

Bus Accidents in the United States, 1995-1999

July 2001

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16. Abstract <p>This document presents aggregate statistics on buses involved in traffic accidents over five years, 1995-1999. These statistics are derived from two sources: the Fatality Analysis Reporting System (FARS) file maintained by the National Highway Traffic Safety Administration (NHTSA) and the General Estimates System (GES) file, also maintained by NHTSA. All figures for involvements in fatal accidents and fatalities are taken from the FARS files. The GES files are used to extend the analysis to nonfatal accidents.</p> <p>An estimated 286,000 buses were involved in traffic accidents over the five year period, 1995-1999. About 1,483 of these were fatal bus involvements. There were 1,698 fatalities and 154,000 injuries in accidents involving buses.</p>					
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Symbol	When You Know	Multiply By	To Find	Symbol	When You Know	Multiply By	To Find
in ft yd mi in ² ft ² yd ² ac mi ² fl oz gal ft ³ yd ³	inches feet yards miles square inches square feet square yards acres square miles fluid ounces gallons cubic feet cubic yards	25.4 0.305 0.914 1.61 645.2 0.093 0.836 0.405 2.59 29.57 3.785 0.028 0.765	millimeters meters meters kilometers square millimeters square meters square meters hectares square kilometers milliliters liters cubic meters cubic meters	mm m m km mm ² m ² m ² ha km ² mL L m ³ m ³	millimeters meters meters kilometers square millimeters square meters square meters hectares square kilometers milliliters liters cubic meters cubic meters	0.039 3.28 1.09 0.621 0.0016 10.764 1.195 2.47 0.386 0.034 0.264 35.71 1.307	inches feet yards miles square inches square feet square yards acres square miles fluid ounces gallons cubic feet cubic yards
oz lb T	ounces pounds short tons (2000 lb)	28.35 0.454 0.907	grams kilograms megagrams (or "metric ton")	g kg Mg (or "t")	grams kilograms megagrams (or "metric ton")	0.035 2.202 1.103	ounces pounds short tons (2000 lb)
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celsius temperature	°C	Celsius temperature	1.8C + 32	Fahrenheit temperature
fc fl	foot-candles foot-Lamberts	10.76 3.426	lux candela/m ²	lx cd/m ²	lux candela/m ²	0.0929 0.2919	foot-candles foot-Lamberts
lbf lbf/in ²	poundforce poundforce per square inch	4.45 6.89	newtons kilopascals	N kPa	newtons kilopascals	0.225 0.145	poundforce poundforce per square inch

NOTE: Volumes greater than 1000 L shall be shown in m³.

* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised September 1993)

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Bus Accidents in the United States, 1995-1999

1 Introduction

This report presents statistics on the involvement of buses in traffic accidents. All traffic accident statistics are taken from the Fatality Analysis Reporting System (FARS) files and the General Estimates System (GES) files. Five years of data, 1995 through 1999, are used from each file.

FARS is a census file with data on each fatal accident on public roads in the United States. A fatal accident results in one or more fatalities as a consequence of the accident. The fatality may be any person involved in the accident, including pedestrians and bicyclists, as well as occupants of passenger cars, buses and trucks. All figures for vehicles involved in fatal accidents and fatalities are taken from the FARS files.

The GES files are used to extend the analysis to non-fatal accidents. GES is a sample of police reported accidents in the United States, with associated sampling errors. Estimates calculated from small subsets of the data, such as fatalities, have relatively large sampling errors associated with them. So, all buses involved in fatal accidents are eliminated from GES files. Non-fatal accidents are distinguished as injury and property-damage-only accidents. An injury accident is one where one or more people are injured, but no one is killed, as a consequence of the accident. This includes all pedestrians, bicyclists, and occupants of passenger cars, buses and trucks involved in the accident. In a property-damage-only accident, one or more vehicles are damaged as a result of the accident, but no one is killed or injured.

The GES files have relatively small samples of bus cases, which limits the amount of detail that can be shown in the tables. Five years of GES data were aggregated to improve sample sizes and narrow sampling errors. The resulting unweighted sample size of five years of GES data was 1,959 buses involved in police-reported accidents.

Estimates in this report that are based on GES, or that combine information from FARS and GES files, are rounded to reflect accuracy. Percentages shown were calculated before the rounding was done. Figures from FARS are regarded as true population totals and are shown exactly.

A bus is defined as a vehicle designed to carry at least sixteen people including the driver. Two types of buses are distinguished in the GES file. A school bus is the familiar yellow and black vehicle commonly used to transport children to school. The other bus category includes transit (intracity) buses and over-the-road (intercity) buses. Transit buses are used to transport passengers within a primary urban geographical area,

mostly over fixed, scheduled routes with multiple stops. Over-the-road buses are those designed for long distance travel, typically highway coaches that transport passengers across state lines. In the FARS file, transit and over-the-road buses are distinguished, so that four categories of buses are shown in some tables of fatal accidents only.

2 Trends and overview of bus traffic accidents

In the five-year period, 1995 through 1999, an annual average of 704,796 buses was registered to operate on U.S. roads (table 1). These buses accumulated almost 7 billion miles, each bus travelling an average of 9,689 miles per year. Buses were involved in an estimated 284,000 traffic accidents over five years, with an average of 57,000 buses involved in accidents every year. There are about 300 buses involved in fatal accidents each year. Combining fatal involvements from FARS files and the non-fatal involvements from GES files generated estimates of all bus involvements. The rates of fatal bus involvements as well as all bus involvements per million miles of travel were also computed.

Table 1: Bus statistics, 1995-1999

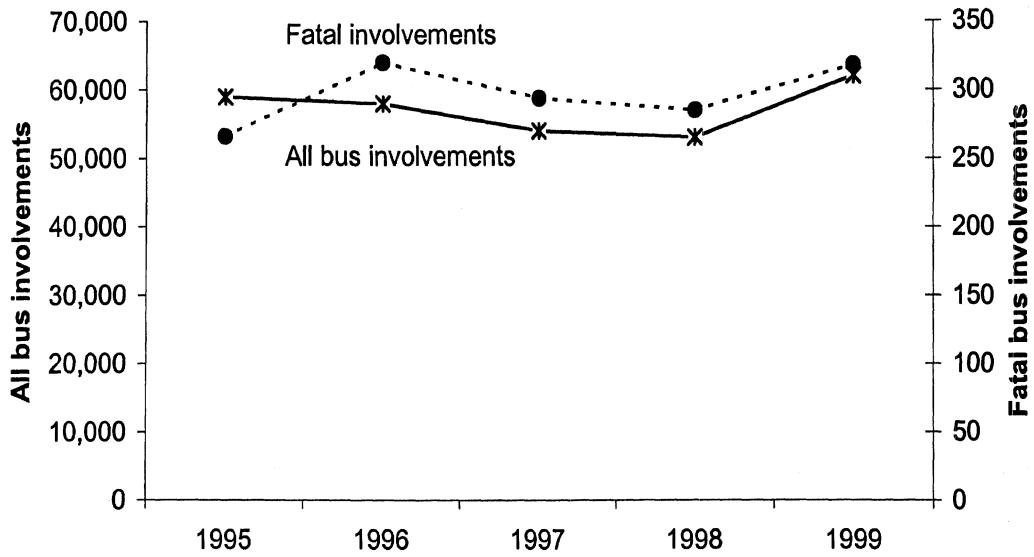
Year	Vehicle registrations	Miles traveled		Number of accidents	Fatal bus involvements		All bus involvements	
		(millions)	Average		N	Rate ^a	N	Rate ^a
1995	685,504	6,379	9,305	58,000	266	0.04	59,000	9.25
1996	696,609	6,534	9,379	57,000	320	0.05	58,000	8.88
1997	697,548	6,834	9,797	53,000	294	0.04	54,000	7.90
1998	715,540	6,992	9,771	53,000	285	0.04	53,000	7.58
1999	728,777	7,405	10,161	62,000	318	0.04	62,000	8.37
Annual	704,796	6,829	9,689	57,000	297	0.04	57,000	8.35

