U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

The Effects of the 65 mph Speed Limit During 1987

A Report To Congress
January 1989

Report to Congress on the Effects of the 65 mph Speed Limit During 1987

January 1989

National Highway Traffic Safety Administration
U. S. Department of Transportation
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Section 1: Executive Summary

Introduction

The Surface Transportation and Uniform Relocation Assistance Act enacted by Congress on April 2, 1987, permitted states to raise the speed limit up to 65 miles per hour, (mph) on their rural Interstate highways. Thirty-eight states have opted for the higher speed limit on some or all of their eligible rural Interstates. Congress subsequently directed the National Highway Traffic Safety Administration (NHTSA) to assess the impact of the increased speed limit on highway safety. This is the first of three annual reports to Congress on the safety impact of the 65 mph speed limit.

This report indicates an increase of fatalities on all rural Interstate highways during calendar year 1987, but NHTSA emphasizes that with only one year of data, it is too early to draw any conclusions as to the long term effect of the increased speed limit on fatalities. There are substantial variations in state data; of the 38 states that raised the speed limit, 27 had an increase in fatalities during the time the increased speed limit was in effect in 1987 compared to the same time period in 1986, while 11 states had no increase, or a decrease in rural interstate fatalities. Likewise, of the 10 states that retained 55 mph, 6 remained unchanged or had a fatality increase in 1987 compared to 1986, and 4 had decreases. Collectively, the 38 states that raised their speed limit had a 19 percent average increase in rural Interstate fatalities. A large portion (64 percent) of this increase is from only 6 states. The 10 states that retained 55 mph also had an increase in fatalities on their rural Interstates of 7 percent.

The interstate system is the safest highway system in the United States and rural Interstate fatalities account for about 5 percent of total traffic fatalities each year. Thus, when assessing the fatality increase on rural Interstates, it must be recognized that any increase or decrease has a relatively small effect on the highway fatality total. In addition, many states have very few rural Interstate fatalities each year, thus their fatality changes, taken individually, may reflect normal random year to year fluctuations. In 1987, the overall highway fatality rate was 2.4 fatalities per one hundred million miles driven - the lowest highway fatality rate in U.S. history, and lower than any other country.

Background

The National Highway Traffic Safety Administration (NHTSA) was directed by Appropriations Committee reports to assess the impact of the increased speed limit on highway safety. The agency's study plan was submitted to the Appropriations Committees in November 1987; it indicated that the first of three annual reports would be submitted to Congress in 1988 and would contain an analysis of the 1987 calendar year's accident experience. This is the first annual report on the effects of the 65 mph speed limit. A second report will be submitted in 1989, followed by the final report in 1990.

The Conference Report accompanying the FY-88 Continuing Resolution directed NHTSA to submit an interim report on the safety effect of the 65 mph speed limit. The report, entitled, Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways, was submitted to Congress in May 1988. Using the best information available in early 1988, the report assessed: 1) the safety effects of the increased speed limit, 2) changes in the nature of crashes because of the higher speed limit, and 3) the safety impact of dual versus uniform speed limits for cars and trucks. The Interim Report contained accident data for the first nine months of 1987. Since speed limits on rural Interstates could not be increased until April 2, 1987, these nine months contained data for less than six months of post-65 mph crash experience. Recognizing that the increased speed limit had not been in effect long enough to determine its long term impact on safety, the principal conclusions of the Interim Report were:

1. Total rural Interstate fatalities (both in those states that raised the speed limit and in those that maintained a 55 mph limit) increased 18 percent during the first nine months of 1987, compared to the same period in 1986. This increase occurred in conjunction with a reduction in both urban Interstate and non-Interstate highway fatalities. For the thirty-seven states that raised speed limits by September 30, 1987, the 1986 to 1987 nine month increase was 18 percent, while for the eleven states that did not raise speed limits by this time, the increase was 17 percent.

2. It was not possible either to identify or to quantify all the factors that contributed to the 1987 rural Interstate fatality increase.

3. The 65 mph speed limit had not been in effect long enough (with data available only through September 1987) to determine its long-term effect on safety. More time with the increased speed limit was needed to provide enough data to made conclusions on the long-term safety effect.

Numerous states responded to the Interim Report and their comments are included in Appendix I.

As background to assessing the impact of the increased rural Interstate speed limit, it is important to note that the Interstate system is the safest highway system in the United States. The fatality rate on all U.S. roads in 1987 (using preliminary vehicle miles traveled information) was 2.4 fatalities per hundred million miles of vehicle travel. The Interstate fatality rate was 1.1 compared to the non-Interstate rate of 2.8. A further distribution of fatalities and vehicle miles traveled between rural Interstate and urban Interstate highways results in 1987 fatality rates of 1.5 and 0.9, respectively.

Another important characteristic of rural Interstates is their relationship to the total traffic fatality population. Historically, fatalities on rural Interstates represent about 5 percent of total traffic fatalities each year, or about 2,100 fatalities per year. Thus, when assessing the safety impact of the speed limit increase on rural Interstates, it must be recognized that fatalities on these highways are a relatively small component of the total highway fatality population.

This report assesses fatality changes on rural Interstates. Because rural Interstate fatalities account for a relatively small component of total traffic fatalities, changes in rural Interstate fatalities have a small effect on overall highway safety. For example, if rural Interstate fatalities were to increase by 20 to 25 percent (approximately 500 fatalities) due to an increase in the speed limit on these highways (as estimated by the National Academy of Sciences in their 1984 report to Congress), the effect on total highway fatalities would be about 1 percent.

This Report and the May 1988 Interim Report

This report, the first of three annual reports on the safety effects of the increased rural Interstate speed limit, contains information for the entire 1987 calendar year. It incorporates all post-65 mph 1987 data and contains preliminary vehicle travel and vehicle travel speed data. In addition to data on fatal crashes, the report includes data from states on police reported crashes. These data include information on property damage only crashes, crashes that result in non-fatal injuries, and crashes that result in fatalities. This report also includes data on rural Interstate fatal crashes in states with a uniform rural Interstate speed limit and states with dual speed limits (lower speeds for large trucks or other special vehicles). Also, the report addresses the issue raised by Congress concerning the 15 highway segments across the nation on which higher speeds have had the most adverse safety impact.

Findings

Rural Interstate Fatalities in 1987

An important observation is the state to state variation in 1986-1987 rural Interstate fatalities. For the 38 states that increased the rural Interstate speed limit in 1987, rural Interstate fatalities increased 21 percent compared to 1986 for the days the higher speed limit was in effect. However, of the 38 states, eleven had no increase or a decrease in rural Interstate fatalities while twenty-seven states had an increase. Further, eight of the 38 states (Arizona, California, New Mexico, North Carolina, Ohio, Tennessee, Texas, and Utah) accounted for 71 percent of the total 1986-1987 rural Interstate fatality increase in these 38 states. Many factors may have contributed to this state to state variation. For example, media coverage, public perception, random year-to-year fluctuation in rural Interstate fatality counts and different levels of enforcement and enforcement strategies may all have had an effect on fatality changes. The agency will explore these and other issues in future reports.

All rural Interstate fatalities in 1987 increased compared to 1986. The increase was 19 percent in the 38 states that increased the speed limit at some time during 1987 and 7 percent in the 10 states that retained the 55 mph speed limit on rural Interstates. Nationwide, rural Interstate fatalities increased 18 percent in the 48 states with these highways (Alaska and Delaware do not have rural Interstates) compared to 1986 (see table).

The fatality rate on rural Interstates increased by 15 percent in 1987 compared to 1986. The fatality rate increase was 14 percent in the 38 states that increased the speed limit. In the states that remained at 55 mph, the fatality rate was unchanged (see table).

As a complement to the 1986-1987 fatality comparisons, mathematical models that use long term fatality trends were developed to estimate 1987 rural Interstate fatalities. The best estimate is that rural Interstate fatalities in states that increased the speed limit were about 16 percent higher in 1987 than would have been expected from the historical relationship between fatality and travel changes.

Based on data provided by thirteen states in the first full calendar year quarter after the speed limit increase (July through September), average travel speeds on rural Interstates increased in states that increased the speed limit and provided data to NHTSA. The increase was from 60.3 mph to 62.2 mph compared to an increase from 57.2 mph to 57.6 mph in states that retained 55 mph.

The speed limit increase must be in effect for a longer period before its long term effect on highway safety can be determined.

Rural Interstate fatalities account for about 5 percent of total traffic fatalities. An increase in rural Interstate fatalities of 20-25 percent (as estimated by the National Academy of Science) would effect total highway fatalities by about 1 percent.

Fatalities On:	1986	1987	1987 vs. 1986 Change	Percent Change
Rural Interstates	2,131	2,504	+373	+18%
Urban Interstates	2,119	2,101	- 18	- 1%
Non-Interstates	41,837	41,781	- 56	0%

Fatalities On:	1986	1987	1987 vs. 1986 Change	Percent Change
Rural Interstates				
38 States with 65 mph	1,839	2,191	+352	+19%
10 States with 55 mph	292	313	+ 21	+ 7%
Urban Interstates				
38 States with 65 mph	1,616	1,498	-118	- 7%
10 States with 55 mph	503	603	+100	+20%
Non-interstates				
38 States with 65 mph	32,406	32,255	-151	0%
10 States with 55 mph	9,431	9,526	+ 95	+ 1%

Fatality Rate* On:	1986	1987	1987 vs. 1986
Rural Interstates			
All States	1.3	1.5	+15%
38 States with 65 mph	1.4	1.6	+14%
10 States with 55 mph	0.9	0.9	0%

All Other Highways	1986	1987	1987 vs. 1986
All States	2.6	2.5	- 4%
38 States with 65 mph	2.7	2.6	- 4%
10 States with 55 mph	2.3	2.3	0%

*Fatality Rate is fatalities per 100 million miles of travel.

Nature of Fatality Changes Associated with the Increase in Rural Interstate Speed Limit:

Two approaches were used to assess whether there were any substantial differences in the nature of rural Interstate fatalities in 1987 compared to 1986. That is, compared to the overall percentage increase in rural Interstate fatalities, an assessment of whether there were specific crash categories, such as the type of vehicle, roadway design, type of crash, or age of crash victim which had a percentage increase that was substantially higher than the overall percentage increase in rural Interstate fatalities. If there were, this could provide insight into the nature of the fatality increase. The first approach is the state-day approach. Here, fatalities occurring from the day the speed limit increased through December 1987, were combined for all 38 states that increased the speed limit. This total was compared to the fatality total for the identical state-days in 1986. In the second approach, total rural Interstate fatalities for the period June-December 1987 for all 28 states that increased the speed limit by June 1 were compared to the fatality total for the 28 states during June-December 1986. Neither of these two approaches indicated any particular crash category of rural Interstate fatalities that increased significantly.

Relationship of Selective Speed Limit Increases to Rural Interstate Fatalities:

Analysis of available data from states that selectively raised rural Interstate speed limits (leaving some road segments at 55 mph) indicates that in some states, fatalities increased more on the segments left at the lower speed limit than they did on segments with the higher speed limit. However, the number of fatalities involved and the inconsistent results among states lead to the conclusion that the effect of selective speed limit increases on fatalities is not known at this time.

Relationship of Dual Versus Uniform Speed Limits to Rural Interstate Safety:

Data from states that implemented dual speed limits (different limits for cars and trucks, or lower speed limits for certain hazardous conditions) are inadequate to indicate the safety effect of dual versus uniform speed limits.

The 15 Highway Segment Speed Limit Safety Impact Study

In the Conference Report accompanying the Department of Transportation FY-89 Appropriation, Congress requested that this report include a section identifying the 15 highway segments across the nation on which higher speeds have had the most adverse safety impact.

The Department does not have data available to address this question, nor is it clear what criterion should be used in making such a calculation. Even if the Department had the data, the approaches which could be taken are numerous and each could result in the identification of different segments. This report will be sent to all Governors to request each state's views on how to address the issue raised by Congress. The responses received from the states, along with the Department's analysis, will be submitted to Congress.

Report Requirement

The Surface Transportation and Uniform Relocation Assistance Act (STURAA) of 1987, enacted on April 2, 1987, allows states to raise the speed limit up to 65 miles per hour (mph) on Interstate highways passing through areas with populations less than 50,000. By April 6, 1987, four states had raised the speed limit on some of their eligible Interstate highways. Other state laws followed, and by the end of 1987, thirty-eight states had raised the speed limit on most of the eligible Interstate highway system. Two more states have raised speed limits in 1988, and other states are considering raising speed limits. Two states, Alaska and Delaware, do not have any rural Interstate highways.

The National Highway Traffic Safety Administration (NHTSA) was directed by Appropriations Committee reports to assess the impact of the increased speed limit on highway safety. The agency's study plan, submitted to the Appropriations Committees in November 1987, indicated that the first of three annual reports would be submitted to Congress in 1988 and would contain an analysis of the 1987 calendar year's accident experience. A second report will be submitted in September 1989, followed by the final report in December 1990.

