	3.59	3.53	3.44	3.53	-1.4%

+ The number of senior drivers involved  
 \* Fatal Collisions per 1,000 total collisions  
 \*\* Fatal Collisions per 1,000 licensed drivers  
 \*\*\* Senior drivers involved per 100 licensed

#### A. Senior Driver Collisions By First Harmful Event

In 1988, 87.7% of the collisions involving senior drivers were "collisions with other moving vehicles." This type of collision also resulted in the greatest percentage of fatal collisions (59.9%) and injury collisions (85.3%). Single-vehicle collisions with fixed objects led to the second largest percentage of senior drivers involvement in total, fatal and injury collisions at 5.6%, 18.2% and 6.4% respectively. While collisions with pedestrians and bicycles comprised only 1.8% of the total senior driver collisions, 15.3% of the fatal crashes, and 4.4% of the senior's injury collisions (Table 11-2).

Table 11-2

COLLISIONS INVOLVING SENIOR DRIVERS* By First Harmful Event						
Type of Collision	Total Collisions		Fatal Collisions		Injury Collisions	
	Number	% of Total	Number	% of Total	Number	% of Total
Collision with other moving motor vehicles	21,520	87.7%	82	59.9%	8,008	85.3%
Collision with parked vehicle	579	2.4%	0	0.0%	125	1.3%
Collision with fixed/other object	1,383	5.6%	25	18.2%	605	6.4%
Overturning & other non collision	370	1.5%	8	5.8%	191	2.0%
Collisions with pedestrian & bicycles	443	1.8%	21	15.3%	417	4.4%
Other collisions including RR train, animal	245	1.0%	1	0.7%	39	0.4%
<b>TOTAL</b>	<b>24,540</b>	<b>100.0%</b>	<b>137</b>	<b>100.0%</b>	<b>9,385</b>	<b>100.0%</b>

\* Collisions in which one or more senior drivers involved

## B. Senior Driver Collision Involvement By Age Group

Failure to yield right-of-way contributed to 49.4% of the total drivers violations for drivers 75 years and older. This violation was also the leading violation for all drivers 55 years and older. This was followed by disregarding traffic control signs and signals for drivers 70 and over. Speed too fast for conditions was the second leading contributing cause for drivers 55-59, 60-64, and 65-69 years old (Table 11-3).

Table 11-3

55 YEARS & OLDER INVOLVEMENT IN TOTAL COLLISIONS Percent of Total Circumstances by Age Group										
Contributing Circumstances*	55-59		60-64		65-69		70-74		75 & Older	
	Number	%	Number	%	Number	%	Number	%	Number	%
Failure to Yield Right of Way	877	31.0%	923	36.0%	879	37.9%	911	44.3%	1,494	49.4%
Speed--Too Fast For Conditions	446	15.8%	336	13.1%	249	10.7%	186	9.1%	209	6.9%
Disregarding Traffic Signal/Signs	237	8.4%	228	8.9%	228	9.8%	229	11.1%	344	11.4%
Following Too Closely	290	10.3%	251	9.8%	208	9.0%	166	8.1%	189	6.3%
Driving While Under the Influence	198	7.0%	150	5.9%	104	4.5%	59	2.9%	33	1.1%
Operating Defective Equipment	70	2.5%	52	2.0%	49	2.1%	36	1.8%	38	1.3%
Crossing Over the Centerline	44	1.6%	36	1.4%	29	1.3%	26	1.3%	38	1.3%
Exceeding Legal Speed	33	1.2%	19	0.7%	11	0.5%	14	0.7%	24	0.8%
All Other Circumstances including Driver Inattention	633	22.4%	568	22.2%	560	24.2%	428	20.8%	655	21.7%
TOTAL	2,828	100.0%	2,563	100.0%	2,317	100.0%	2,055	100.0%	3,024	100.0%

\*Investigated collisions only

In 1988, the 55-59 year old group was involved in 6,805 reported collisions for 3.47% of all collisions. This group made up 5.40% of the total number of drivers licensed to drive in this state. The under-representation ratio of 0.64 was the same as reported for the previous year and the previous four-year baseline average (Figure 11-1). The 60-64 age group post an under-representation ratio of 0.58, up slightly from the previous four-year baseline average (Figure 11-2). The 65-69 year old group recorded a 0.53 under-representation ratio, the same as the previous four-year average (Figure 11-3). The 70-74 age group recorded a 0.53 under-representation ratio, down from .55 baseline average (Figure 11-4). The last group is the 75 years old and older group. This group had a .60 under-representation, down from the baseline ratio of .63 (Figure 11-5).