^a per million vehicle miles

Sources: Highway Statistics 1995-1999;
1995-1999 FARS; 1995-1999 GES

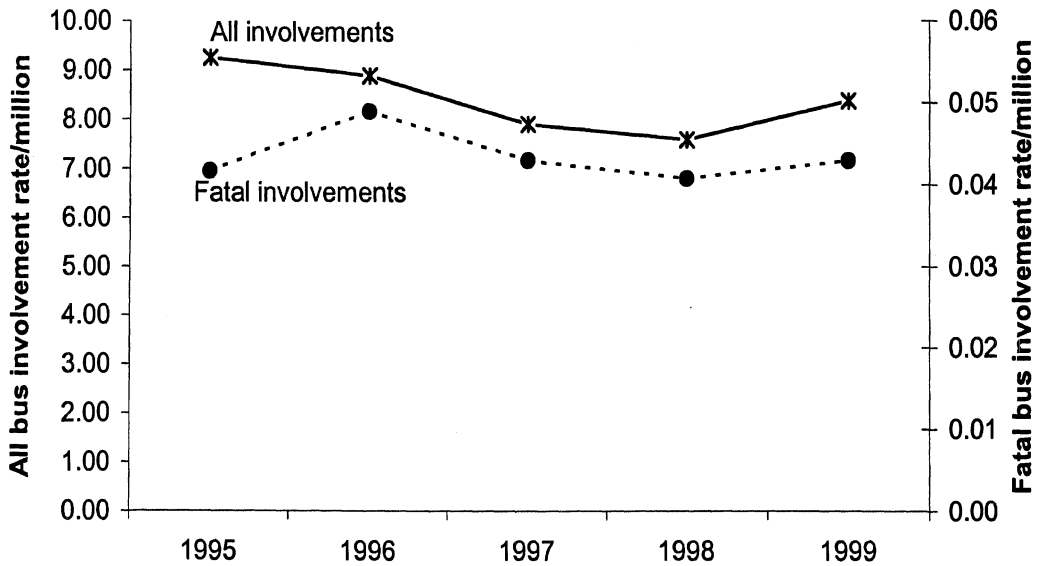
Figure 1 compares the number of fatal bus involvements and the number of all bus involvements by year. The number of buses involved in fatal accidents shows a uniform trend over the five-year period, 1995-1999, as well as all bus accident involvements. In figure 2, the rate per million miles of fatal involvements and the rate per million miles of all bus involvements are compared by year.

Figure 1: Fatal and all bus involvements, 1995-1999



Source: 1995-1999 FARS, 1995-1999 GES

Figure 2: Fatal and all bus involvement rates per million miles of travel, 1995-1999



Source: 1995-1999 FARS, 1995-1999 GES and Highway Statistics, 1995-1999

The annual number of buses involved in traffic accidents averaged about 57,000 per year from 1995 to 1999. The greatest estimated number of accident involvements occurred in 1999 with 62,000 bus involvements (table 2). The number of buses in fatal accidents also has fluctuated within a narrow range, from a low of 266 in 1995 to a high of 320 in 1996. Counts of fatal involvements are taken from the FARS file, a census file of all fatal traffic accidents, so they are expected to be precise. Estimates of injury and property damage-only involvements are generated from the GES file. Since the GES file is based on a sample of accidents, each estimate has an associated sampling error. Tests of significance have been calculated for the differences between the annual totals. None of the year-to-year differences in the counts of injury or property-damage-only involvements is statistically significant.

Table 2: Bus involvements by accident severity, 1995-1999

Year	Fatal		Injury		PDO		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
1995	266	0.5	14,000	24.2	41,000	69.4	3000.0	6.0	59,000	100.0
1996	320	0.6	15,000	25.8	40,000	69.1	3000.0	4.4	58,000	100.0
1997	294	0.5	12,000	22.9	39,000	72.7	2000.0	3.4	54,000	100.0
1998	285	0.5	13,000	23.7	37,000	69.5	3000.0	5.7	53,000	100.0
1999	318	0.5	13,000	21.6	44,000	70.9	4000.0	7.4	62,000	100.0
Annual	297	0.5	13,000	23.6	40,000	70.3	3000.0	5.4	57,000	100.0

Sources: 1995-1999 FARS, 1995-1999 GES

PDO: Property-damage-only

Table 3 shows the number of fatalities and injuries in bus-involved accidents, 1995-1999. These figures represent people killed or injured as a consequence of an accident involving a bus, whether these fatalities and injuries occurred in a bus or not. The greatest number of deaths occurred in 1999 (372), while 1996 had the highest estimated number of injuries (33,000). The number of injuries has remained quite stable over the period 1995-1999. None of the year-to-year differences are statistically significant, in part because GES includes only a relatively small sample of bus involvements.

Table 3: Total fatalities and injuries in bus accidents, 1995-1999

Year	Fatalities	Injuries	Total
1995	306	32,000	32,000
1996	361	33,000	34,000
1997	335	28,000	28,000
1998	324	30,000	31,000
1999	372	31,000	31,000
Annual	340	31,000	31,000

Sources: 1995-1999 FARS, 1995-1999 GES

Table 4 shows the number of buses involved in fatal accidents over five years by bus type. This table shows the additional body type categories available in the FARS file for transit and over-the-road buses. The annual average number of school buses involved in fatal accidents was 117, out of 297 buses involved in fatal accidents per year. School buses accounted for 40% of all fatal bus involvements. About 36% were transit buses and 11% were over-the-road buses.

Table 4: Fatal bus involvements by bus type, 1995-1999

Year	School bus		Over-the road		Transit bus		Other bus		Unknown bus		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
1995	108	40.6	23	8.6	96	36.1	23	8.6	16	6.0	266	100.0
1996	124	38.8	34	10.6	111	34.7	32	10.0	19	5.9	320	100.0
1997	106	36.1	33	11.2	103	35.0	25	8.5	27	9.2	294	100.0
1998	111	38.9	37	13.0	115	40.4	15	5.3	7	2.5	285	100.0
1999	138	43.4	38	11.9	105	33.0	20	6.3	17	5.3	318	100.0
Annual	117	39.6	33	11.1	106	35.7	23	7.8	17.2	5.8	297	100.0

Source: 1995-1999 FARS

3 Bus type and accident severity

Table 5 shows annual average bus involvements by bus type and accident severity for 1995-1999. An estimated 27,200 of the 57,100 buses involved in traffic accidents annually were school buses. School buses accounted for 47.6% of all bus involvements; they were 39.6% of bus involvements in fatal accidents and 41.2% of bus involvements in injury accidents. School buses may have had a lower proportion of fatal and injury involvements because school buses commonly operate in residential areas where traffic speeds are low.

Table 5: Annual average bus involvements by bus type and accident severity

Bus type	Fatal		Injury		PDO		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
School bus	117	39.6	5,600	41.2	20,300	50.5	1200	38.1	27,200	47.6
Other bus	162	54.6	7,100	52.9	17,200	42.7	1600	51.1	26,100	45.6
Unknown	17	5.8	800	6.0	2,700	6.7	300	10.8	3,900	6.8
Annual	297	100.0	13,500	100.0	40,200	100.0	3200	100.0	57,100	100.0

Sources: 1995-1999 FARS, 1995-1999 GES

An average of 340 persons died each year in accidents involving buses from 1995-1999 (table 6). Over 38.5% (131) of the fatalities occurred in accidents in which a school bus was involved, and 55.5% (189) occurred in accidents involving an other type of bus. These fatalities include all deaths as a consequence of the accident, regardless of whether the fatality occurred in a bus. An estimated average of 30,800 persons were injured in traffic accidents involving buses, including 12,900 in school bus accidents and 16,000 in other bus accidents. (The totals and hence the averages in this table are calculated separately, rather than by summing the columns. If an accident involved both a school bus and an other bus, killed and injured persons in such an accident would be included in both the school and the other bus categories. Summing the columns would double count such cases).