Subsequently, in the Conference Report accompanying the FY-88 continuing Resolution, the Appropriations Committee directed NHTSA to submit an interim report on the safety impact of the 65 mph speed limit by March 15, 1988. An Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways was submitted to Congress in May 1988. It was based on data for the first nine months (January through September) of 1987. The principal conclusions of the Interim Report were:

1. Total rural Interstate fatalities (both in those states that raised the speed limit and in those that maintained a 55 mph limit) increased 18 percent during the first nine months of 1987, compared to the same period in 1986. This increase occurred in conjunction with a reduction in both urban Interstate and non-Interstate highway fatalities. For the thirty-seven states that raised speed limits by September 30, 1987, the 1986 to 1987 nine month increase was 18 percent, while for the eleven states that did not raise speed limits by this time, the increase was 17 percent.

2. It was not possible either to identify or to quantify all the factors that contributed to the 1987 rural Interstate fatality increase.

3. The 65 mph speed limit had not been in effect long enough (with data available only through September 1987) to determine its long-term effect on safety. More time with the increased speed limit was needed to provide enough data to made conclusions on the long-term safety effect.

Previous Analysis

In 1974, Congress enacted the 55 mph national maximum speed limit (NMSL) in response to the 1973 oil embargo. Congress had been involved with speed limits only once before, during World War II. Then, a nationwide speed limit of 35 mph was set to conserve fuel and rubber for the war. Between the end of World War II and 1974, each state set its own speed limits. In January 1974, Congress passed the Emergency Highway Energy Conservation Act, establishing the 55 mph NMSL.

The NMSL was in effect in all states by March 1974. Average speeds on rural Interstate highways decreased from 65.0 mph in 1973 to 57.6 mph in 1974. Although the NMSL was enacted to conserve fuel, a sharp drop in traffic fatalities (from 55,511 in 1973 to 46,402 in 1974) suggested that it had important safety effects as well. Other factors (such as reduced discretionary travel) also tended to reduce fatalities. However, most analyses concluded that lower travel speeds following the enactment of the NMSL prevented 3,000 to 5,000 traffic fatalities in 1974.

Over the next twelve years, speeds gradually increased. By 1986, the average speed on rural Interstate highways was 59.7 mph. The percent of vehicles exceeding 65 mph had doubled -- from 9 percent in 1974 to 18 percent in 1986. The 85th percentile speed (the speed at or below which 85 percent of traffic is traveling) on rural Interstate highways rose from 61.8 mph in 1976 (the first year this statistic was available) to 66.2 mph in 1986.

The safety effects of the NMSL are discussed in detail in 55: A Decade of Experience, prepared by the National Academy of Sciences at the request of Congress in 1984. The Academy concluded that:

> The NMSL saved lives, but that the benefits were eroding as speeds increased;
>
> The NMSL was saving an estimated 2,000 to 4,000 lives per year in the early 1980's; and
>
> Raising the speed limit on rural Interstates would result in approximately 500 additional fatalities per year.

This predicted fatality increase represents a 20 to 25 percent increase in rural Interstate fatalities.

Data and Analysis

This report uses 1987 fatality, injury, travel, and other data for the entire calendar year. Complete 1987 calendar year fatality data were available from the Fatal Accident Reporting System (FARS). As in the Interim Report, Alaskan Interstate highways (so-designated for funding purposes) are considered to be non-Interstates for this analysis; Alaskan Interstates are built to different design standards than are Interstates elsewhere. The FARS data were used to compare numbers and types of fatalities before and after the speed limit increase and to compare the experiences of different groups of states.

In addition to the fatality data from FARS, four states (Louisiana, Indiana, Missouri, and Texas) provided NHTSA with computerized accident data files that contain information on all police reported crashes in their state. These files provide information on property damage only crashes, non-fatal injury crashes, and fatal crashes before and after the increase in the rural Interstate speed limit. This crash and injury data complements the data from fatal crashes and are used to assess whether there has been an increase in the number of crashes, the severity of occupant injury in crashes, or both. Also, one state (North Carolina) provided crash and injury data for analysis. Finally, some states (Arizona and New Mexico) provided copies of their own analysis of the effect of the 65 mph speed limit in their state.

State speed monitoring data were available from most states through the Federal Highway Administration (FHWA). Since there was no requirement for states to collect travel speed data on rural Interstates with the increased speed limit, there were limited travel speed data collected on these roads after the speed limit change for describing how changes in the speed limit have changed travel speeds. Thirteen states that increased the rural Interstate speed limit provided complete travel speed data to NHTSA. Ten states had not increased their rural Interstate speed limit by the end of 1987. Complete travel speed data was available from eight of these states. These speed monitoring data were used to compare travel speeds before and after the speed limit change, on rural and on urban Interstates, both in states with and without a speed limit increase.

Preliminary travel (vehicle miles traveled - VMT) data were provided from the states through FHWA. These data were used to assess the effect of travel changes on the number of fatalities.

In this report, a variety of analytic approaches were employed to assess the effects of the increased speed limit on highway safety. One approach compares the crash experience on rural Interstates before and after introduction of the 65 mph speed limit and examines differences between states that increased speed limits and those that did not. As background for these comparisons, rural Interstate fatalities, as well as fatalities on other road systems over the period 1982-1987, are presented. Also, an assessment of changes in the nature of rural Interstate crashes is presented.

The comparisons contrast 1987 crash data to prior years. To complement these comparisons, a mathematical model using twelve years of fatality data was developed. The model estimates 1987 rural Interstate fatalities based on

the historical relationship between rural Interstate fatalities and fatalities on other highways. The model was used to estimate 1987 rural Interstate fatalities in the first 28 states that raised the speed limit. The estimated fatalities were compared with the actual fatality experience after the speed limit was raised.

This report uses complete 1987 data from the Fatal Accident Reporting System (FARS), supplemented with data from several state accident files. FARS uses FHWA land use categories:

> rural (areas with populations of less than 5,000) and
> urban (areas with populations of 5,000 or more).

FHWA subcategorizes urban areas as:

> small urban (areas with populations between 5,000 and 49,999) and
> urbanized (areas with populations of 50,000 or more).

These FHWA subcategories are not available on FARS.

The 1987 Surface Transportation and Uniform Relocation Assistance Act (STURAA) allows the 65 mph speed limit on Interstate highways passing through areas with populations less than 50,000. This is the combination of rural and small urban areas, according to FHWA definitions. Thus, FARS and STURAA use different upper limits in defining less-populated areas.

An additional complication is that some states left some miles of rural Interstate (eligible for the 65 mph speed limit) posted at 55 mph. Many states posted some eligible miles of urban Interstate at 65 mph. It is not easy (or even possible from the national data alone) to identify those segments whose speed limit was increased to 65 mph in 1987. Fortunately, useful analysis can be done using the rural Interstate system as a surrogate for the higher speed limit segments.

Most analysis was done using the rural Interstate system as a surrogate for the higher speed limit segments of the Interstate system. There were three reasons for using rural Interstate fatality changes alone as the basis for studying the effect of STURAA. First, rural Interstate miles are 96 percent of the miles eligible for the 65 mph speed limit. Second, speed limits were increased on 97 percent of the eligible rural Interstate miles in states that raised the speed limit. And third, rural Interstate highways are easily identified in FARS. There are six states that maintained at least 7 percent of their rural Interstate miles at 55 mph. Fatality data from four of these states (California, Louisiana, North Carolina, and Ohio) on both the segments of rural Interstates eligible for 65 mph and posted at 65 mph, as well as segments eligible for 65 mph but posted at 55 mph, were available to assess the sensitivity of the overall results to the use of this surrogate. These data do not allow firm conclusions on the results of maintaining a 55 mph speed limit on selected miles of the rural Interstate system. Section 6 provides an analysis of selective speed limit increases on rural Interstates.

Because such a large portion (97 percent) of the eligible rural Interstate highways had speed limits increased, the agency believes that the rural Interstate system is an excellent surrogate for highways with the higher speed limit.

The agency would welcome comments from states on the use of the surrogate as well as the safety effects of maintaining a 55 mph speed limit on rural Interstates eligible for posting at 65 mph.

Report Organization

Section 1 summarizes the Findings from analysis of the 1987 fatality, injury, travel, and speed data. The later sections describe these results in more detail.

Section 2 (this section) includes relevant Background information for understanding the speed limit increase and the fatality and injury changes.

Section 3 puts fatality changes in perspective by providing data on Monthly Fatalities since 1982, by road type. A Time Series Analysis of Fatality Changes, described in Section 4 (and Appendix II), produces an estimate of the effect of the 65 mph speed limit after accounting for concurrent safety and travel changes. Section 5 discusses the 15 Highway Segment Speed Limit Safety Impact Study in which Congress requests the identification of the 15 highway segments across the nation on which higher speeds have had the most adverse safety impact.

Two variants in state implementation of speed limit increases are addressed in Section 6 (Selective Speed Limit Increases -- for states that left some rural Interstate miles posted at 55 mph) and Section 7 (Dual Speed Limits -- in states that restricted larger vehicles or vehicles driving under certain conditions to 55 mph after the speed limit was generally raised to 65 mph).

Changes in where, when, and to whom rural Interstate fatalities occurred -- changes in the Nature of Fatalities -- are described in Section 8 (and Appendix IV); these are compared with fatalities on other roads in these states and with fatalities in other states. Changes in the Number of Injuries (by injury severity) are described in Section 9 using data from several states.

The available Travel Speed data are summarized in Section 10. The effect of changes in Vehicle Travel on fatality changes are explored in Section 11. Research Plans (including several contract and grant activities in progress) are described in Section 12.

Two other appendices are included. Appendix I presents letters received from the states in response to the Interim report of May 1988. Appendix III - Exploration of State Differences, identifies factors in states that had fatality increases after the speed limit was raised to 65 mph.

Section 3: Monthly Fatalities

One difficulty in identifying and quantifying fatality changes is the inherent variability of fatality counts. This is especially true for small subsets of the data, such as fatalities on rural Interstates by month. This section presents six years of monthly fatality data in order to compare 1987 to 1986, as well as to fatality trends from 1982-1986.

The simple fatality comparisons provided here rule out many explanations of the fatality increase noted after the speed limit increase. The 1987 rural Interstate fatality increase is not explained by any of the following: a general fatality increase, a general Interstate fatality increase, a long term increase on rural Interstate roads, the selection of 1986 as the comparison year, or an increase in the number of fatalities per fatal accident.

Fatality Counts

There are about 4,000 fatalities on Interstate highways each year, and about half of these occur on rural Interstates. The relatively small number of rural Interstate fatalities that occur each month (usually between one hundred and two hundred-fifty) makes it difficult to interpret short-term changes. To reduce the effect of the annual variability, 1987 fatalities were compared to the 1982-1986 average, as well as to 1986 alone.

Table 3-1 shows the number of fatalities on all roads for each month from January 1982 through December 1987. The ratio of 1987 fatalities to 1986 fatalities and to the 1982-1986 average are presented for each month and for the year. A ratio of 1.04 implies a 4 percent increase; a ratio of 0.98 implies a 2 percent decrease. Total fatalities in 1987 were 1 percent higher than the total for 1986; they were 5 percent higher than the previous five-year average.

Table 3-1: Monthly Traffic Deaths on All Road Types

	Deaths on All Roads						1987 vs	1982-86	1987 vs
Month	1982	1983	1984	1985	1986	1987	1986	Average	Average
January	2,888	2,875	2,830	2,908	3,123	3,072	0.98	2,925	1.05
February	2,768	2,695	2,765	2,592	2,676	2,845	1.06	2,699	1.05
March	3,305	3,079	3,304	3,212	3,417	3,364	0.98	3,263	1.03
April	3,523	3,257	3,249	3,524	3,508	3,488	0.99	3,412	1.02
May	3,886	3,669	3,764	3,927	4,173	4,081	0.98	3,884	1.05
June	3,826	3,703	4,089	4,220	4,305	4,130	0.96	4,029	1.03
July	4,293	4,146	4,251	4,110	4,495	4,241	0.94	4,259	1.00
August	4,220	4,155	4,253	4,375	4,730	4,711	1.00	4,347	1.08
September	3,947	3,987	4,134	3,838	4,003	4,145	1.04	3,982	1.04
October	4,094	3,970	4,048	3,891	4,114	4,380	1.06	4,023	1.09
November	3,520	3,552	3,741	3,809	3,787	4,021	1.06	3,682	1.09
December	3,675	3,501	3,829	3,419	3,756	3,908	1.04	3,636	1.07
Total	43,945	42,589	44,257	43,825	46,087	46,386	1.01	44,141	1.05

Interstate fatalities in 1987 were 8 percent higher than in 1986 and 11 percent higher than the five-year average (Table 3-2). Non-Interstate fatalities (including a small number of fatalities on unknown road types) in 1987 were close to the 1986 level and 4 percent above the five-year average (Table 3-3). These data indicate that 1987 Interstate fatalities increased more than those on non-Interstate roads.