Figure 11-1

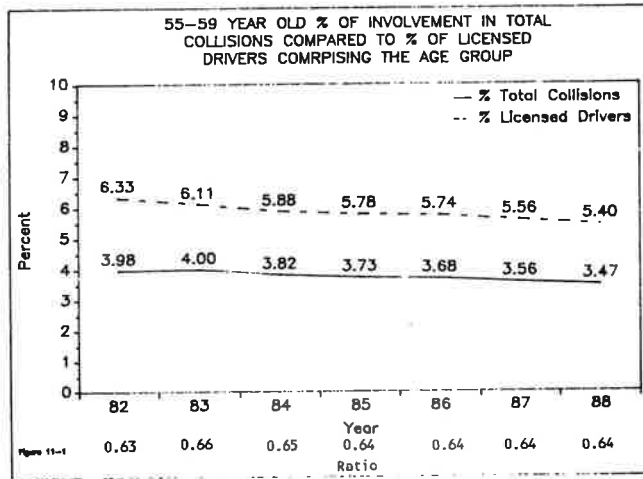


Figure 11-2

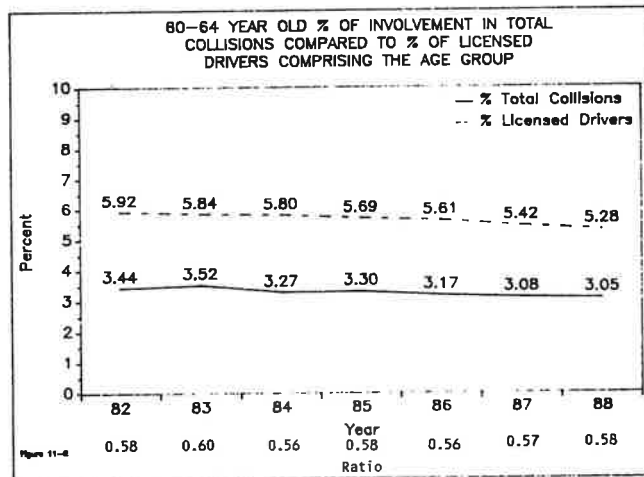


Figure 11-3

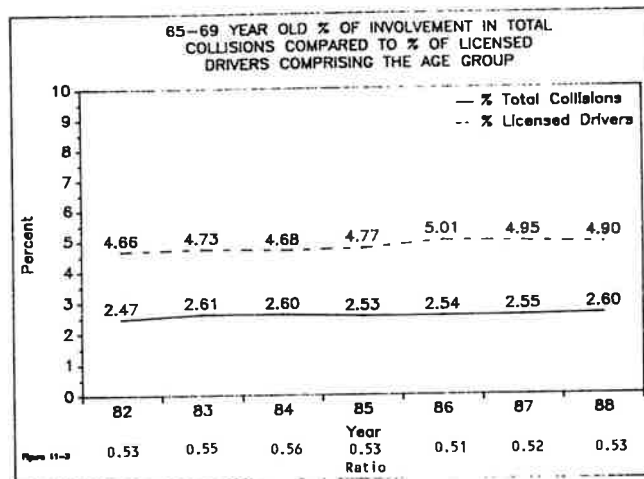


Figure 11-4

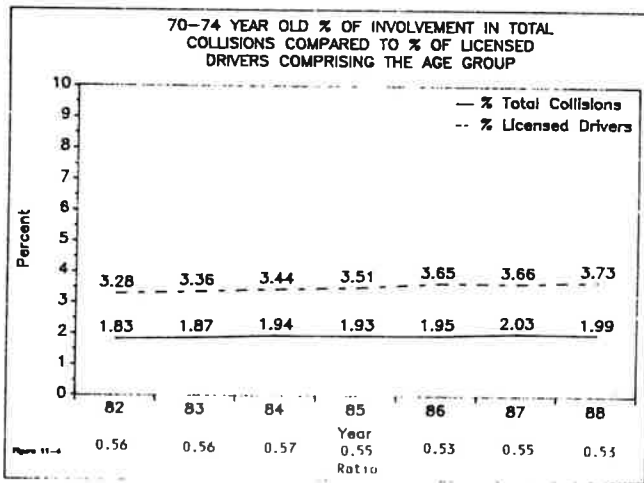
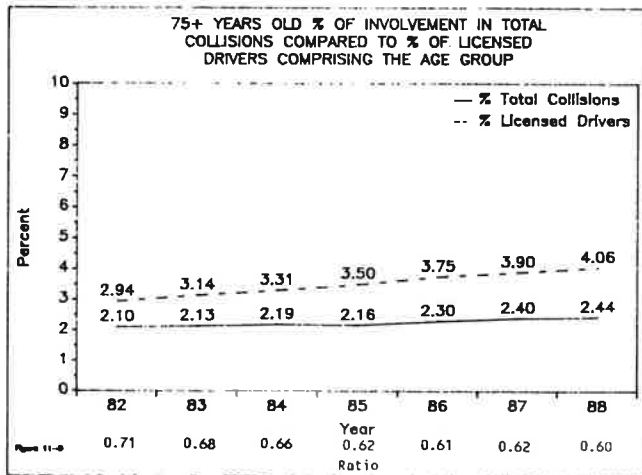