Table 6: Annual average fatalities and injuries by bus type

Bus type	Fatalities		Injuries		Total	
	N	%	N	%	N	%
School bus	131	38.5	12,900	41.9	13,000	41.9
Other bus	189	55.5	16,000	52.0	16,200	52.1
Unknown	21	6.1	1,900	6.1	1,900	6.1
Annual	340	100.0	30,800	100.0	31,100	100.0

Sources: 1995-1999 FARS, 1995-1999 GES

Table 7 shows the annual average number of persons killed and injured in bus accidents, by bus type and person location. Out of 340 persons who died annually in accidents involving a bus, 33 were bus occupants, 211 were occupants of another vehicle involved in the accident and 96 were pedestrians, bicyclists, or other non-motorists. An estimated annual average of 30,800 people were injured in bus-involved accidents, which includes 17,900 bus occupants, 11,800 occupants of other vehicles involved in the accident and 1,100 pedestrians, bicyclists, or other non-motorists.

Table 7: Annual average fatalities and injuries by bus type and person location

Bus type	Bus	Other vehicle	Non-motorist	Total
Fatalities				
School bus	8	98	25	131
Other bus	21	101	66	189
Unknown	3	12	5	21
Annual	33	211	96	340
Injuries				
School bus	8,100	4,500	300	12,900
Other bus	8,800	6,400	800	16,000
Unknown	1,000	800	*	1,800
Annual	17,900	11,800	1,100	30,800

* GES sample size too small

Sources: 1995-1999 FARS, 1995-1999 GES

The annual average fatality counts are shown in table 8, by the four categories of buses distinguished in the FARS file. An annual average of 340 people were killed in fatal accidents. The percentage of these fatalities that occurred in school bus-involved accidents was 38.5%; 13.4% resulted from accidents with over-the-road buses and 34% were from transit bus accidents. The greater proportion of fatalities occurred with school bus and transit bus-involved accidents, but the percentage of fatalities was lower for the occupants of the bus compared to the fatalities in the other vehicle. The percentages of pedestrian, bicyclist, or non-motorist fatalities associated with these two bus types were also higher than other bus types.

Table 8: Annual average fatalities by bus type and person location

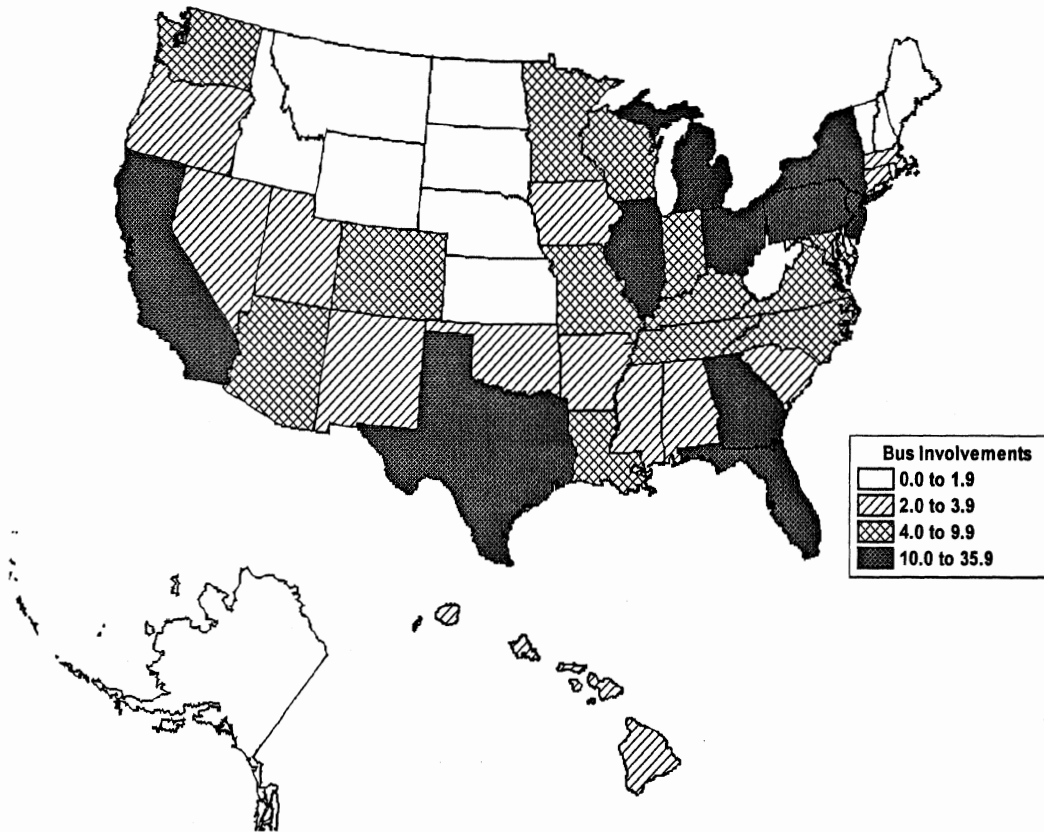
Bus type	Bus		Other vehicle		Non-motorist		Total	
	N	%	N	%	N	%	N	%
School bus	8	25.2	98	46.4	25	25.6	131	38.5
Over-the-road	11	35.0	28	13.5	6	6.0	46	13.4
Transit Bus	3	9.2	58	27.6	54	56.7	116	34.0
Other bus	7	20.2	15	7.0	6	6.3	27	8.1
Unknown Bus	3	10.4	12	5.7	5	5.4	21	6.1
Annual	33	100.0	211	100.0	96	100.0	340	100.0

Source: 1995-1999 FARS

4 Fatal bus involvements by state

Figure 3 shows the distribution of average annual fatal bus involvements across the U.S. in the five-year period from 1995 to 1999. Only buses involved in fatal accidents are shown, because only the FARS file identifies the state where the accident took place. California, New York and Florida had the greatest number of bus involvements; they are also among the most populous states. New Hampshire, Vermont and Wyoming all had one fatal bus involvement each in five years.

Figure 3: Annual average fatal bus involvements, 1995-1999



Source: 1995-1999 FARS

Table 9 shows the annual average involvement in fatal accidents of school buses, over-the-road buses, transit buses, other bus, and unknown bus types respectively for each state. The corresponding percentages of fatal bus involvements for each state are also tabulated. Florida showed the greatest percentage (9.5%) of school bus involvements, followed by Texas (6.5%), New York (6.3%) and Ohio (6.1%). But California had a higher percentage of transit bus and over-the-road bus fatal involvements than school buses. New York accounted for a high percentage of fatal bus involvements for all three types of buses.

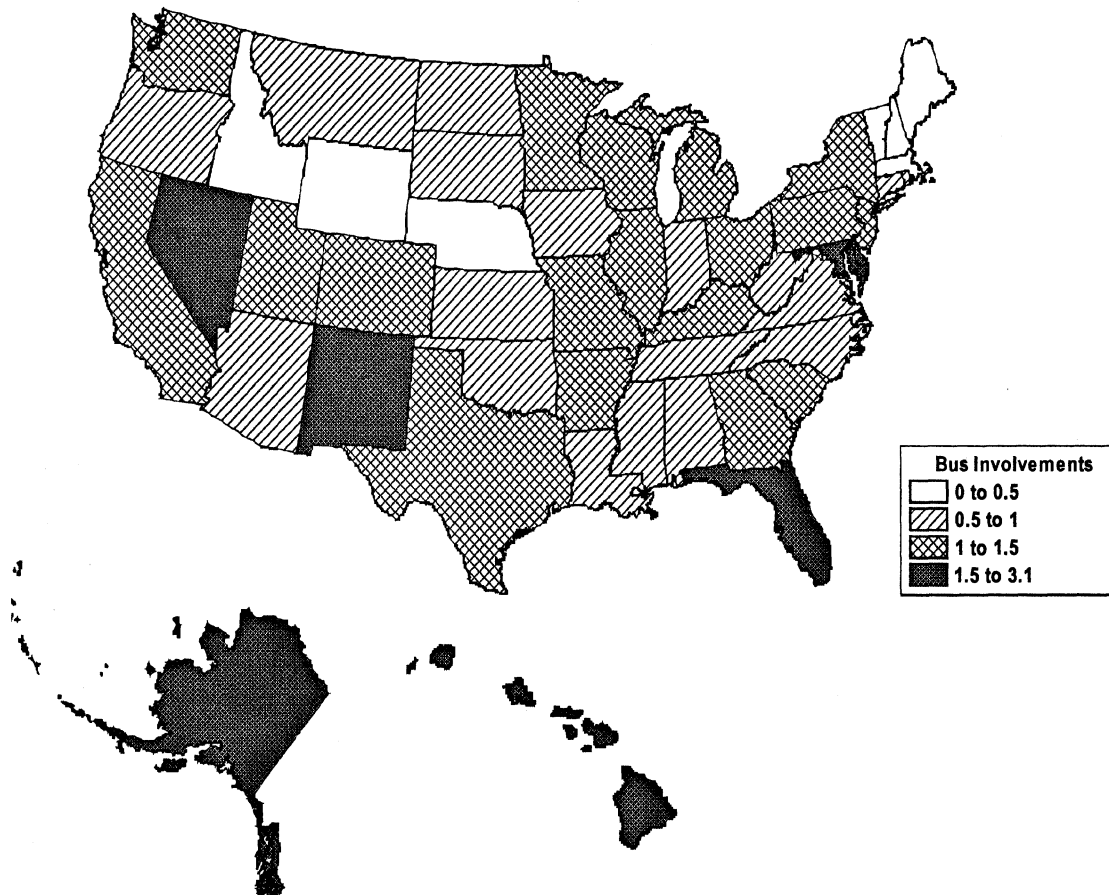
Table 9: Annual average fatal bus involvements by state and bus type, 1995-1999