Table 3-2: Monthly Traffic Deaths on Interstate Roads

	Deaths on All Interstate Roads						1987 vs	1982-86	1987 vs
Month	1982	1983	1984	1985	1986	1987	1986	Average	Average
January	275	273	235	289	273	286	1.05	269	1.06
February	274	270	263	242	236	236	1.00	257	0.92
March	315	282	335	292	318	350	1.10	308	1.13
April	334	285	326	313	304	334	1.10	312	1.07
May	349	340	361	390	365	381	1.04	361	1.06
June	333	376	428	384	412	455	1.10	387	1.18
July	437	429	371	404	469	481	1.03	422	1.14
August	410	424	450	445	441	485	1.10	434	1.12
September	369	337	444	357	336	416	1.24	369	1.13
October	354	341	374	352	372	449	1.21	359	1.25
November	314	328	328	323	371	388	1.05	333	1.17
December	319	327	355	323	353	344	0.97	335	1.03
Total	4,083	4,012	4,270	4,114	4,250	4,605	1.08	4,146	1.11

Table 3-3: Monthly Traffic Deaths on Noninterstate Roads

	Deaths on Non-Interstate Roads						1987 vs	1982-86	1987 vs
Month	1982	1983	1984	1985	1986	1987	1986	Average	Average
January	2,613	2,602	2,595	2,619	2,850	2,786	0.98	2,656	1.05
February	2,494	2,425	2,502	2,350	2,440	2,609	1.07	2,442	1.07
March	2,990	2,797	2,969	2,920	3,099	3,014	0.97	2,955	1.02
April	3,189	2,972	2,923	3,211	3,204	3,154	0.98	3,100	1.02
May	3,537	3,329	3,403	3,537	3,808	3,700	0.97	3,523	1.05
June	3,493	3,327	3,661	3,836	3,893	3,675	0.94	3,642	1.01
July	3,856	3,717	3,880	3,706	4,026	3,760	0.93	3,837	0.98
August	3,810	3,731	3,803	3,930	4,289	4,226	0.99	3,913	1.08
September	3,578	3,650	3,690	3,481	3,667	3,729	1.02	3,613	1.03
October	3,740	3,629	3,674	3,539	3,742	3,931	1.05	3,665	1.07
November	3,206	3,224	3,413	3,486	3,416	3,633	1.06	3,349	1.08
December	3,356	3,174	3,474	3,096	3,403	3,564	1.05	3,301	1.08
Total	39,862	38,577	39,987	39,711	41,837	41,781	1.00	39,995	1.04

There is a marked difference in the fatality experience of urban and rural Interstates. In 1987, urban Interstate fatalities were 1 percent lower than they were in 1986 and 5 percent higher than the five-year average (Table 3-4). Rural Interstate fatalities in 1987 were 18 percent higher than in 1986 and 17 percent higher than for the five-year average (Table 3-5). Thus, while all Interstate fatalities were at higher levels in 1987 than in 1986 or in the five-year average, they were especially high on rural Interstate roads. (Fatalities on Interstates with unknown land use are included in Table 3-2, but not in either Table 3-4 or 3-5.)

Table 3-4: Monthly Traffic Deaths on Urban Interstate Roads

	Deaths on Urban Interstate Roads						1987 vs	1982-86	1987 vs
Month	1982	1983	1984	1985	1986	1987	1986	Average	Average
January	129	146	126	145	148	139	0.94	139	1.00
February	155	141	143	121	110	122	1.11	134	0.91
March	158	120	154	152	176	152	0.86	152	1.00
April	154	139	177	153	142	155	1.09	153	1.01
May	155	183	199	182	182	145	0.80	180	0.80
June	160	174	199	168	207	205	0.99	182	1.13
July	205	173	147	169	229	210	0.92	185	1.14
August	197	185	187	183	192	215	1.12	189	1.14
September	174	151	208	175	169	186	1.10	175	1.06
October	167	162	176	184	190	238	1.25	176	1.35
November	166	158	155	151	208	170	0.82	168	1.01
December	170	146	172	168	166	164	0.99	164	1.00
Total	1,990	1,878	2,043	1,951	2,119	2,101	0.99	1,996	1.05

Table 3-5: Monthly Traffic Deaths on Rural Interstate Roads

	Deaths on Rural Interstate Roads						1987 vs	1982-86	1987 vs
Month	1982	1983	1984	1985	1986	1987	1986	Average	Average
January	143	126	109	144	125	147	1.18	129	1.14
February	118	129	120	121	126	114	0.90	123	0.93
March	157	162	180	140	142	198	1.39	156	1.27
April	179	146	149	160	162	179	1.10	159	1.12
May	194	156	161	208	183	236	1.29	180	1.31
June	172	201	229	216	205	250	1.22	205	1.22
July	231	256	224	235	240	271	1.13	237	1.14
August	213	239	263	262	249	270	1.08	245	1.10
September	193	185	236	182	167	230	1.38	193	1.19
October	185	179	198	168	182	211	1.16	182	1.16
November	148	170	173	172	163	218	1.34	165	1.32
December	148	181	183	155	187	180	0.96	171	1.05
Total	2,081	2,130	2,225	2,163	2,131	2,504	1.18	2,146	1.17

Since December 1986, rural Interstate fatalities have been higher each month than they were in the same month of the previous year (Table 3-5) except for February and December 1987. Because of this increase in number of rural Interstate fatalities, these fatalities are a larger portion of all Interstate fatalities (Table 3-6) and of fatalities on all road types (Table 3-7) in 1987 than they were in either 1986 or the five-year average.

Table 3-6: Deaths on Rural Interstates as a Percent of All Interstates

	Of Interstate Deaths, Percent Rural						1987 vs	1982-86	1987 vs
Month	1982	1983	1984	1985	1986	1987	1986	Average	Average
January	52.6	46.3	46.4	49.8	45.8	51.4	1.12	48.2	1.07
February	43.2	47.8	45.6	50.0	53.4	48.3	0.90	47.8	1.01
March	49.8	57.4	53.9	47.9	44.7	56.6	1.27	50.7	1.12
April	53.8	51.2	45.7	51.1	53.3	53.6	1.01	51.0	1.05
May	55.6	46.0	44.7	53.3	50.1	61.9	1.24	50.0	1.24
June	51.8	53.6	53.5	56.3	49.8	54.9	1.10	53.0	1.04
July	53.0	59.7	60.4	58.2	51.2	56.3	1.10	56.2	1.00
August	52.0	56.4	58.4	58.9	56.5	55.7	0.99	56.5	0.99
September	52.6	55.1	53.2	51.0	49.7	55.3	1.11	52.3	1.06
October	52.6	52.5	52.9	47.7	48.9	47.0	0.96	50.9	0.92
November	47.1	51.8	52.7	53.3	43.9	56.2	1.28	49.6	1.13
December	46.5	55.4	51.5	48.0	53.0	52.3	0.99	51.0	1.03
Average	51.1	53.1	52.1	52.6	50.1	54.4	1.08	51.8	1.05

Table 3-7: Deaths on Rural Interstate Roads as a Percent of All Roads

	Of All Deaths, Percent Rural Interstate						1987 vs	1982-86	1987 vs
Month	1982	1983	1984	1985	1986	1987	1986	Average	Average
January	4.95	4.38	3.85	4.95	4.00	4.79	1.20	4.42	1.08
February	4.26	4.79	4.34	4.67	4.71	4.01	0.85	4.55	0.88
March	4.75	5.26	5.45	4.36	4.16	5.89	1.42	4.79	1.23
April	5.08	4.48	4.59	4.54	4.62	5.13	1.11	4.67	1.10
May	4.99	4.25	4.28	5.30	4.39	5.78	1.32	4.64	1.24
June	4.50	5.43	5.60	5.12	4.76	6.05	1.27	5.08	1.19
July	5.38	6.17	5.27	5.72	5.34	6.39	1.20	5.57	1.15
August	5.05	5.75	6.18	5.99	5.26	5.73	1.09	5.64	1.02
September	4.89	4.64	5.71	4.74	4.17	5.55	1.33	4.84	1.15
October	4.52	4.51	4.89	4.32	4.42	4.82	1.09	4.53	1.06
November	4.20	4.79	4.62	4.52	4.30	5.42	1.26	4.49	1.21
December	4.03	5.17	4.78	4.53	4.98	4.61	0.93	4.70	0.98
Average	4.74	5.00	5.03	4.94	4.62	5.40	1.17	4.86	1.11

Fatal Accident Counts

A fatal accident can have several fatalities. Some of the monthly rural Interstate fatality variation is explained by randomness in the number of people killed per accident. The data for rural Interstate fatal accidents (Table 3-8) show a little less variation than among fatalities on these roads (compare to Table 3-5). Still, these fatal accidents increased 17 percent over 1986 levels and 14 percent over the five-year average.

Table 3-8: Rural Interstate Fatal Accidents

	Fatal Accidents on Rural Interstate Roads						1987 vs	1982-86	1987 vs
Month	1982	1983	1984	1985	1986	1987	1986	Average	Average
January	122	120	97	125	98	124	1.27	112	1.10
February	102	106	107	103	104	105	1.01	104	1.01
March	132	132	148	124	127	162	1.28	133	1.22
April	144	120	132	141	142	153	1.08	136	1.13
May	172	129	145	181	159	184	1.16	157	1.17
June	150	167	191	185	162	205	1.27	171	1.20
July	201	223	190	198	207	222	1.07	204	1.09
August	171	207	213	212	218	227	1.04	204	1.11
September	165	162	190	164	143	202	1.41	165	1.23
October	157	155	177	137	160	180	1.13	157	1.15
November	134	149	153	144	133	188	1.41	143	1.32
December	122	156	161	133	158	164	1.04	146	1.12
Total	1,772	1,826	1,904	1,847	1,811	2,116	1.17	1,832	1.14

Section 4: Time Series Analysis of Fatality Changes

As a complement to the 1986-1987 fatality comparisons presented earlier, mathematical models were developed using rural Interstate fatality data from 1975 through 1986. These mathematical, or time series, models allow the comparison of 1987 rural Interstate fatality counts to what would be expected on the basis of 1975 through 1986 fatality data. This is in contrast to the fatality comparisons discussed previously which compare 1987 fatality data to 1986 and the 1982-1986 average only.

Time series models develop relationships between some particular parameter (in this case rural Interstate fatalities) and some other companion series. These companion series are discussed in Appendix II. When a good historical relationship is found through statistical tests, the model can be used to estimate 1987 rural Interstate fatalities based on the trend over time (i.e., the time series) between rural Interstate fatalities and some other companion series. Time series analysis of fatality data from 1975 through 1987 produced an estimate that rural Interstate fatalities increased 18 percent after states raised the speed limit to 65 mph. Analysis of the effect of vehicle travel increases suggests that about 2 percent of the fatality increase can be explained by travel increases and that 1987 rural Interstate fatalities were about 16 percent higher in 1987 than would have been expected from the historical relationship between fatality and travel changes. The model results are consistent with the 1986-1987 fatality comparisons discussed earlier in this report and summarized in the table contained in the Executive Summary.

The various models that were developed and results obtained with these models are presented in Appendix II.

Section 5: The 15 Highway Segment Speed Limit Safety Impact Study

In the Conference Report accompanying the Department of Transportation's FY-89 Appropriation, Congress requested that this report include a section identifying the 15 highway segments across the nation on which higher speeds have had the most adverse safety impact.

The agency, working with the Federal Highway Administration, has attempted to address this question. There is no universally accepted definition of a highway segment on which to base such an analysis. Additionally, even were such a definition available, it is not clear what criterion should be used to define the safety or the safety impact related to the speed limit increase.

The difficulty in addressing this issue is demonstrated by considering the Carrollton, Kentucky, school bus crash that occurred last May. This one crash, in which there were 27 fatalities, occurred on a rural Interstate highway posted at 65 mph. One approach to assess the safety on this highway would be to determine the number of traffic casualties that occurred on the entire length of Interstate I-71. This approach would define the miles of I-71 as a "segment" and the safety of the segment as the number of casualties occurring both before the increased speed limit and after 65 mph was implemented. Since Kentucky had 36 rural Interstate fatalities in all of 1986, this criterion would result in a very large change between 1986 (when 55 mph was in effect) and 1988 (when 65 mph was in effect). In fact, the large increase would be due in part to counting 27 fatalities which occurred on this highway and were due to drunk driving, not the increased speed limit.