Figure 11-5



The urban/rural collision ratio involving senior drivers (55 years old and older) remained relatively constant during the past seven years with a 65.2 to 34.8 urban/rural mix for 1988. The senior driver injury collision urban/rural mix has also remained fairly constant during the past seven years. Senior driver fatal collisions continued to be more common in rural areas. In 1988, 66.9% or two-thirds of the fatal collisions involving senior drivers occurred in rural areas (Figure 11-8).

Figure 11-6

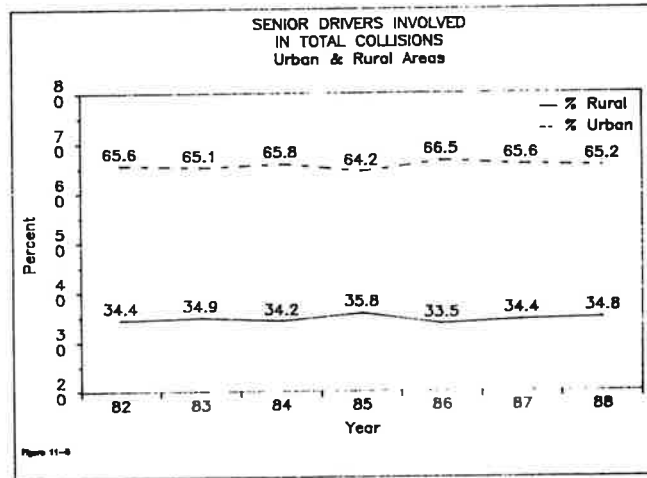


Figure 11-7

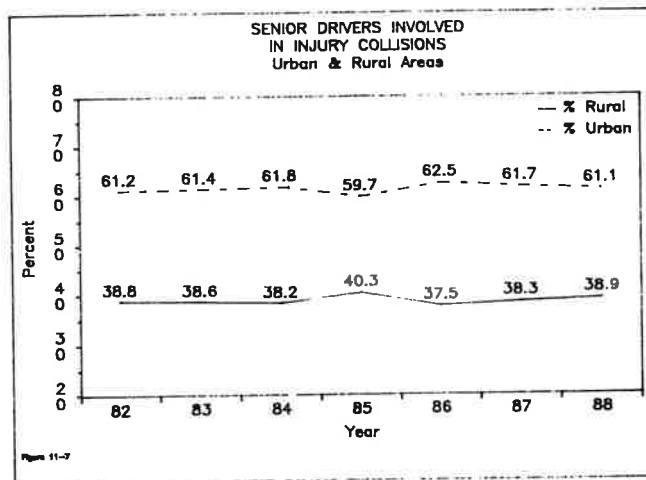
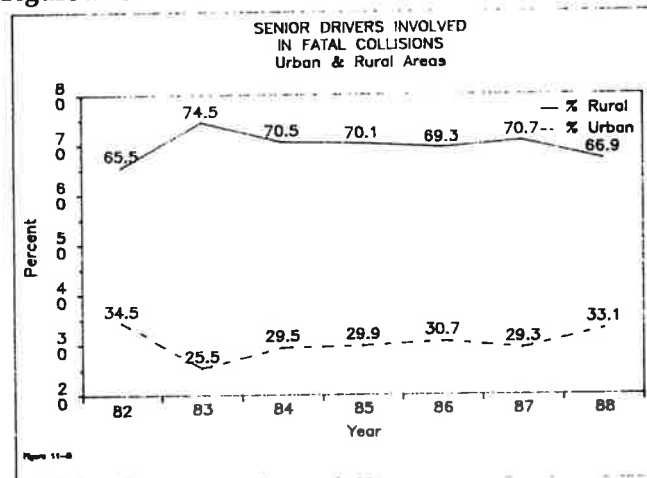