State	School		Over-the-road		Transit		Other		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Alabama	1.4	1.2	1.0	3.0	0.4	0.4	0.0	0.0	0.2	1.2	3.0	1.0
Alaska	0.6	0.5	0.2	0.6	0.0	0.0	0.4	1.7	0.0	0.0	1.2	0.4
Arizona	1.2	1.0	0.8	2.4	1.6	1.5	0.0	0.0	0.8	4.7	4.4	1.5
Arkansas	0.6	0.5	0.8	2.4	0.2	0.2	1.2	5.2	0.2	1.2	3.0	1.0
California	3.8	3.2	3.2	9.7	22.8	21.5	3.8	16.5	0.6	3.5	34.2	11.5
Colorado	0.6	0.5	1.6	4.8	2.6	2.5	0.4	1.7	0.0	0.0	5.2	1.8
Connecticut	1.2	1.0	0.6	1.8	0.8	0.8	0.0	0.0	0.0	0.0	2.6	0.9
Delaware	1.0	0.9	0.0	0.0	0.2	0.2	0.6	2.6	0.0	0.0	1.8	0.6
Dist of Columbia	0.0	0.0	0.4	1.2	0.8	0.8	0.4	1.7	0.0	0.0	1.6	0.5
Florida	11.2	9.5	1.4	4.2	5.2	4.9	3.6	15.7	1.8	10.5	23.2	7.8
Georgia	6.2	5.3	1.6	4.8	2.4	2.3	0.0	0.0	0.2	1.2	10.4	3.5
Hawaii	0.2	0.2	0.8	2.4	1.2	1.1	0.0	0.0	0.0	0.0	2.2	0.7
Idaho	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.2
Illinois	4.8	4.1	1.4	4.2	7.6	7.2	0.4	1.7	0.0	0.0	14.2	4.8
Indiana	2.0	1.7	0.2	0.6	1.2	1.1	0.8	3.5	0.4	2.3	4.6	1.6
Iowa	1.6	1.4	0.0	0.0	0.8	0.8	0.0	0.0	0.0	0.0	2.4	0.8
Kansas	0.6	0.5	0.4	1.2	0.2	0.2	0.2	0.9	0.4	2.3	1.8	0.6
Kentucky	3.6	3.1	0.2	0.6	0.4	0.4	0.0	0.0	0.4	2.3	4.6	1.6
Louisiana	2.2	1.9	0.4	1.2	1.0	0.9	0.2	0.9	0.4	2.3	4.2	1.4
Maine	0.4	0.3	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.6	0.2
Maryland	2.0	1.7	0.4	1.2	4.0	3.8	0.6	2.6	0.8	4.7	7.8	2.6
Massachusetts	0.6	0.5	0.0	0.0	1.6	1.5	0.2	0.9	0.4	2.3	2.8	0.9
Michigan	5.0	4.3	0.2	0.6	3.8	3.6	1.0	4.3	0.0	0.0	10.0	3.4
Minnesota	3.8	3.2	0.0	0.0	0.6	0.6	0.4	1.7	0.0	0.0	4.8	1.6
Mississippi	0.2	0.2	0.4	1.2	0.0	0.0	0.0	0.0	1.4	8.1	2.0	0.7
Missouri	3.8	3.2	0.4	1.2	1.0	0.9	0.2	0.9	0.4	2.3	5.8	2.0
Montana	0.2	0.2	0.4	1.2	0.0	0.0	0.0	0.0	0.2	1.2	0.8	0.3
Nebraska	0.2	0.2	0.2	0.6	0.2	0.2	0.0	0.0	0.0	0.0	0.6	0.2
Nevada	1.0	0.9	0.6	1.8	1.6	1.5	0.4	1.7	0.0	0.0	3.6	1.2
New Hampshire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.2	0.2	0.1
New Jersey	2.6	2.2	1.4	4.2	5.8	5.5	1.0	4.3	1.0	5.8	11.8	4.0
New Mexico	1.0	0.9	1.6	4.8	0.4	0.4	0.0	0.0	0.4	2.3	3.4	1.1
New York	7.4	6.3	2.6	7.9	11.6	10.9	2.2	9.6	3.4	19.8	27.2	9.2
North Carolina	4.0	3.4	1.2	3.6	0.4	0.4	0.4	1.7	0.4	2.3	6.4	2.2
North Dakota	0.2	0.2	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.4	0.1
Ohio	7.2	6.1	0.6	1.8	3.0	2.8	0.6	2.6	0.0	0.0	11.4	3.8
Oklahoma	2.0	1.7	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	2.2	0.7
Oregon	0.8	0.7	0.4	1.2	1.2	1.1	0.2	0.9	0.2	1.2	2.8	0.9
Pennsylvania	5.8	4.9	2.4	7.3	5.4	5.1	0.4	1.7	0.0	0.0	14.0	4.7
Rhode Island	0.2	0.2	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0	0.8	0.3
South Carolina	2.6	2.2	0.2	0.6	0.2	0.2	0.6	2.6	0.2	1.2	3.8	1.3
South Dakota	0.4	0.3	0.0	0.0	0.0	0.0	0.2	0.9	0.0	0.0	0.6	0.2
Tennessee	2.0	1.7	0.6	1.8	0.8	0.8	0.8	3.5	0.0	0.0	4.2	1.4
Texas	7.6	6.5	2.4	7.3	6.8	6.4	1.2	5.2	1.8	10.5	19.8	6.7
Utah	1.0	0.9	0.0	0.0	1.2	1.1	0.0	0.0	0.0	0.0	2.2	0.7
Vermont	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1
Virginia	4.0	3.4	0.6	1.8	1.0	0.9	0.0	0.0	0.8	4.7	6.4	2.2
Washington	3.0	2.6	0.4	1.2	3.2	3.0	0.2	0.9	0.2	1.2	7.0	2.4
West Virginia	1.2	1.0	0.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.5
Wisconsin	3.6	3.1	0.6	1.8	1.6	1.5	0.2	0.9	0.0	0.0	6.0	2.0
Wyoming	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	0.0	0.0	0.2	0.1
Total	117.4	100.0	33.0	100.0	106.0	100.0	23.0	100.0	17.2	100.0	296.6	100.0

Source: 1995-1999 FARS

Figure 4 provides a context for interpreting figure 3. Figure 4 shows average annual involvements of buses in fatal accidents per million population in each of the fifty states. Note that most of the states with the greatest number of fatal bus involvements (i.e., California, New York and Florida) have only an average involvement rate per million people. Moreover, the range of fatal involvement rates is relatively narrow for states with more than a few bus fatalities per year. The small range suggests that state-to-state differences are not significant, particularly since the rates themselves are relatively low. Since there are so few buses involved in fatal accidents, a change of one or two in a small state can make a large difference in the involvement rate per capita for that state.