Another approach would be to disaggregate I-71 into a series of segments, each one being, for example, 10 miles. The same method discussed above would be employed, except here the number of casualties on each 10 mile segment before the increased limit and after 65 was implemented. Clearly, the same phenomenon discussed above would result.

The intent of Congress appears to be the identification of certain segments of the Interstate system that have experienced a significant decrease in safety during the period of increased speed limits. As the above discussion illustrates, and the data in this report demonstrate, rural Interstate fatalities can vary dramatically from year to year in a state. This characteristic makes a calculation of safety on a particular segment of the rural Interstate system in a state meaningless.

As Section 6 of this report indicates, some states implemented the 65 mph speed limit on their eligible rural Interstate highways on the basis of their own analysis of crashes, injuries, and fatalities on these highways. Clearly, states have the data on which to assess measures of safety on their rural Interstate highways. Therefore, this report will be mailed to the Governor of each state, and their views on how to address the issue raised by Congress will be specifically requested. The responses received from the states will be analyzed, and the Department will submit the responses, along with the analysis, to Congress.

Section 6: Selective Speed Limit Increases

Most states that raised the speed limit to 65 mph did so on nearly all eligible miles of rural Interstate and small urban Interstate roads. A few states performed safety studies before implementation and retained the 55 mph speed limit on certain sections of highway. At least one state (Louisiana) restored the 55 mph speed limit on some road segments after further review. These decisions were motivated by safety considerations, so a natural question is what effect selective speed limit increases had on safety.

The available fatality data in states that posted some rural Interstate miles at 65 mph and left other rural Interstate miles at 55 mph are inconclusive. Four states (California, Louisiana, North Carolina, and Ohio) that left at least 7 percent of their rural Interstate miles at 55 mph, although they were eligible for 65 mph posting, were analyzed. In California and North Carolina, the percent increase in 1987 rural Interstate fatalities compared to 1986 was larger on those segments that remained at 55 mph than the segments posted at 65 mph. In Louisiana and Ohio, the percent fatality increase was larger on those segments posted at 65 mph. It should be noted, however, that the fatality counts are small, and the percent changes from year-to-year due to the normal fluctuation in small fatality counts mask any differences due to selective speed limit increases. Accordingly, these results do not allow an assessment of the safety effects of leaving certain highways eligible for 65 mph posted at 55 mph.

The agency would welcome comments from the states on the safety effects of maintaining 55 mph on highways eligible for 65 mph.

Approach

Most states that raised the speed limit did so on most of the miles eligible for the 65 mph speed limit under STURAA. The data provided by the states through the Federal Highway Administration are shown in Table 6-1.

Six states left at least 7 percent of their rural Interstate miles at 55 mph: California, Florida, Louisiana, New Hampshire, North Carolina, and Ohio. Of these, New Hampshire was eliminated from this analysis because there were only 15 miles of rural Interstate posted at 55 mph.

Data from Florida could not be used because the specific road section could not be identified from the FARS data, even with the help of the FARS analyst in the state. For other states, it was necessary to use information beyond that available on the FARS analysis file. In these cases, the FARS analyst reviewed the individual case and supplementary data from other state highway records. Without this review, it would not have been possible to accurately classify fatalities by highway segment and the associated posted speed limit. Data from four states were used in assessing the effects of selective speed limit increases: California, Louisiana, North Carolina, and Ohio. The remainder of this section describes the available data.

Table 6-1: Interstate Miles Posted at 65 mph (see note below)

State	Eligible Miles		Posted Miles		Percent Posted	
	Rural	Urban	Rural	Urban	Rural	Urban
Alabama	658	29	658	29	100%	100%
Arizona	1,055	47	1,055	47	100%	100%
Arkansas	420	27	410	27	98%	100%
California	1,417	91	1,085	69	77%	76%
Colorado	783	6	783	3	100%	50%
Florida	931	3	847	2	91%	67%
Idaho	539	43	507	43	94%	100%
Illinois	1,410	34	1,410	34	100%	100%
Indiana	850	27	813	22	96%	81%
Iowa	653	11	635	10	97%	91%
Kansas	708	23	703	22	99%	96%
Kentucky	575	38	575	38	100%	100%
Louisiana	514	23	477	23	93%	100%
Maine	314	3	313	3	100%	100%
Michigan	761	22	761	22	100%	100%
Minnesota	688	16	688	16	100%	100%
Mississippi	569	29	569	29	100%	100%
Missouri	838	26	838	26	100%	100%
Montana	1,141	46	1,141	32	100%	70%
Nebraska	445	3	437	3	98%	100%
Nevada	503	6	497	0	99%	0%
New Hampshire	179	18	164	10	92%	56%
New Mexico	902	55	902	55	100%	100%
North Carolina	644	35	486	35	75%	100%
North Dakota	534	12	534	12	100%	100%
Ohio	878	26	808	24	92%	92%
Oklahoma	724	58	716	48	99%	83%
Oregon	582	37	571	37	98%	100%
South Carolina	643	0	643	0	100%	-
South Dakota	633	7	633	7	100%	100%
Tennessee	756	27	738	27	98%	100%
Texas	2,288	165	2,288	165	100%	100%
Utah	756	19	756	19	100%	100%
Vermont	299	14	288	12	96%	86%
Washington	511	21	505	21	99%	100%
West Virginia	449	9	449	9	100%	100%
Wisconsin	507	8	507	8	100%	100%
Wyoming	866	32	866	32	100%	100%
Change in 1987	27,923	1,096	27,056	1,021	97%	93%
Georgia	872	53	872	53	100%	100%
Virginia	767	27	749	27	98%	100%
Change in 1988	1,639	80	1,621	80	99%	100%

Note - Eligible and posted mileage obtained by the Federal Highway Administration from states. Data may vary slightly from data reported in 1987 Highway Statistics.

Table 6-1: Interstate Miles Posted at 65 mph (continued)

State	Eligible Miles		Posted Miles		Percent Posted	
	Rural	Urban	Rural	Urban	Rural	Urban
Alaska	0	0	0	0	-	-
Connecticut	108	4	0	0	0%	0%
Delaware	0	0	0	0	-	-
District of Columbia	0	0	0	0	-	-
Hawaii	5	0	0	0	0%	-
Maryland	163	3	0	0	0%	0%
Massachusetts	172	14	0	0	0%	0%
New Jersey	129	2	0	0	0%	0%
New York	865	57	0	0	0%	0%
Pennsylvania	1,164	20	0	0	0%	0%
Rhode Island	28	0	0	0	0%	-
No Change	2,634	100	0	0	0%	0%
Subtotals						
Change in 1987	27,923	1,096	27,056	1,021	97%	93%
Change in 1988	1,639	80	1,621	80	99%	100%
No Change	2,634	100	0	0	0%	0%
National total	32,196	1,276	28,677	1,101	89%	86%

California

On May 14, 1987 California passed a law allowing 65 mph speed limits on some Interstate roads. On May 29, signs for the higher speed limit were posted. Some rural Interstate miles are posted at 55 mph, and some small urban Interstate miles are posted at 65 mph. Overall, 77 percent of the eligible Interstate miles are posted at 65 mph.

The 1986 FARS California data do not include trafficway identifier and milepoint. Instead, this information was extracted from the Highway Performance Monitoring System (HPMS) designator. The 1986 FARS data file contains the HPMS designator for all California Interstate fatal accidents. The HPMS designator is not available on the FARS "analytical" file for California. For this project, it was extracted from the FARS "master" file from which the analytical file is created. The HPMS designator was interpreted to determine the trafficway identifier and milepoint at which the accident occurred. These variables, together with the county in which the accident occurred, were used to classify the accident by road segment type using a list of 65 mph road segments provided by the state of California.

The 1987 FARS California data do contain trafficway identifier and milepoint on the "analytical" file. These were used as a check on the speed limit coding. The agreement between the variables was very good.

Table 6-2 shows the results of the comparison for fatalities that occurred from May 15 through December 31. Fatalities increased from 257 in 1986 to 297 in 1987 on Interstate roads that retained the lower speed limit. The increase was less on roads whose speed limit was increased on May 15.

Table 6-3 shows the comparison for fatalities after the speed limit signs were changed: from May 29 through December 31. Fatalities increased from 246 in 1986 to 278 in 1987 on Interstates eligible for 65 mph but posted at 55 mph, and remained almost constant on Interstates with posted speed limits of 65 mph.

It would be useful to study travel speed and speed variance changes on the segments of the rural Interstate left at 55 mph, as compared to segments with the higher speed limit. These data are not available to NHTSA.

Table 6-2: California Fatalities After the Speed Limit Increase from May 15 through December 31

	1986	1987
Rural Interstate		
Changed Speed Limit	110	116
Retained Speed Limit	56	65
Urban Interstate		
Changed Speed Limit	11	14
Retained Speed Limit	201	232

Table 6-3: California Fatalities After Higher Speed Limits Posted from May 29 through December 31

	1986	1987
Rural Interstate		
Changed Speed Limit	106	102
Retained Speed Limit	52	60
Urban Interstate		
Changed Speed Limit	10	13
Retained Speed Limit	194	218

Louisiana

On April 6, 1987 Louisiana raised speed limits on the eligible Interstate miles. On June 15, the 55 mph speed limits were restored on three rural elevated bridge segments. This left 93 percent of the eligible Interstate miles at 65 mph.

The fatalities were classified by whether or not the speed limit was raised, with the help of the FARS analyst in the state. Table 6-4 shows that in Louisiana, rural Interstate fatalities increased from 29 in 1986 to 50 in 1987 on those segments with a 65 mph speed limit at the end of the year. There were very few fatalities on rural Interstate segments that never were increased to 65 mph; fatalities decreased from 4 to 3 on these segments. It is not possible to draw conclusions from small changes in small numbers.

There were three elevated bridge sites whose speed limit was raised to 65 mph on April 8 and 9, 1987 and lowered back to 55 mph the following June 15. The fatalities on these segments are tabulated separately. Six fatalities occurred here on the 1986 comparison days, but none in 1987.

Table 6-4: Louisiana Fatalities After the Speed Limit Increase from April 6 through December 31

	1986	1987
Rural Interstate		
Changed Speed Limit	29	50
Retained Speed Limit	4	3
Bridges	6	0
Urban Interstate		
Changed Speed Limit	1	0
Retained Speed Limit	19	16
Bridges	0	0

North Carolina

On August 10, 1987 North Carolina raised speed limits on 77 percent of their eligible Interstate miles. The analysis of the fatalities and injuries by Interstate road segment was performed by the Highway Safety Research Center at North Carolina, using state data files available to them. Identifying the accidents by road segment required the cooperation and help of the state Division of Highways.

Table 6-5 shows fatality changes on Interstate roads after the speed limit increase. From August 15 through the end of 1986, there was only one fatality on a rural Interstate road segment that retained the 55 mph speed limit in 1987; on the same days in 1987, there were ten fatalities on these roads. On the Interstates that increased the speed limit, fatalities increased from 15 in 1986 to 24 in 1987. Fatalities on Interstates that both retained and changed the speed limit are small and yearly changes are due to random fluctuation in these year-to-year fatality counts.

Tables 6-6 through 6-8 show injury counts for decreasing injury thresholds: incapacitating injuries and greater, non-incapacitating injuries and greater, and possible injuries and greater (respectively). All three tables confirm the indications of Table 6-5. Injury increases were greater on rural Interstates that retained the 55 mph speed limit than on rural Interstates that increased the speed limit to 65 mph.

The North Carolina results (for fatalities and injuries) generally agree with the California results (for fatalities). Both show that after the speed limit was raised to 65 mph on some Interstate segments, casualties increased more on rural Interstate segments that retained the 55 mph speed limit than on rural Interstate segments with the higher speed limit. The data from the other two states available for this comparison (Louisiana and Ohio) showed somewhat different results; but in these states the fatality counts on rural Interstate roads with the 55 mph speed limit were very small (no more than six in either state for either year).

Table 6-5: North Carolina Fatalities After Higher Speed Limits Posted from August 15 through December 31

	1986	1987
Rural Interstate		
Changed Speed Limit	15	24
Retained Speed Limit	1	10
Urban Interstate		
Changed Speed Limit	0	0
Retained Speed Limit	14	10

Table 6-6: North Carolina Injuries After Higher Speed Limits Posted
(Incapacitating and Fatal Injuries)
from August 15 through December 31

	1986	1987
Rural Interstate		
Changed Speed Limit	95	108
Retained Speed Limit	25	45
Urban Interstate		
Changed Speed Limit	0	0
Retained Speed Limit	91	98

Table 6-7: North Carolina Injuries After Higher Speed Limits Posted
(Non-incapacitating, Incapacitating, and Fatal Injuries)
from August 15 through December 31

	1986	1987
Rural Interstate		
Changed Speed Limit	216	248
Retained Speed Limit	63	90
Urban Interstate		
Changed Speed Limit	0	0
Retained Speed Limit	282	271

Table 6-8: North Carolina Injuries After Higher Speed Limits Posted
(All Injuries, Including Fatal Injuries)
from August 15 through December 31

	1986	1987
Rural Interstate		
Changed Speed Limit	365	480
Retained Speed Limit	130	184
Urban Interstate		
Changed Speed Limit	0	0
Retained Speed Limit	746	826

Ohio

On July 15, 1987 Ohio raised speed limits on 92 percent of their eligible Interstate miles. Table 6-10 shows fatality counts by whether the fatality occurred on a segment the state changed to 65 mph, or a segment on which 55 mph was retained. This determination was made by the FARS analyst after reviewing the available Ohio data, including data not included on the FARS automated files.