Figure 11-8



### C. Senior Driver Involvement By Time

Last year, 18.0% of all rural fatal collisions involving senior drivers occurred on Monday, 17.6% occurred on Saturday, and 15.4% occurred on Tuesday. Friday was the high day of the week for total reported rural collisions, accounting for 17.0% of the senior driver collisions. Thursday followed with 15.6% and Tuesday with 14.9% of the collisions (Figure 11-9). Friday and Saturday were the two highest fatal collision days, each recording 19.6% of the senior drivers urban area collisions. Friday recorded the greatest percentage of urban total reported collisions, 19.5%, for the group (Figure 11-10).

Figure 11-9

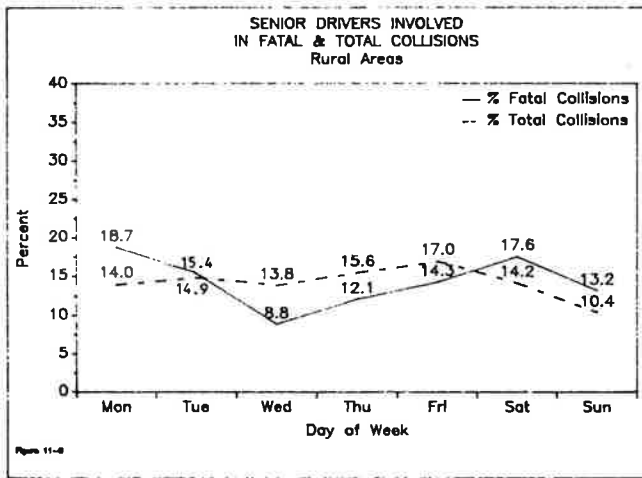
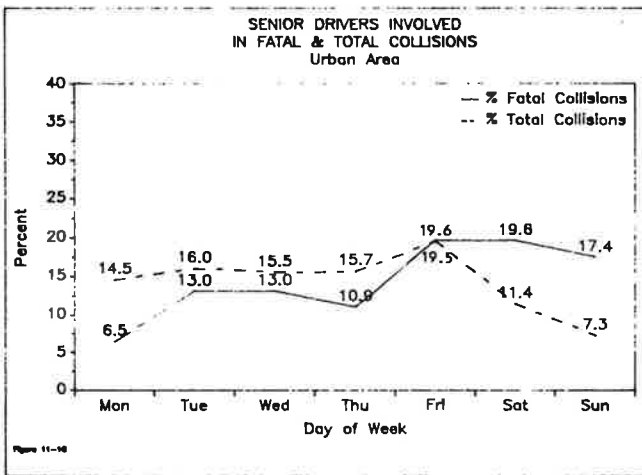


Figure 11-10



In rural areas, the greatest percentage (28.6%) of senior driver involvement in fatal crashes occurred from 3 p.m. to 6 p.m.. The greatest percentage of total collision involvement (29.2%) for these drivers also occurred from 3 p.m. to 6 p.m. (Figure 11-11). In the urban areas, the greatest senior involvement was from 3 p.m. to 6 p.m. for fatal collisions at 30.6%. This same time frame recorded 30.0% of the total urban reported collisions of the senior drivers (Figure 11-12).

Figure 11-11

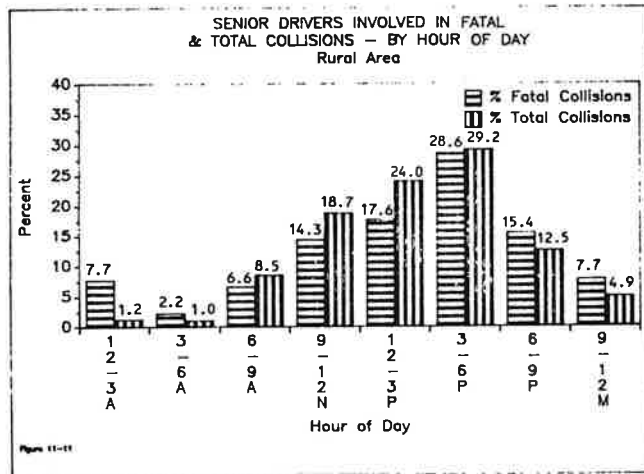


Figure 11-12