Figure 4: Annual average fatal bus involvements per million population, 1995-1999

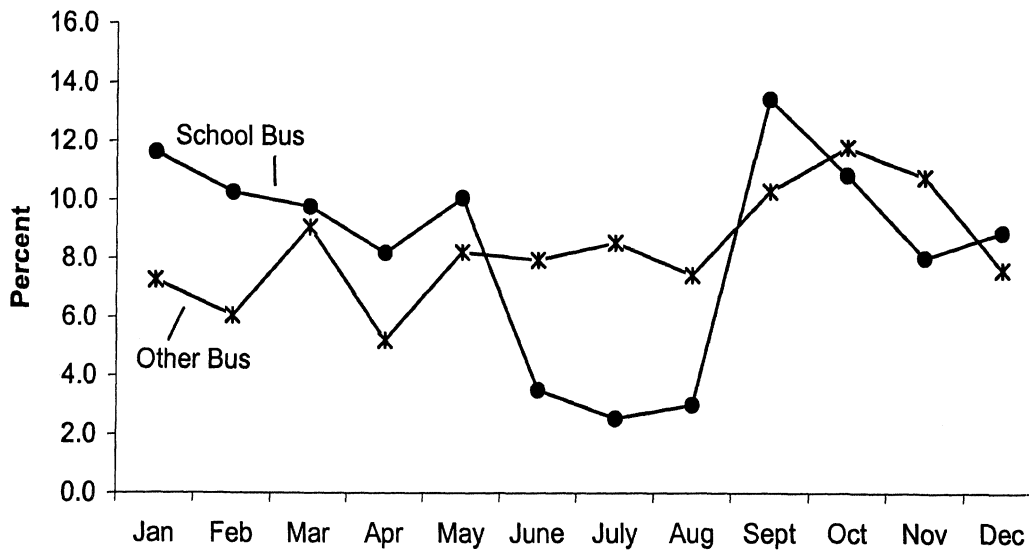


Source: 1995-1999 FARS
U.S. Census Bureau, 1997

5 Bus involvements by month, day of week, and time of day

Bus accident involvements show interesting variations by month (figure 5). School bus involvements are lowest during the summer months but fluctuate in a wide range during the school year, peaking in September with over 13% of all school bus involvements. Other buses show a different pattern, with a higher proportion of involvements in the fall as well as summer travel season.

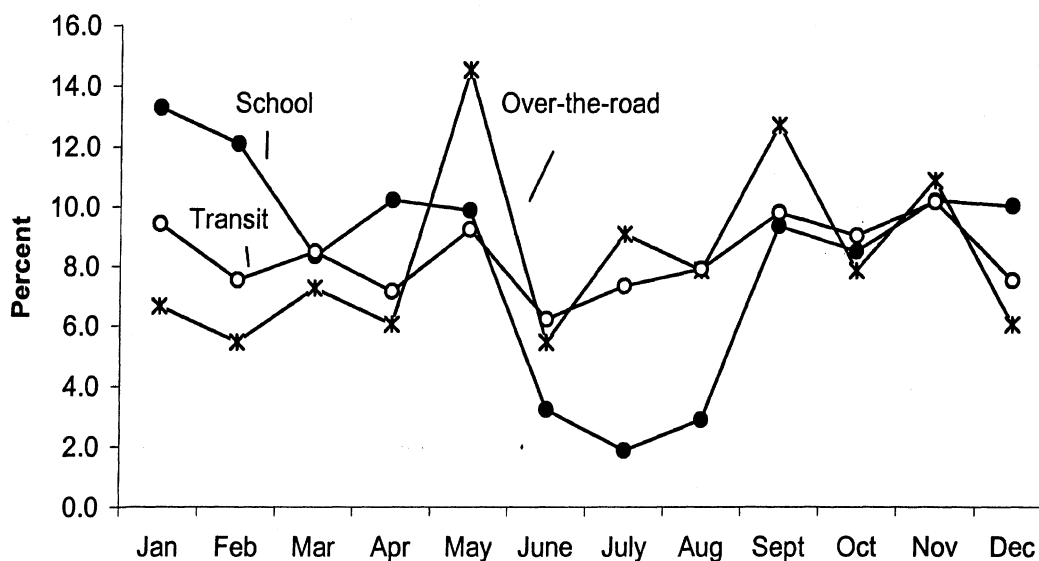
Figure 5: Bus involvements by month



Source: 1995-1999 FARS, 1995-1999 GES

Figure 6 shows fatal bus involvements by month, for three different bus types: transit, over-the-road, and school bus. The fatal involvements of school buses shows a pattern similar to that of all bus involvements, as shown in figure 5. Over-the-road bus involvements were high during the months of May and September and low during the winter months. Transit bus involvements did not show much fluctuation over the year, but had a higher proportion of involvements in the fall than other months.

Figure 6: Fatal bus involvements by month

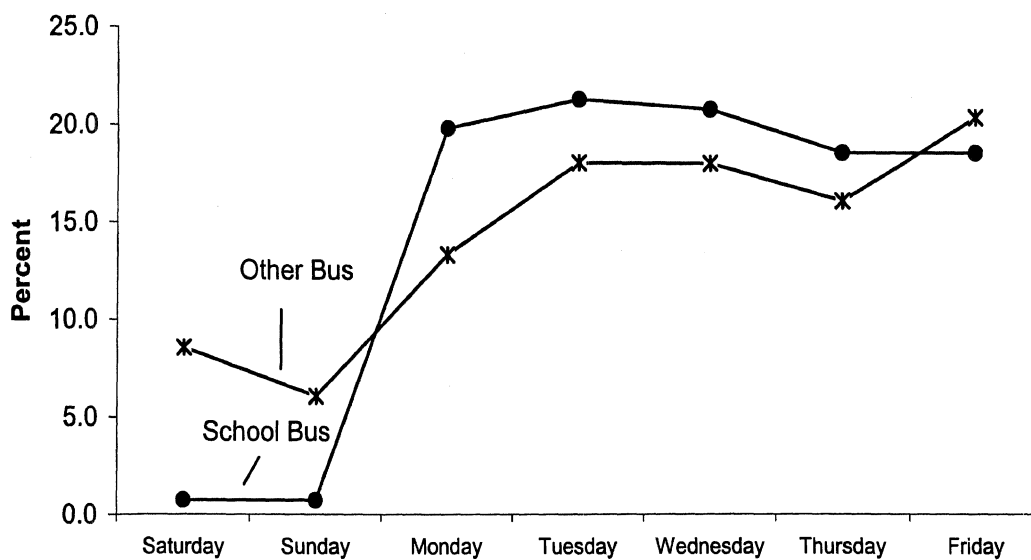


Source: 1995-1999 FARS

School bus involvement in all accidents, over the five year period 1995-1999, occurred primarily during the work week (figure 7). Only a handful occurred over the weekend. Tuesday had the highest proportion of involvements with 21.2%, while the lowest percentage of weekday involvements (18.4%) occurred on Friday. Involvements of other buses also showed a definite pattern through the week. Other buses on this figure include both intracity transit buses and intercity over-the-road buses, since the figure includes all accident severities and the source of the data, GES, does not distinguish transit or over-the-road buses. Involvements were low over the weekend and rose to a peak on Friday when 20.2% of all other bus accident involvements occurred. For the remainder of the workweek, proportions of other bus involvements were between 13.3% and 18%.