On Ohio rural Interstates, fatalities increased on both segments that retained the 55 mph speed limit and segments with the increased speed limit. However, the number of fatalities in each group was small, making it impossible to draw conclusions based on percentage change in small numbers. In particular, the 55 mph speed limit comparison was based on only three fatalities in 1986 and only six in 1987. Counts this small are subject to large random fluctuations.

Table 6-10: Ohio Fatalities After the Speed Limit Increase from July 15 through December 31

	1986	1987
Rural Interstate		
Changed Speed Limit	11	23
Retained Speed Limit	3	6
Urban Interstate		
Changed Speed Limit	11	18
Retained Speed Limit	61	29

Section 7: Dual Speed Limits

Several states that raised speed limits on rural Interstate roads elected to establish lower speeds for large trucks or for other special vehicles. At this time, there are not adequate data to assess the safety impact of these special provisions in the rural Interstate speed limits.

Approach

Thirteen states that raised speed limits in 1987 (plus Virgina, with a law that went into effect on July 1, 1988) have special provisions in their laws. Table 7-1 lists the exceptions to the 65 mph speed limit. Some exceptions apply only to trucks over a specified gross vehicle weight (gvw) rating. Others apply to conditions requiring more caution (such as school buses, vehicles carrying hazardous materials, nighttime driving, and mountain driving).

Table 7-1: Speed Limit Restrictions

State	Vehicles or Conditions Restricted to Lower Speed Limits
Alabama	Limit 55 mph for vehicles carrying hazardous materials
California	Limit 55 mph for trucks and specified other vehicles
Colorado	Lower speeds for large trucks in the mountains
Illinois	Limit 55 mph for trucks over 8,000 pounds gvw
Indiana	Limit 55 mph for trucks over 26,000 pounds gvw (eff. 4/88)
Maine	Limit 55 mph for loaded school buses
Michigan	Limit 55 mph for trucks over 5,000 pounds gvw
Missouri	Limit 55 mph for trucks over 24,000 gvw
Montana	Limit 55 mph for trucks and all vehicles at night
Ohio	Limit 55 mph for trucks over 8,000 gvw and school buses
Oregon	Limit 55 mph for trucks and other heavy vehicles
Texas	Limit trucks to 60 mph during the day and 55 mph at night
Virginia	Limit 55 mph for trucks and tractor-trailers
Washington	Limit 60 mph for trucks

States that established dual speed limits tended to raise the speed limit later than states that uniformly raised the speed limit to 65 mph. Dual speed limit implementation dates are shown in Table 7-2.

Table 7-2: Dual Speed Limit Implementation Dates

State	Implementation Date
Alabama	August 1, 1987
California	May 14, 1987
Colorado	April 6, 1987
Illinois	April 28, 1987
Indiana	April 1988
Maine	June 12, 1987
Michigan	November 29, 1987
Missouri	April 30, 1987
Montana	April 22, 19987
Ohio	July 15, 1987
Oregon	September 30, 1987
Texas	May 9, 1987
Virginia	July 1, 1988
Washington	April 22, 1987

Dual speed limits are meant to restrict some vehicles to lower speeds than other traffic. If these speed limits affect safety, the effect might be most easily seen in the frequency of interactions between vehicles restricted to different speeds. For example, the frequency of cars and heavy trucks involved together in fatal accidents might be different for states with dual speed limits for these two vehicle classes than for states with uniform speed limits.

Tractor-trailers are simpler to identify than are heavy straight trucks of specified weight capacities. Therefore, this section provides counts of fatal accidents involving both a car and a tractor-trailer. Counts of fatal accidents involving only a car and counts of fatal accidents involving only a tractor-trailer are provided for perspective.

Results

There are a relatively few rural Interstate fatalities in accidents involving a heavy truck each year in states with a dual speed limit. Since states that implemented a dual speed limit tended to raise the speed limit later in 1987, there are currently few fatalities available for an assessment of the effect of dual speed limits on safety. The available fatality data are shown in Tables 7-3 through 7-5.

Each table compares four groups of states in four subtables:

First, thirteen states with a 55 mph speed limit through 1987 that applied to all vehicles;

Second, four states with different speed limits for mountains, night, or set at 60 mph for trucks;

Third, four states with a 65 mph speed limit for cars and a 55 mph speed limit for heavy trucks; and

Fourth, twenty states with a 65 mph speed limit in effect by June 1, 1987 that applied to all vehicles.

Table 7-3 shows there were few fatalities each year in accidents involving a car and a tractor-trailer on rural Interstates. The number of these was higher in 1987 than it had been in the previous five years for states with a uniform speed limit in 1987 -- either a 55 mph speed limit or a 65 mph speed limit for all vehicles. There was little or no change in the two groups of states with either type of dual speed limit, but the fatality counts are especially low in these states.

Table 7-4 shows comparable data for all other roads (urban Interstates and non-Interstates, combined). Table 7-5 shows fatalities on all roads, the sum of Tables 7-3 and 7-4.

It is impossible to evaluate the safety impact of a dual speed limit from these data. The agency will continue to monitor the fatality trends and explore the use of state data for this assessment in subsequent reports.

The agency requests comments from states concerning their experience with dual and uniform speed limits. Additionally, the agency would welcome comments from the states on the safety impact of dual versus uniform speed limits.

Table 7-3: Fatal Accidents on Rural Interstates
(June through December)

Speed Limit 55 mph for All Vehicles

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1982	65	16	18	71	170
1983	58	22	22	71	173
1984	58	25	15	69	167
1985	64	23	15	63	165
1986	64	12	18	75	169
1987	64	20	26	70	180
1982-87 Change	-1.5%	25.0%	44.4%	-1.4%	5.9%

Speed Limit Over 55 mph for Some Conditions

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1982	74	26	12	96	208
1983	58	19	16	116	209
1984	70	20	6	115	211
1985	70	11	13	97	191
1986	71	14	11	93	189
1987	79	9	12	95	195
1982-87 Change	6.8%	-65.4%	0.0%	-1.0%	-6.3%

Speed Limit 65 mph (Cars), 55 mph (Trucks)*

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1982	70	22	20	73	185
1983	72	18	13	103	206
1984	73	24	16	95	208
1985	68	17	12	89	186
1986	77	17	18	120	232
1987	79	19	18	130	246
1982-87 Change	12.9%	-13.6%	-10.0%	78.1%	33.0%

Speed Limit 65 mph for All Vehicles*

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1982	160	36	38	160	394
1983	151	49	32	189	421
1984	174	47	42	217	480
1985	143	38	34	225	440
1986	147	39	24	200	410
1987	180	45	51	270	546
1982-87 Change	12.5%	25.0%	34.2%	68.8%	38.6%

*1987 is the only year with the 65 mph speed limit. All other years were 55 mph.

Table 7-4: Fatal Accidents on Other than Rural Interstates
(June through December)

Speed Limit 55 mph for All Vehicles

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1982	2,205	73	170	2,867	5,315
1983	2,137	84	189	2,851	5,261
1984	2,206	84	185	2,857	5,332
1985	2,035	93	182	3,045	5,355
1986	2,310	88	179	3,263	5,840
1987	2,330	82	181	3,377	5,970
1982-87 Change	5.7%	12.3%	6.5%	17.8%	12.3%

Speed Limit Over 55 mph for Some Conditions

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1982	987	40	117	1,778	2,922
1983	876	65	108	1,762	2,811
1984	856	72	115	1,820	2,863
1985	762	56	116	1,718	2,652
1986	781	34	83	1,659	2,557
1987	728	48	80	1,635	2,491
1982-87 Change	-26.2%	20.0%	-31.6%	-8.0%	-14.8%

Speed Limit 65 mph (Cars), 55 mph (Trucks)*

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1982	1,679	54	103	2,568	4,404
1983	1,537	65	154	2,529	4,285
1984	1,653	65	153	2,727	4,598
1985	1,537	65	159	2,685	4,446
1986	1,630	73	165	3,046	4,914
1987	1,656	79	152	3,071	4,958
1982-87 Change	-1.4%	46.3%	47.6%	19.6%	12.6%

Speed Limit 65 mph for All Vehicles*

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1982	1,969	94	216	3,557	5,836
1983	1,905	117	239	3,458	5,719
1984	1,899	106	230	3,693	5,928
1985	1,834	90	236	3,682	5,842
1986	1,871	92	249	3,692	5,904
1987	1,816	90	236	3,784	5,926
1982-87 Change	-7.8%	-4.3%	9.3%	6.4%	1.5%

*Status of speed limit on rural Interstates in 1987. Data presented is for all other roads (urban Interstate and non-Interstate).

Table 7-5: Fatal Accidents on All Roads
(June through December)

Speed Limit 55 mph for All Vehicles

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1982	2,270	89	188	2,938	5,485
1983	2,195	106	211	2,922	5,434
1984	2,264	109	200	2,926	5,499
1985	2,099	116	197	3,108	5,520
1986	2,374	100	197	3,338	6,009
1987	2,394	102	207	3,447	6,150
1982-87 Change	5.5%	14.6%	10.1%	17.3%	12.1%

Speed Limit Over 55 mph for Some Conditions

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1983	934	84	124	1,878	3,020
1984	926	92	121	1,935	3,074
1985	832	67	129	1,815	2,843
1986	852	48	94	1,752	2,746
1987	807	57	92	1,730	2,686
1982-87 Change	-23.9%	-13.6%	-28.7%	-7.7%	-14.2%

Speed Limit 65 mph (Cars), 55 mph (Trucks)*

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1982	1,749	76	123	2,641	4,589
1983	1,609	83	167	2,632	4,491
1984	1,726	89	169	2,822	4,806
1985	1,605	82	171	2,774	4,632
1986	1,707	90	183	3,166	5,146
1987	1,735	98	170	3,201	5,204
1982-87 Change	-0.8%	28.9%	38.2%	21.2%	13.4%

Speed Limit 65 mph for All Vehicles*

Year	Car Only	Tractor Only	Car-to-Tractor	Other	Total
1982	2,129	130	254	3,717	6,230
1983	2,056	166	271	3,647	6,140
1984	2,073	153	272	3,910	6,408
1985	1,977	128	270	3,907	6,282
1986	2,018	131	273	3,892	6,314
1987	1,996	135	287	4,054	6,472
1982-87 Change	-6.2%	3.8%	13.0%	9.1%	3.9%

*Status of speed limit on rural Interstates in 1987.

Section 8: Nature of Fatalities

Two approaches were used to assess whether there were any substantial differences in the nature of rural Interstate fatalities in 1987 compared to 1986. The objective was to determine if there were specific categories (such as types of vehicles or types of crashes) in which 1987 rural Interstate fatalities increased at a much higher percentage level than the overall percentage increase in rural Interstate fatalities from 1986 to 1987. Neither of the approaches indicated any particular characteristic of rural Interstate fatalities that increased significantly. While both approaches indicated a 1986-1987 percentage increase in fatalities of individuals under 5, these fatality counts are too small to determine if the increase is real or due to the random year-to-year fluctuation in small fatality counts. Additionally, there is no logical reason for fatalities in this age group to increase differently from other age groups for reasons associated with a speed limit increase.

The data from both approaches indicate that rural Interstate fatality increases were very large in some states, but were unchanged or declined in others. Additionally, in some states that increased the rural Interstate speed limit, fatalities on these highways declined while for some states that retained 55 mph, rural Interstate fatalities increased. Finally, a relatively small portion of the states accounted for the majority of the fatality increase on rural Interstates.

Approaches

Previous sections discussed the increase in 1987 rural Interstate fatalities and described characteristics of states with large fatality increases. This section describes the fatality changes on rural Interstate highways using other available FARS data. The tables attempt to isolate the fatality increase to particular situations, vehicles, and people.

While all types of fatalities increased, some increased more than others. There are two comparison approaches used. One set of tables (Tables 8-1 through 8-3 and IV-1 through IV-14) compare fatalities on rural Interstates with fatalities on other roads (urban Interstates and non-Interstates) in the same states for the same periods. These are called internal comparisons.