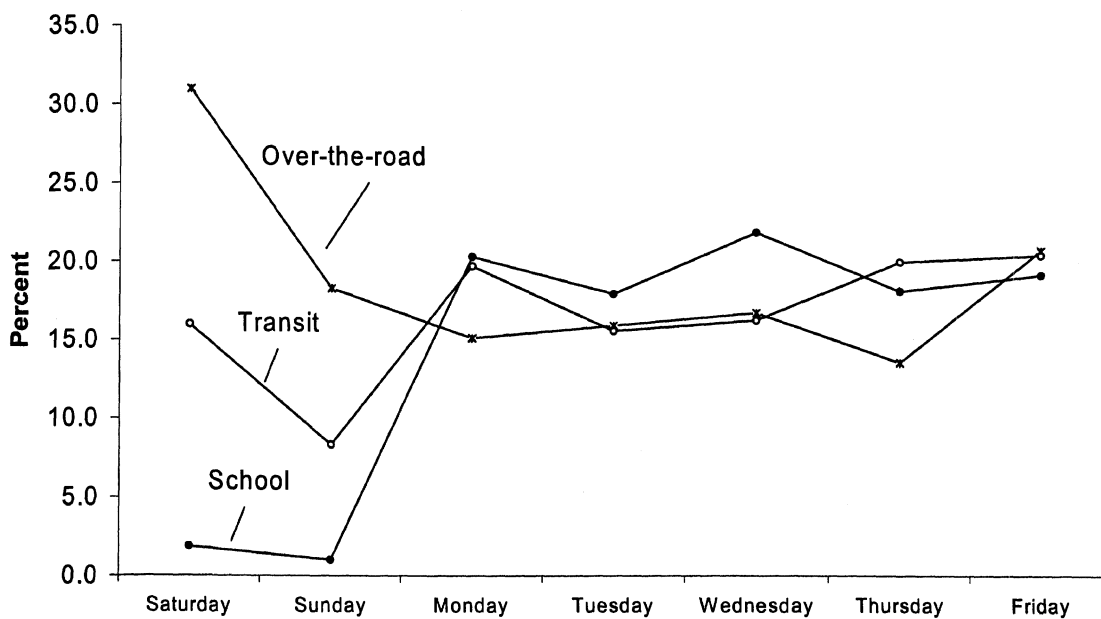
School bus involvements in fatal accidents (figure 8) also shows a similar pattern to that of all bus involvements. Transit bus involvements were low on Sunday (8.3%), but for the remainder of the week, proportions of transit bus involvements vary within a narrow range of 15.5% to 20.4%. Over-the-road bus involvements show a different pattern with a high of 31.1% of fatal bus involvements on Saturday and 18.3% on Sunday. The percentages of weekday involvements were lower than weekend, except on Friday when it was 20.6%.

Figure 7: Bus involvements by day of week



Source: 1995-1999 FARS, 1995-1999 GES

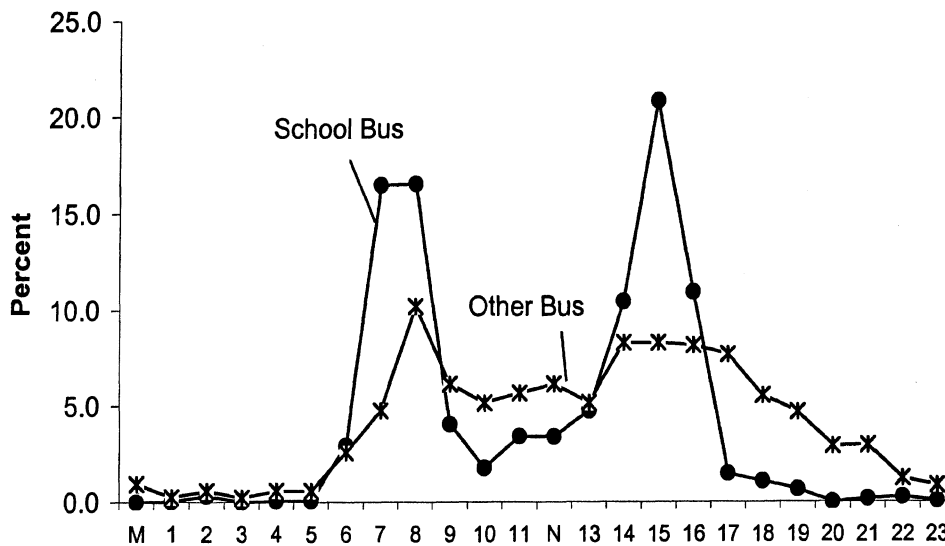
Figure 8: Fatal bus involvements by day of week



Source: 1995-1999 FARS

Figure 9 shows the distribution of school bus and other bus involvements in all accidents from 1995 to 1999 by time of day in hourly increments. The patterns of involvements over the course of the day clearly follow the typical usage of both school and other buses. School bus involvements have two major peaks, from 6 a.m. to 10 a.m. and from noon to 6 p.m., corresponding to the periods of travel to and from school. Other buses show similar, though less dramatic, peaks that encompass morning and afternoon rush hours in most cities. School buses had a low number of involvements between 6 p.m. and 6 a.m. Other buses, which include city transit buses as well as passenger buses between cities, had significant numbers of involvements until about 10 p.m.

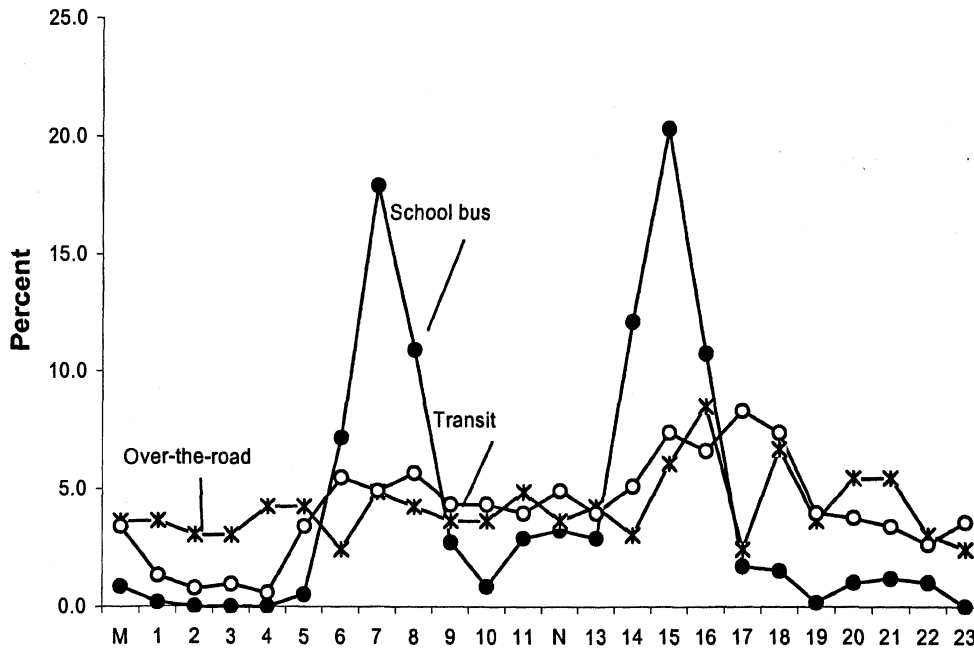
Figure 9: Bus involvements by time of day



Source: 1995-1999 FARS, 1995-1999 GES

Figure 10 shows the distribution of school bus, transit bus and over-the-road bus involvements in fatal accidents by time of day in hourly increments, 1995-1999. School bus and transit bus involvements show the morning and afternoon peaks of rush hour traffic. But, over-the-road buses show significant numbers of involvements during night as well as early morning hours.

Figure 10: Fatal bus involvements by time of day



Source: 1995-1999 FARS

6 Manner of collision

Table 10 illustrates the types of collisions buses are involved in. School buses are shown separately from other buses. School buses had a lower proportion of sideswipe same direction, angle, and pedestrian/bicyclist/non-motorist collision involvements than other buses, while they had a higher proportion of rear-end, head-on and sideswipe opposite direction collisions (table 10). The most common collision type for all buses is angle collisions. These usually occur at intersections.