The second set of tables (Tables 8-4 through 8-5 and IV-15 through IV-29) compare fatalities on rural Interstates in states that increased the speed limit early (by June 1, 1987) with fatalities in states that increased the speed limit later (but by the end of 1987), and with fatalities in states that did not raise the speed limit during 1987. These are called external comparisons. Each set of comparisons helps put the fatality changes after the speed limit increase in perspective.

Finally, a third set of tables (Table IV-30 through IV-38) explore some possible complicating factors. These include factors which might have increased fatalities temporarily in 1987 (factors such as road construction, weather, and hazardous cargo transportation) or might indicate more lasting changes to road safety (factors such as the prevalence of alcohol involvement and safety belt use). The tables do not suggest an explanation of the fatality increase that occurred after the speed limit was increased.

Internal Comparisons

The following seventeen tables summarize fatality data from states after the speed limit increase. At two extremes, the tables include fatalities from April 6 through December 31 for Colorado, Louisiana, Nevada, and New Mexico; but they include fatalities from only November 29 through December 31 for Michigan. This produces comparisons based on total 1987 post-change data. The changes from 1986 to 1987 are shown for these state-days, for rural Interstate, urban Interstate, and non-Interstate involvements.

For the thirty-eight states that raised rural Interstate speed limits during 1987, on the days after the speed limit change:

> Rural Interstate fatalities increased 21 percent,
> Urban Interstate fatalities decreased 10 percent, and
> Non-Interstate fatalities were essentially unchanged --

compared to the same days in 1986. The data are shown as Table 8-1, by state.

For comparison, fatalities from January 1 through the last day of the 55 mph speed limit are shown in Table 8-2. For the same thirty-eight states, on the days before the speed limit change in 1987:

> Rural Interstate fatalities increased 15 percent,
> Urban Interstate fatalities decreased 1 percent, and
> Non-Interstate fatalities decreased 1 percent --

compared to the same days in 1986.

Fatality changes for all 1986 and 1987 can be calculated from the sum of Tables 8-1 and 8-2. For the thirty-eight states that raised the speed limit in 1987:

> Rural Interstate fatalities increased from 1,839 in 1986 to 2,191 in 1987 (a 19 percent increase),
>
> Urban Interstate fatalities decreased from 1,616 in 1986 to 1,498 in 1987 (a 7 percent decrease), and
>
> Non-Interstate fatalities decreased from 32,406 in 1986 to 32,255 in 1987 (a decrease of less than half a percent).

Rural Interstate fatal accidents increased 21 percent (Table 8-3) after the speed limit increase -- the same increase noted for rural Interstate fatalities. Thus, the national increase in rural Interstate fatalities is not accounted for by increases in the number of fatalities per fatal accident. However, increases in a particular state may reflect the randomness of vehicle occupancy and survival in serious accident, which are expressed as fatalities per fatal accident. Further analysis of the internal comparisons is provided in Appendix IV.

Table 8-1: Fatalities After the Speed Limit Increase
from the Day of the Increase through December 31
-- State in which the Fatality Occurred

State	Rural Interstate		Urban Interstate		Non-Interstate	
	1986	1987	1986	1987	1986	1987
Alabama	27	29	11	10	397	448
Arizona	75	131	19	18	650	573
Arkansas	18	26	5	9	408	429
California	166	181	212	246	3,260	3,247
Colorado	63	43	31	26	404	416
Florida	98	77	49	62	1,754	1,779
Idaho	21	26	8	5	172	169
Illinois	44	53	78	70	1,102	1,095
Indiana	35	34	18	12	626	613
Iowa	5	18	7	5	301	339
Kansas	15	18	13	8	304	311
Kentucky	18	21	24	10	437	509
Louisiana	39	53	21	16	640	543
Maine	9	8	4	3	134	151
Michigan	2	2	3	2	137	131
Minnesota	9	17	16	14	342	318
Mississippi	30	44	7	16	524	531
Missouri	49	54	43	64	727	621
Montana	28	20	1	2	150	149
Nebraska	8	13	6	2	191	205
Nevada	25	31	6	9	157	171
New Hampshire	5	4	8	2	123	140
New Mexico	63	94	17	14	307	352
North Carolina	12	33	19	14	618	628
North Dakota	4	4	1	1	78	74
Ohio	14	29	72	47	770	846
Oklahoma	40	38	30	21	444	417
Oregon	7	6	6	3	148	165
South Carolina	25	36	15	2	515	549
South Dakota	5	11	0	0	107	92
Tennessee	42	59	44	39	736	779
Texas	147	163	221	169	2,025	1,847
Utah	28	45	15	5	185	153
Vermont	2	5	0	0	90	91
Washington	23	26	24	24	488	529
West Virginia	13	13	8	7	284	309
Wisconsin	6	15	2	2	468	477
Wyoming	27	32	8	2	91	74
Total	1,247	1,512	1,072	961	20,294	20,270

Eight of the 38 states (Arizona, California, New Mexico, North Carolina, Ohio, Tennessee, Texas, and Utah) accounted for 71 percent of the 1986-1987 increase in rural Interstate fatalities (1,512 - 1,247 = 265).

For this calculation, a state had to have at least 15 more rural Interstate fatalities in 1987 than it had in 1986.

Table 8-2: Fatalities Before the Speed Limit Increase from January 1 through the Day Before the Increase -- State in which the Fatality Occurred

State	Rural Interstate		Urban Interstate		Non-Interstate	
	1986	1987	1986	1987	1986	1987
Alabama	47	32	13	20	586	571
Arizona	30	24	8	10	225	181
Arkansas	18	8	4	4	150	163
California	67	85	77	118	1,471	1,627
Colorado	12	16	9	6	84	84
Florida	29	34	36	22	865	865
Idaho	5	6	2	0	50	56
Illinois	9	16	13	21	350	405
Indiana	17	24	8	4	334	368
Iowa	8	5	1	3	119	121
Kansas	9	12	7	5	152	137
Kentucky	18	15	8	8	300	281
Louisiana	7	26	7	0	218	189
Maine	5	1	0	0	62	69
Michigan	13	39	60	60	1,390	1,363
Minnesota	0	6	9	4	195	171
Mississippi	13	4	3	2	194	159
Missouri	22	9	16	21	272	275
Montana	4	5	0	0	39	58
Nebraska	6	2	2	5	77	70
Nevada	1	8	4	1	40	42
New Hampshire	2	2	3	1	31	30
New Mexico	13	24	3	2	96	82
North Carolina	34	38	26	19	938	852
North Dakota	2	0	1	0	14	22
Ohio	25	30	43	38	749	782
Oklahoma	14	8	7	4	163	109
Oregon	34	19	12	5	412	422
South Carolina	21	42	13	7	470	450
South Dakota	0	5	0	0	22	26
Tennessee	18	26	16	17	374	328
Texas	53	79	120	112	1,001	891
Utah	13	8	3	2	69	83
Vermont	0	4	0	0	17	19
Washington	6	8	5	6	157	187
West Virginia	3	1	4	3	128	138
Wisconsin	10	3	0	7	261	293
Wyoming	4	5	1	0	37	16
Total	592	679	544	537	12,112	11,985

Table 8-3: Fatal Accidents After the Speed Limit Increase from the Day of the Increase through December 31 -- State in which the Accident Occurred

State	Rural Interstate		Urban Interstate		Non-Interstate	
	1986	1987	1986	1987	1986	1987
Alabama	25	24	11	9	361	390
Arizona	72	106	18	18	572	497
Arkansas	16	23	5	6	360	368
California	138	152	187	227	2,892	2,920
Colorado	47	41	27	24	334	361
Florida	79	70	40	60	1,589	1,630
Idaho	19	26	6	5	145	155
Illinois	40	45	68	65	1,000	986
Indiana	31	31	16	12	558	563
Iowa	4	17	7	5	264	310
Kansas	13	17	13	8	250	265
Kentucky	15	20	18	9	395	457
Louisiana	36	43	17	15	559	493
Maine	8	7	4	3	118	136
Michigan	2	2	3	2	126	114
Minnesota	9	14	15	13	304	282
Mississippi	24	37	7	15	459	458
Missouri	42	44	40	59	624	557
Montana	25	18	1	2	127	130
Nebraska	7	10	5	2	173	181
Nevada	21	27	5	8	139	156
New Hampshire	3	4	8	2	118	127
New Mexico	54	82	15	12	268	306
North Carolina	11	25	13	13	571	569
North Dakota	4	4	1	1	67	67
Ohio	11	26	64	45	698	761
Oklahoma	27	31	22	21	401	375
Oregon	5	6	5	3	134	146
South Carolina	22	30	12	2	464	491
South Dakota	5	7	0	0	94	77
Tennessee	39	48	39	36	658	689
Texas	121	133	195	150	1,772	1,651
Utah	25	38	14	5	167	143
Vermont	2	5	0	0	75	77
Washington	20	25	24	22	448	462
West Virginia	11	12	8	6	251	271
Wisconsin	6	10	2	2	400	422
Wyoming	23	22	8	1	76	68
Total	1,062	1,282	943	888	18,011	18,111

External Comparisons

Rural Interstate fatalities increased from 2,131 in 1986 to 2,504 in 1987 (by 18 percent). The twenty-eight states that raised the speed limit by June 1, 1987 had an 18 percent increase in rural Interstate fatalities (1,503 in 1986 and 1,770 in 1987). Ten other states that raised the speed limit during 1987 had a 25 percent rural Interstate fatality increase (336 in 1986 and 421 in 1987). Fatalities on rural Interstates in states that did not raise the speed limit during 1987 increased 7 percent (292 in 1986 and 313 in 1987).

The data are shown in Table 8-4. The urban Interstate and non-Interstate fatalities shown include those that occurred in Alaska, Delaware, and the District of Columbia -- jurisdictions with no rural Interstate miles.

Table 8-4: Whole-Year Fatality Changes
by Date of Speed Limit Change and Road Class

Speed Limit	Rural Interstate			Urban Interstate			Non-Interstate		
Change Date	1986	1987	Change	1986	1987	Change	1986	1987	Change
By June 1	1,503	1,770	18%	1,260	1,223	-3%	23,077	22,779	-1%
Later in 1987	336	421	25%	356	275	-23%	9,329	9,476	2%
Total in 1987	1,839	2,191	19%	1,616	1,498	-7%	32,406	32,255	0%
Not in 1987	292	313	7%	503	603	20%	9,431	9,526	1%
Total	2,131	2,504	18%	2,119	2,101	-1%	41,837	41,781	0%

Speed Limit	All Roads		
Change Date	1986	1987	Change
By June 1	25,840	25,772	0%
Later in 1987	10,021	10,172	2%
Not in 1987	10,226	10,442	2%
Total	46,087	46,386	1%

As described in Section 4 (Time Series Analysis of Fatality Changes) and Appendix II, fatalities in states that raised the speed limit to 65 mph historically do not track closely with fatalities in states that retained the 55 mph speed limit through 1987. Thus, it is difficult to interpret the relative changes in rural Interstate fatalities among the three groups of states considered here.

Table 8-5 (and Tables IV-15 through IV-29 in Appendix IV) compares types of rural Interstate fatalities for three groups of states:

28 states with higher speed limits by June 1, 1987;
10 other states that increased speed limits during 1987; and
10 states that did not raise speed limits in 1987.

This last group includes Georgia and Virginia, which increased speed limits in 1988; but does not include Alaska, Delaware, and the District of Columbia, which do not have any rural Interstate miles.

For each of the three groups of states, fatalities were tabulated for the period June 1 through December 31. For the first group of states, higher speed limits were in effect for the whole seven months. For the second group, higher speed limits were in effect for between one and seven months. For the third group, speeds were limited to 55 mph for the whole seven months. Thus, although the time periods compared are the same, the conditions differ.

During the seven months compared here, rural Interstate fatalities increased 17 percent (from 986 to 1,156) in the twenty-eight states that raised speed limits by June 1, 1987. During these months, rural Interstate fatalities increased 25 percent in the other ten states that raised the speed limit during 1987; they increased 7 percent in states that retained the 55 mph speed limit through 1987.

Rural Interstate fatalities increased in most states, but the increase was larger and occurred in more states with a speed limit increase (Table 8-5). Rural Interstate fatalities increased in:

21 of 28 states that raised speed limits by June 1, 1987;
7 of 10 other states with speed limit increases during 1987; and
4 of 10 states that retained the 55 mph speed limit through 1987.

The number of rural Interstate fatalities in a single state in one year is small and subject to random variability. Understanding these fatality changes is helped by looking for patterns among states, identifying particular types of fatalities that have increased most, and investigating changes in nonfatal injury frequency.