Table 10: Annual average bus involvements by manner of collision

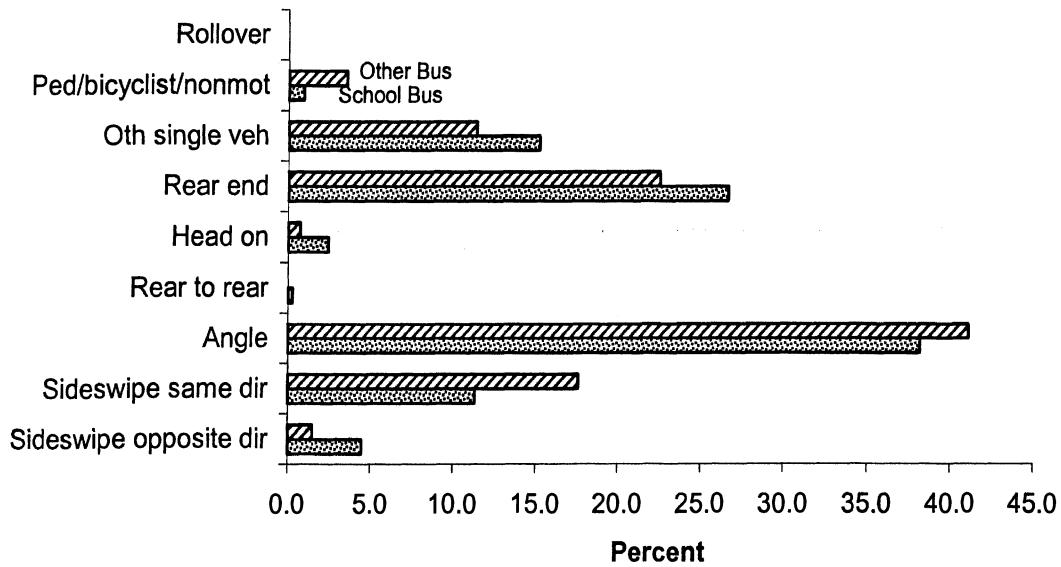
Collision Type	School bus		Other bus		All	
	N	%	N	%	N	%
Rollover	*	*	*	*	*	*
Ped/bicy/non-mot	200	0.9	900	3.5	1,200	2.1
Other single-vehicle	4,100	15.2	3,000	11.4	7,500	13.1
Rear-end	7,300	26.7	5,900	22.6	14,200	24.9
Head-on	700	2.4	200	0.7	900	1.5
Rear to rear	*	0.3	*	*	*	0.1
Angle	10,400	38.2	10,700	41.1	22,800	40.0
Sideswipe same dir	3,100	11.3	4,600	17.6	8,100	14.3
Sideswipe opp dir	1,200	4.5	400	1.5	1,800	3.1
Unknown	100	0.5	400	1.6	600	1.0
Annual	27,200	100.0	26,100	100.0	57,100	100.0

* GES sample size too small

Note: Annual average, includes an estimated 3,900 cases with unknown bus type.

Sources: 1995-1999 FARS, 1995-1999 GES

Figure 11: Manner of collision by bus type



Source: 1995-1999 FARS

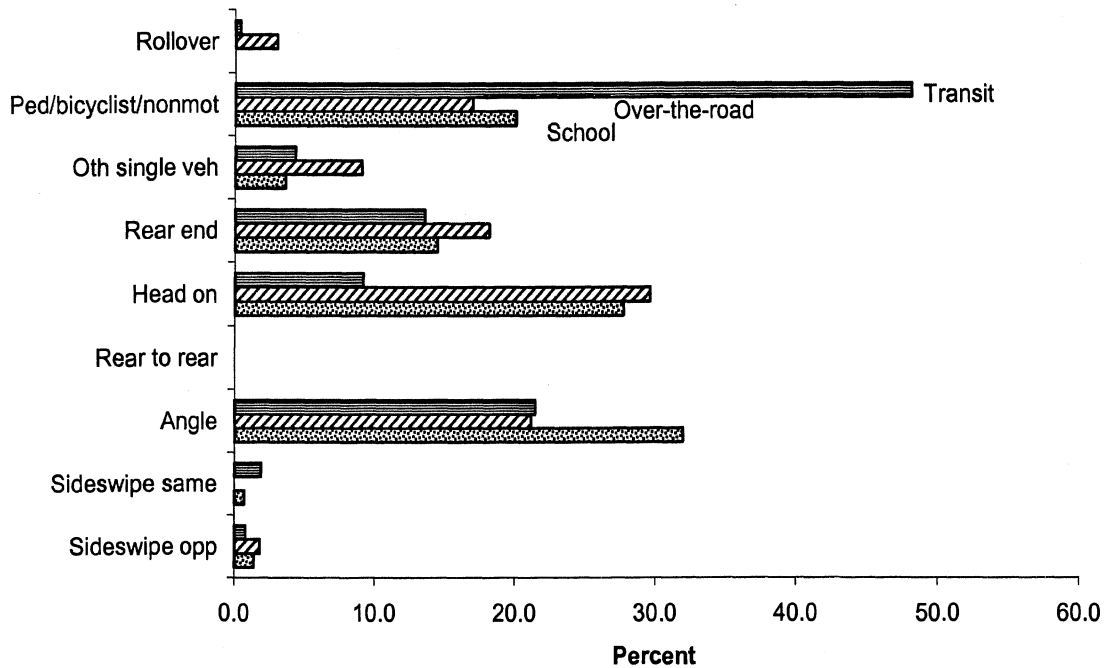
Average annual fatal bus involvements is shown according to collision type in table 11. More than 30% of all fatal involvements and about 48% of the fatal involvements of transit buses are collisions with a pedestrian, bicyclist, or other type of non-motorist. Another frequently occurring collision type in fatal accidents is the angle collision. School buses have a high proportion of angle collisions. Almost 30% of accidents involving over-the-road buses are head-on collisions.

Table 11: Annual average fatal bus involvements by manner of collision

Collision type	School		Over-the-road		Transit		Other		Total	
	N	%	N	%	N	%	N	%	N	%
Rollover	0	0.0	1	3.0	0.4	0.4	1.4	6.1	3	1.0
Ped/bicy/non-motor	23.6	20.1	5.6	17.0	51.2	48.3	5.8	25.2	91	30.7
Other single-vehicle	4.2	3.6	3	9.1	4.6	4.3	2.2	9.6	15.4	5.2
Rear end	17	14.5	6	18.2	14.4	13.6	2.2	9.6	41.2	13.9
Head on	32.6	27.8	9.8	29.7	9.8	9.2	5.8	25.2	61.4	20.7
Rear to rear	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Angle	37.6	32.0	7	21.2	22.8	21.5	5	21.7	77.8	26.2
Sideswipe same	0.8	0.7	0	0.0	2	1.9	0.4	1.7	3.4	1.1
Sideswipe opp	1.6	1.4	0.6	1.8	0.8	0.8	0.2	0.9	3.4	1.1
Unknown	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Annual	117.4	100.0	33	100.0	106	100.0	23	100.0	296.6	100.0

Source: 1995-1999 FARS

Figure 12: Manner of collision by bus type in fatal accidents



Source: 1995-1999 FARS

7 Driver age and sex

Table 12 shows the age distribution for drivers of school and other buses involved in all traffic accidents in 1995-1999. The age distributions of drivers of both bus types are similar, and the differences are not large enough to be statistically significant.

Table 12: Bus accident involvements by driver age

Driver age	School bus		Other bus		Total	
	N	%	N	%	N	%
No driver	*	0.2	300	1.2	400	0.6
<25	1,400	5.0	1,100	4.1	2,600	4.5
25-44	12,300	45.3	11,900	45.6	26,000	45.5
45-64	11,000	40.5	10,200	39.3	22,700	39.7
>64	1,500	5.7	1,100	4.3	2,900	5.0
Annual	27,200	100.0	26,100	100.0	57,100	100.0

* GES sample size too small

Note: Annual average includes an estimated 3,900 cases with unknown bus type.

Sources: 1995-1999 GES, 1995-1999 FARS

Table 13 shows the age distribution for drivers of school, over-the-road, transit, and other buses involved in fatal accidents for the five years, 1995-1999. Drivers between ages 25 and 64 were involved in over 90% of all fatal bus accidents. About 47.5% of drivers were in age group 45-64 and 42.6% were in age group 25-44. Transit bus drivers

are most often in the 25-44 years age group and over-the-road bus drivers are most often in the 45-64 years age group.