Table 8-5: Rural Interstate Fatalities, June through December -- State in which the Fatality Occurred

State	By June 1, 1987		Later in 1987		Not in 1987	
	1986	1987	1986	1987	1986	1987
Alabama			44	36		
Arizona	64	108				
Arkansas	17	22				
California	155	158				
Colorado	55	37				
Connecticut					7	7
Florida	78	69				
Georgia					56	40
Hawaii					1	1
Idaho	21	25				
Illinois	41	47				
Indiana	35	34				
Iowa	5	18				
Kansas	14	16				
Kentucky			20	23		
Louisiana	33	45				
Maine			9	8		
Maryland					13	13
Massachusetts					9	9
Michigan			11	25		
Minnesota			9	17		
Mississippi	26	38				
Missouri	44	45				
Montana	23	17				
Nebraska	8	13				
Nevada	20	22				
New Hampshire	5	4				
New Jersey					1	6
New Mexico	51	79				
New York					27	38
North Carolina			29	44		
North Dakota	4	2				
Ohio			20	35		
Oklahoma	27	34				
Oregon			29	17		
Pennsylvania					51	64
Rhode Island					3	4
South Carolina			32	43		
South Dakota	4	10				
Tennessee	34	55				
Texas	139	147				
Utah	28	41				
Vermont	2	5				
Virginia					29	29
Washington	15	23				
West Virginia	12	11				
Wisconsin			7	15		
Wyoming	26	31				
Total	986	1,156	210	263	197	211

Seven of the 28 states (Arizona, Iowa, Louisiana, Mississippi, New Mexico, Tennessee, and Utah) accounted for 84 percent of the 1986-1987 increase in rural Interstate fatalities (1,156 - 986 = 170). For this calculation, a state had to have at least 12 more rural Interstate fatalities than it had in 1986.

Section 9: Injuries in Crashes

From 1986 to 1987, fatalities increased 21 percent on rural Interstates during the period the speed limit was increased. An important question is whether more casualties occurred due to an increase in crashes, whether the severity of crashes increased, or both.

Answering this question requires nonfatal accident data. Only fatality data are available in a common format from all states. Differences in state coding have been largely resolved by individual case review by a trained FARS analyst in each state, and questions about an individual case can be further resolved by the FARS analyst as needed. No such consistent and comprehensive data base exists for nonfatal accidents. The national injury data that do exist do not produce state-level estimates and so are not suitable for studying state issues.

There are individual state data files available for each state. However, there are limitations to an analysis from a few state accident data files because the rural Interstate fatality increase was not uniform. Some states had particularly large fatality increases, other states had only small increases, and in a few states fatalities decreased after the speed limit increase. In addition, many states have very few rural Interstate fatalities each year. Their fatality changes, taken individually, may reflect random year-to-year fluctuations.

Unless all or most states are included in an analysis of nonfatal accidents, the results are at best only suggestive of the national experience. Further work will involve attempting to acquire accident and injury data in a consistent format from each state. This should allow more definitive conclusions on the effect of the speed limit on the frequency of accident occurrence and the injury distribution in accidents.

For this report, accident data or reports were available from four states that experienced large rural Interstate fatality increases after the speed limit increase and from three states with small rural Interstate fatality increases. This information was used to explore whether states with large fatality increases also had large nonfatal injury increases and large increases in total accidents. Because only four states were analyzed, results cannot be used to estimate the national changes in injuries and accidents on rural Interstate roads.

The available state accident data suggest that states which experienced large fatality increases on rural Interstate highways had smaller increases in less-serious accidents. In these states, fatality increases may be more the result of increases in crash severity than in crash frequency, though both factors are important.

Data available from states with only small rural Interstate fatality increases (or small decreases) generally show changes in the range of zero to ten percent in the number of nonfatal injuries and noninjury involvements.

Approach

State data were available from three different sources. First, eighteen states have been providing copies of their state accident data files to the agency for the past few years. Data from several available state accident data files were tabulated for this report. The criteria for inclusion were as follows:

> A state with a speed limit increase and a large rural Interstate fatality increase that could provide complete 1986 and 1987 data in time for analysis (Louisiana); and
>
> States with a speed limit increase but without a large rural Interstate fatality increase that could provide complete 1986 and 1987 data in time for analysis, with preference given to states included in the Interim Report to Congress and those that could provide data early, in time for analysis (Indiana, Missouri, and Texas).

Second, two states with large fatality increases (Arizona and New Mexico) could not provide data files in time for this analysis, but had performed their own analysis. The results of their analysis are described in this report.

Third, an additional state that had a large rural Interstate fatality increase after the speed limit increase (North Carolina) provided data tabulations for this report under an existing contract with NHTSA.

Data from four states with large fatality increases were available for this report. According to the FARS data:

> Arizona rural Interstate fatalities increased from 75 in 1986 to 131 in 1987, for the period after the speed limit increase.
>
> Louisiana rural Interstate fatalities increased 39 in 1986 to 53 in 1987, for the period after the speed limit increase.
>
> New Mexico rural Interstate fatalities increased from 63 in 1986 to 94 in 1987, for the period after the speed limit increase.
>
> North Carolina rural Interstate fatalities increased from 12 in 1986 to 33 in 1987, for the period after the speed limit increase.

Data from three states with only small rural Interstate fatality increases (or small decreases) were available for this report. According to the FARS data:

> Indiana rural Interstate fatalities decreased from 35 in 1986 to 34 in 1987, for the period after the speed limit increase.
>
> Missouri rural Interstate fatalities increased from 49 in 1986 to 54 in 1987, for the period after the speed limit increase.
>
> Texas rural Interstate fatalities increased from 147 in 1986 to 163 in 1987, for the period after the speed limit increase.

In this section, data provided by individual states are presented. Fatality counts provided by states may not agree with fatality counts obtained using the FARS data, presented earlier in this report. Because of differences in accident data coding among states (and differences from FARS), it is not always possible to categorize rural Interstate fatalities in these states exactly as they were categorized in FARS (rural Interstates). And it is not generally possible to determine whether an accident occurred on a road covered by the STURAA (rural and small urban Interstates) from the data state files provided. Additional data available in the state may allow a state to make these determinations, using data not available on the accident record.

There may be additional reasons for differences between FARS statistics and statistics derived from the state accident files available at NHTSA. For example, small fatality count differences are explained by more restrictive FARS definitions of "accident" (for example, FARS accidents must have occurred on a public roadway) and "fatality" (in FARS, death must have occurred within thirty days of the accident).

The remainder of this section describes data from state accident records. The comparisons do not account for any changes in accident reporting that may have occurred between the two years. Changes in the numbers of people in any category may reflect random variation, especially for the small counts in some categories.

States with Large Fatality Increases

Arizona:

Arizona raised the speed limit on most rural Interstate miles on April 15, 1987. The Arizona Department of Public Safety provided a summary of accident statistics. From April 15 through December 31, the number of rural Interstate fatalities was:

92 in 1985,
81 in 1986, and
130 in 1987 (after the speed limit increase).

Fatal accidents increased, but by a lesser amount. The number of fatal accidents from April 15 through December 31 on rural Interstates was:

73 in 1985,
75 in 1986, and
102 in 1987 (after the speed limit increase).

Injury accidents increased by a slightly lower amount. From April 15 through December 31, the number of rural Interstate injury accidents was:

846 in 1985,
867 in 1986, and
1,093 in 1987 (after the speed limit increase).

Total accidents increased a little less than did injury accidents. The number of total accidents from April 15 through Decemer 31 on rural Interstates was:

2,324 in 1985,
2,373 in 1986, and
2,923 in 1987 (after the speed limit increase).

From 1986 to 1987 for these days, the Arizona state data files showed that fatalities increased from 81 to 130, fatal accidents increased from 75 to 102, injury accidents increased from 867 to 1093, and all accidents increased from 2,373 to 2,923. From 1985 to 1987 for these days, fatalities increased from 92 to 130, fatal accidents increased from 73 to 102, injury accidents increased from 846 to 1,093, and all accidents increased from 2,324 to 2,923.

Arizona released a report on the first year's experience with the higher speed limit: "Impact of the 65 mph Speed Limit" with data through April 14, 1988. Their conclusion is that:

> "Considering the 6-12% increase in ADT (average daily travel for 1987, the increased speed limit has not had a substantial impact on the total number of all accidents, nor the number of non-injury accidents that have occurred on the rural Interstate. However, the increased speed limit has had an impact on the severity of accidents (injury and fatal accidents) that have occurred on the rural Interstate."

Louisiana:

Louisiana raised the speed limit on most rural Interstate miles on April 6, 1987. Table 9-1 shows counts of involved and injured people. "Seriously injured" people are those the state categorized as having severe, serious, critical, or fatal injuries.

Injuries (serious injuries and all injuries) were essentially unchanged between the two years. Crash involvements (whether or not injured) increased 27 percent on rural Interstates. Because of random changes in small fatality counts, the percentage change in fatalities is not shown.

Table 9-1: Louisiana State Data, April 6 through December 31

1986 Road Type and Population Group	All People	Injured People	Seriously Injured	People Killed[1]
Interstates:				
Rural	6,429	2,095	177	39
Urban:				
Up to 4,999	25	10	0	0
5,000 - 49,999	1,031	342	11	1
50,000 and up	4,412	1,300	70	20
Non-Interstates	152,512	47,825	2,973	643
Total People	164,409	51,572	3,231	703

1987 Road Type and Population Group	All People	Injured People	Seriously Injured	People Killed
Interstates:				
Rural	8,152	2,091	178	54
Urban:				
Up to 4,999	62	22	2	1
5,000 - 49,999	952	286	17	5
50,000 and up	5,388	1,540	74	18
Non-Interstates	172,012	50,035	2,559	535
Total People	186,566	53,974	2,830	613

1986 to 1987 Percent Change	All People	Injured People	Seriously Injured	People Killed
Interstates:				
Rural	27%	-0%	1%	-
Urban:				
Up to 4,999	148%	120%	-	-
5,000 - 49,999	-8%	-16%	55%	-
50,000 and up	22%	18%	6%	-
Non-Interstates	13%	5%	-14%	-
Total People	13%	5%	-12%	-

1 - "People Killed" is the number of fatalities obtained using the state data file.

New Mexico:

New Mexico raised speed limits to 65 mph on all eligible Interstate miles on April 6, 1987. The University of New Mexico reviewed the accident data files from that state (Robert U. Anderson and James W. Davis, Division of Government Research, reported in their Preliminary Analysis of New Mexico Rural Interstate Crash Data from 1984 to 1987, March 1988). During April through December, the average number of rural Interstate fatal accidents per week was:

1.25 in 1984,
1.07 in 1985,
1.26 in 1986, and
1.95 in 1987 (after the speed limit increase).

Injury accidents increased by a much lower amount. From April through December the average number of rural Interstate injury accidents per week was:

14.95 in 1984,
12.13 in 1985,
14.44 in 1986, and
15.90 in 1987 (after the speed limit increase).

All accidents increased by about the same amount as did injury accidents. The average number per week was:

46.3 in 1984,
36.4 in 1985,
45.6 in 1986, and
51.2 in 1987 (after the speed limit increase).

North Carolina:

North Carolina raised the speed limit on most rural Interstate miles on August 10, 1987. Accident involvements and injury outcomes are shown in Table 9-2, for accidents after signs with the higher speed limits were posted on August 15, 1987.

Serious injuries on rural Interstates (fatalities and incapacitating injuries) increased from 120 in 1986 to 153 in 1987, essentially the same as the percentage change in injured people and people in crashes. Because of the random changes in small fatality counts, the percentage change is not shown.

Table 9-2: North Carolina State Data, August 15 through December 31

1986 Road Type and Population Group	All People	Injured People	Seriously Injured	People Killed[1]
Interstates:				
Rural	1,798	495	120	16
Urban	3,127	746	91	14
Total Interstate	4,925	1,241	211	30

1987 Road Type and Population Group	All People	Injured People	Seriously Injured	People Killed
Interstates:				
Rural	2,348	664	153	34
Urban	3,565	826	98	10
Total Interstate	5,913	1,490	251	44

1986 to 1987 Percent Change	All People	Injured People	Seriously Injured	People Killed
Interstates:				
Rural	31%	34%	28%	-
Urban	14%	11%	8%	-
Total Interstate	20%	20%	19%	-

1 - "People Killed" is the number of fatalities obtained using the state data file.

States without Large Fatality Increases

Indiana:

Indiana raised the speed limit on most rural Interstates on June 1, 1987. The counts of people involved in traffic accidents by injury status are shown in Table 9-3 for accidents that occurred between June 1 and December 31. "Serious injuries" were defined as those coded by the state as Severe Internal, Severe Burn, Severe Bleeding, and Fracture-Dislocation. There were small increases in accident involved people, injured people, and seriously injured people on rural Interstates between 1986 and 1987. Fatalities, however, declined from 43 to 35.