Table 13: Fatal bus accident involvements by driver age

Driver sex	School		Over-the-road		Transit		Other		Total	
	N	%	N	%	N	%	N	%	N	%
No driver	0.4	0.3	0.0	0.0	0.6	0.6	0.2	0.9	1.2	0.4
<25	4.0	3.4	0.4	1.2	3.2	3.0	1.0	4.3	9.2	3.1
25-44	48.8	41.6	10.6	32.1	49.6	46.8	9.4	40.9	126.4	42.6
45-64	55.2	47.0	18.6	56.4	49.2	46.4	11.2	48.7	140.8	47.5
>64	9.0	7.7	3.4	10.3	2.0	1.9	1.2	5.2	16.8	5.7
Annual	117.4	100.0	33.0	100.0	106.0	100.0	23.0	100.0	296.6	100.0

Source: 1995-1999 FARS

Overall, bus drivers involved in traffic accidents in 1995-1999 were more likely to be male (Table 14). Females accounted for more than half of the drivers of accident-involved school buses, while over 79% of the drivers of other buses in traffic accidents were male. Table 11 also shows a small percentage (0.6%) of buses involved in traffic accidents that were driverless. These are most likely buses not legally parked, and left unattended.

Table 14: Bus accident involvements by driver sex

Driver sex	School bus		Other bus		Total	
	N	%	N	%	N	%
No Driver	*	0.2	300	1.2	400	0.6
Male	10,100	37.2	20,500	78.6	33,200	58.2
Female	16,200	59.6	4,400	16.7	21,500	37.7
Annual	27,200	100.0	26,100	100.0	57,100	100.0

* GES sample size too small

Note: Annual average includes an estimated 3,900 cases with unknown bus type.

Sources: 1995-1999 GES, 1995-1999 FARS

In the case of fatal accidents also, the percentage of male bus drivers is much higher than female drivers. Over 90% of the drivers of over-the-road buses and 77.5% of transit bus drivers involved were male. Only 9.1% of over-the-road bus drivers and 21% of transit bus drivers involved were female. But more than half of the drivers of school

buses involved in fatal accidents were female. Females may be more likely to drive school buses, while most other bus drivers are male.

Table 15: Fatal bus accident involvements by driver sex

Driver sex	School		Over-the-road		Transit		Other		Total	
	N	%	N	%	N	%	N	%	N	%
No driver	0.4	0.3	0.0	0.0	0.6	0.6	0.2	0.0	1.2	0.4
Male	55.4	47.2	30.0	90.9	82.2	77.5	18.8	90.9	201.0	67.8
Female	61.6	52.5	3.0	9.1	22.2	20.9	4.0	9.1	92.6	31.2
Annual	117.4	100.0	33.0	100.0	106.0	100.0	23.0	100.0	296.6	100.0

Source: 1995-1999 FARS

8 Driver fatigue in fatal bus accidents

Table 16 shows the distribution of driver fatigue by bus type for buses involved in fatal accidents. Only fatal bus involvements are shown, because only the FARS file identifies the contribution of driver-related factors, including fatigue, to an accident. "Drowsy, asleep or fatigued" was coded as a contributing factor for five bus drivers out of a total of 1,483 buses involved in fatal accidents over the five year period, 1995-1999, for an average of one per year. There was only one case of a school bus driver, in five years, where the driver condition was coded as drowsy, fatigued or asleep, for an average of 0.2 per year.

Overall, 0.3% of bus drivers that are involved in fatal accidents were coded as drowsy, fatigued or asleep over the five-year period.

Table 16: Bus driver fatigue by bus type in fatal accidents

Bus type	No Fatigue		Fatigue		Total	
	N	%	N	%	N	%
School	117	99.8	0.2	0.2	117	100.0
Over-the-road	33	98.8	0.4	1.2	33	100.0
Transit	106	100.0	0.0	0.0	106	100.0
Other	23	98.3	0.4	1.7	23	100.0
Unknown	17	100.0	0.0	0.0	17	100.0
Total	296	99.7	1.0	0.3	297	100.0

Source: 1995-1999 FARS

The five cases of bus driver fatigue coded occurred in the years 1997, 1998 and 1999 (table 17). There were no fatal accidents with a bus driver coded as fatigued in 1995 or 1996.

Table 17: Bus driver fatigue by year in fatal accidents

Year	No Fatigue		Fatigue		Total	
	N	%	N	%	N	%
1995	266	100.0	0	0.0	266	100.0
1996	320	100.0	0	0.0	320	100.0
1997	293	99.7	1	0.3	294	100.0
1998	283	99.3	2	0.7	285	100.0
1999	316	99.4	2	0.6	318	100.0
Annual	296	99.7	1	0.3	297	100.0

Source: 1995-1999 FARS

Appendix

Fatal bus involvements by month, day of week and time of day are tabulated below.

Fatal bus involvements by month

Month	School		Over-the-road		Transit	
	N	%	N	%	N	%
January	78	13.3	11	6.7	50	9.4
February	71	12.1	9	5.5	40	7.5
March	49	8.3	12	7.3	45	8.5
April	60	10.2	10	6.1	38	7.2
May	58	9.9	24	14.5	49	9.2
June	19	3.2	9	5.5	33	6.2
July	11	1.9	15	9.1	39	7.4
August	17	2.9	13	7.9	42	7.9
September	55	9.4	21	12.7	52	9.8
October	50	8.5	13	7.9	48	9.1
November	60	10.2	18	10.9	54	10.2
December	59	10.1	10	6.1	40	7.5
Total	587	100.0	165	100.0	530	100.0

Source: FARS 1995-1999

Fatal bus involvements by day of week

Week	School		Over-the-road		Transit	
	N	%	N	%	N	%
Saturday	11	1.9	39	31.0	73	16.0
Sunday	6	1.0	23	18.3	38	8.3
Monday	119	20.3	19	15.1	90	19.7
Tuesday	105	17.9	20	15.9	71	15.5
Wednesday	128	21.8	21	16.7	74	16.2
Thursday	106	18.1	17	13.5	91	19.9
Friday	112	19.1	26	20.6	93	20.4
Total	587	100.0	126	100.0	457	100.0

Source: FARS 1995-1999

Fatal bus involvements by time of day

Time of day	School		Over-the-road		Transit	
	N	%	N	%	N	%
12am-1am	5	3.5	6	2.6	18	3.4
1am-2am	1	0.9	6	1.1	7	1.3
2am-3am	0	0.0	5	0.8	4	0.8
3am-4am	0	2.6	5	0.9	5	0.9
4am-5am	0	1.7	7	0.9	3	0.6
5am-6am	3	1.7	7	2.4	18	3.4
6am-7am	42	5.2	4	5.7	29	5.5
7am-8am	105	4.3	8	10.1	26	4.9
8am-9am	64	3.5	7	7.3	30	5.7
9am-10am	16	7.0	6	3.8	23	4.3
10am-11am	5	8.7	6	3.2	23	4.3
11am-12pm	17	3.5	8	3.4	21	4.0
12pm-1pm	19	5.2	6	4.0	26	4.9
1pm-2pm	17	4.3	7	3.6	21	4.0
2pm-3pm	71	7.8	5	7.7	27	5.1
3pm-4pm	119	9.6	10	12.4	39	7.4
4pm-5pm	63	5.2	14	8.6	35	6.6
5pm-6pm	10	6.1	4	4.7	44	8.3
6pm-7pm	9	5.2	11	4.8	39	7.4
7pm-8pm	1	6.1	6	2.8	21	4.0
8pm-9pm	6	1.7	9	2.6	20	3.8
9pm-10pm	7	3.5	9	2.6	18	3.4
10pm-11pm	6	0.9	5	2.0	14	2.6
11pm-12pm	0	1.7	4	1.8	19	3.6
unknown	1	0.0	0	0.1	0	0.0
Total	587	100.0	165	100.0	530	100.0