Table 9-3: Indiana State Data, June 1 through December 31

1986 Road Type and Population Group	All People	Injured People	Seriously Injured	People Killed[1]
Interstates:				
Rural	5,697	1,288	197	43
Urban:				
Up to 4,999	53	15	4	1
5,000 - 49,999	761	213	29	2
50,000 and up	2,704	425	38	7
Non-Interstates	234,639	46,502	4,455	627
Total People	243,854	48,443	4,723	680

1987 Road Type and Population Group	All People	Injured People	Seriously Injured	People Killed
Interstates:				
Rural	6,130	1,364	203	35
Urban:				
Up to 4,999	79	11	4	1
5,000 - 49,999	894	190	17	2
50,000 and up	2,140	393	36	8
Non-Interstates	238,362	44,826	4,237	614
Total People	247,605	46,784	4,497	660

1986 to 1987 Percent Change	All People	Injured People	Seriously Injured	People Killed
Interstates:				
Rural	8%	6%	3%	-
Urban:				
Up to 4,999	49%	-27%	0%	-
5,000 - 49,999	17%	-11%	-41%	-
50,000 and up	-21%	-8%	-5%	-
Non-Interstates	2%	-4%	-5%	
Total People	2%	-3%	-5%	-

1 - "People Killed" is the number of fatalities obtained using the state data file.

Missouri:

Missouri raised the speed limit on most rural Interstates on April 30, 1987. The counts of people involved, by injury status, are shown in Table 9-4 for accidents that occurred between April 30 and December 31.

While there were small increases in fatalities on rural Interstate roads (using either the state or FARS definition of rural), injuries and serious injuries declined. Total involvements on rural Interstates (injury plus noninjury) increased 8 percent.

Table 9-4: Missouri State Data, April 30 through December 31

1986 Road Type and Population Group	All People	Injured People	Seriously Injured	People Killed[1]
Interstates:				
Rural	4,860	1,553	369	56
Urban:				
Up to 4,999	1,376	338	57	4
5,000 - 49,999	5,223	1,125	197	13
50,000 and up	9,467	1,918	205	21
Non-Interstates	207,602	46,568	7,255	738
Total People	228,528	51,502	8,083	832

1987 Road Type and Population Group	All People	Injured People	Seriously Injured	People Killed
Interstates:				
Rural	5,253	1,461	358	65
Urban:				
Up to 4,999	1,638	397	48	4
5,000 - 49,999	5,975	1,259	215	23
50,000 and up	8,448	1,733	245	29
Non-Interstates	199,015	43,635	7,038	628
Total People	220,329	48,485	7,904	749

1986 to 1987 Percent Change	All People	Injured People	Seriously Injured	People Killed
Interstates:				
Rural	8%	-6%	-3%	-
Urban:				
Up to 4,999	19%	17%	-16%	-
5,000 - 49,999	14%	12%	9%	-
50,000 and up	-11%	-10%	20%	-
Non-Interstates	-4%	-6%	-3%	-
Total People	-4%	-6%	-2%	-

1 - "People Killed" is the number of fatalities obtained using the state data file.

Texas:

Texas raised the speed limit on most rural Interstates on May 9, 1987. Table 9-5 shows counts of people involved in accidents between May 9 and December 31.

Rural Interstate (through areas with up to 5,000 people) accident involvements increased, as did the number of injured people. Fatalities increased from 148 to 161. Fatalities on urbanized Interstates and on non-Interstates decreased.

Table 9-5: Texas State Data, May 9, through December 31

1986 Road Type and Population Group	All People	Injured People	Seriously Injured	People Killed[1]
Interstates:				
Up to 5,000	12,756	3,620	1,503	148
5,000 and up:				
5,000 - 50,000	9,839	1,926	702	42
50,000 and up	66,207	14,658	4,464	177
Non-Interstates	633,747	137,362	51,824	2,027
Total People	722,549	157,566	58,493	2,394

Road Type and Population Group	All People	Injured People	Seriously Injured	People Killed
Interstates:				
Up to 5,000	13,046	3,908	1,700	161
5,000 and up:				
5,000 - 50,000	9,539	2,106	774	45
50,000 and up	55,542	13,747	3,900	122
Non-Interstates	566,599	132,241	46,814	1,851
Total People	644,726	152,002	53,188	2,179

1986 to 1987 Percent Change	All People	Injured People	Seriously Injured	People Killed
Interstates:				
Up to 5,000	2%	8%	13%	9%
5,000 and up:				
5,000 - 50,000	-3%	9%	10%	7%
50,000 and up	-16%	-6%	-13%	-31%
Non-Interstates	-11%	-4%	-10%	-9%
Total People	-11%	-4%	-9%	-9%

1 - "People Killed" is the number of fatalities obtained using the state data file.

Section 10: Travel Speed

The relationship between travel speeds and casualties is clearly a central issue in assessing the safety impact of increasing the rural Interstate speed limit. This section presents data the agency has reviewed in an attempt to assess this relationship. Travel speed data voluntarily provided by states, along with data provided as part of the speed compliance monitoring process, were analyzed to define changes in rural Interstate travel speed patterns associated with the increased speed limit.

Subsequent to the enactment of STURRA, states were no longer required to collect and report travel speed data on rural Interstates with an increased speed limit. However, of the 32 states that increased the rural Interstate speed limit between April and June 1987, travel speed data on rural Interstates was voluntarily provided to NHTSA by thirteen states. Ten states had not increased their speed limit by the end of 1987. Of these ten states, complete data were available for eight.

The major finding from analyses of these speed data is that rural Interstate travel speeds increased in these thirteen states after the speed limit change. In the third quarter of 1987 (the first full quarter in which the 65 mph speed limit was in effect) the average travel speed in these thirteen states was 62.2 mph compared to 60.3 mph in the third quarter of 1986 when 55 mph was in effect. This compares to an increase from 57.2 mph (in the third quarter) in 1986 to 57.6 mph in the eight states that retained 55 mph, for which data were available. Another speed measure, the 85th percentile speed (the speed at which 85 percent of traffic is travelling at or below), demonstrated a similar trend. In the states that increased the rural Interstate speed limit, the 1987 85th percentile speed was 67.6 mph compared to 66.3 mph in 1986 (third quarter speeds). In the eight 55 mph states, the 1987 85th percentile speed was 64.5 mph compared to 63.3 mph in 1986.

On the basis of this travel speed data, rural Interstate travel speed increased after the speed limit change and the increase was largest in the states that raised the speed limit. However, the increase in average travel speed was less than the 10 mph increase in the speed limit itself.

The agency welcomes comments from states concerning the changes in travel speeds associated with the increased speed limit, the relationship of the existing travel speed measures currently collected to travel speed distributions, and the relationship between travel speed and casualties.

Approach

It is difficult to analyze changes in travel speeds on rural Interstates after the speed limit increase. States are required to collect speed data only on 55 mph roads. As a consequence, some states discontinued speed monitoring, discontinued reporting the results, or modified their speed monitoring practices after increasing their speed limits on these roads. For this reason, there is uncertainty in comparing states to each other or to compare speeds before the speed limit increase to speeds after the increase.

Data from thirteen states that increased the speed limit were obtained for this report. These states supplied rural Interstate speed data, including three travel speed measures collected from October 1985 through March 1988. The data represent the fourth quarter of 1985 (85Q4) through the first quarter of 1988 (88Q1). The three measures, all of which have been collected since 1975 as part of the compliance monitoring process, are:

(1) Average Speed (the mean speed);

(2) 85th Percentile Speed (the speed at or below which 85 percent of traffic is traveling); and

(3) Percent Exceeding 65 mph (the percentage of vehicles exceeding 65 mph).

In this section, all rural Interstate speed data reported for times before a speed limit change are Federal Highway Administration (FHWA) compliance data. Data for times after a speed limit change were voluntarily provided by individual states. The major part of the analysis in this section deals with changes in average speed and changes in 85th percentile speed. The reason for reliance on these measures is that data are not available that would show the distribution of travel speed in excess of 65. As a result, measures of percentage of vehicles in excess of 65 do not indicate whether most of the traffic is a fraction above 65, (e.g., 66 mph) or substantially in excess of 65. Thus, without actual travel speed distributions above 65 mph, use of this measure produces little insight. In order to better define the travel speed distribution, the agency will work with states to obtain more detailed information on the speed distribution of vehicles travelling in excess of 65 mph. In addition, the agency has provided, in the closing section of this chapter, a brief analysis, using available travel speed information.

Comparisons Between State Groups

Thirty-two states increased their rural Interstate speed limit to 65 mph between April and June 1987. Complete data were available for this report from thirteen of these states. The data from the thirteen states was averaged to produce a cross-state average of both average and 85th percentile speed measures. The cross-state averages of average speed and 85th percentile speed are presented in Tables 10-1 and 10-2, respectively. The data from Tables 10-1 and 10-2 are illustrated in Figure 10-1.

Ten states had not increased their speed limit by the end of 1987. Of these ten states, complete data were available for eight. The data for these eight states are presented in Tables 10-3 and 10-4, and graphically in Figure 10-2.

1987 Travel Speeds

The 1987 Increase in the Average Travel Speed

The data in Table 10-1 indicate that average speed in the thirteen states increased from 60.3 mph in the third quarter of 1986 to 62.2 mph in the third quarter of 1987 (the first full quarter in which 65 mph was in effect).

The average third quarter travel speeds for these thirteen states for 1982 1987 are shown below.

Year	Average Third Quarter Travel Speed, mph	Change from Prior Year, mph
1982	59.5	-
1983	59.4	-0.1
1984	60.4	+1.0
1985	60.0	-0.4
1986	60.3	+0.3
1987	62.2	+1.9

The average travel speed between 1982 and 1986 increased an average of 0.20 mph per year (0.8/4). The 1987 increase of 1.9 mph is substantially larger than this average yearly increase. Developing a mathematical model using this data results in an average travel speed increase of 0.22 mph per year. In 1987, this increase was 1.62 mph. This statistically significant increase (R-square of 0.93) in average travel speed is over 7 times greater than what would have been expected, based on the historical trend of increases in average speed.

The 1987 Increase in the 85th Percentile Speed

The data in Table 10-2 indicate that the 85th percentile speed (the speed at which 85 percent of the traffic is travelling at or below) increased from 66.3 mph in the third quarter of 1986 to 67.6 mph in the third quarter of 1987.

The third quarter 85th percentile speeds for these thirteen states for 1982 - 1987 are shown below.

Year	85th Percentile Speed, mph	Change from Prior Year, mph
1982	65.1	-
1983	65.2	+0.1
1984	66.3	+1.1
1985	65.9	-0.4
1986	66.3	+0.4
1987	67.6	+1.3

As was the case with average travel speed, the 85th percentile speed increased in 1987 compared to 1986.

Hypothetical Increases in 1987 Travel Speeds

As discussed above, the percent exceeding 65 mph speed measure can provide misleading information about increases in travel speed. For example, if a large number of drivers increase their driving speed from 64 mph to 66 mph - a 2 mph increase - there will be a substantial increase in the percent of traffic exceeding 65 mph when, in fact, actual speeds increased slightly. This is precisely why, as mentioned earlier, it is critical to work with states to obtain more detailed information on the travel speed distribution of vehicles travelling in excess of 65 mph.

It is, however, possible to estimate this distribution with a critical assumption. If it is hypothesized that travel speeds are normally distributed about the average speed, this speed measure, along with the 85th percentile speed can define the travel speed distribution. Using these two speed measures (from Table 10-1 and Table 10-2) results in the following:

	Third Quarter	
	1986	1987
Percent of Traffic, 65-70 mph	16.1	22.8
Percent of Traffic, 70+ mph	4.6	6.6
Total (Percent exceeding 65 mph)	20.7	29.4

As a measure of the accuracy of assuming a normal distribution of speeds around the average speed, the bottom line in the above table (percent exceeding 65 mph) obtained with this assumption can be compared to actual measured percent exceeding 65 mph travel speed data (Table 10-5). The 20.7 percent and 29.4 percent values from the above table are reasonably close to the measured values of 19.6 percent and 29.2 percent, respectively.

Similarly, the same assumption can be applied to the eight states that retained 55 mph:

	Third Quarter	
	1986	1987
Percent of Traffic, 65-70 mph	7.7	10.2
Percent of Traffic, 70+ mph	1.5	3.1
Total (Percent Exceeding 65 mph)	9.2	13.3

The 9.2 percent and the 13.3 percent values from the bottom line in the table are reasonably close to the actual measured values in Table 10-6 of 11.4 percent and 15.0 percent, respectively.

These data suggest that there has been an increase in the proportion of traffic travelling in both the 65-70 mph speed range and in the 70 mph and above speed range in the thirteen states that increased the speed limit. While this analysis is hypothetical, it suggests that the nature of speed data is such that small increases in average speed and 85th percentile speed can result in rather large changes in the proportion of traffic at higher speeds.

Table 10-1: Rural Interstate Average Speeds (see note below)

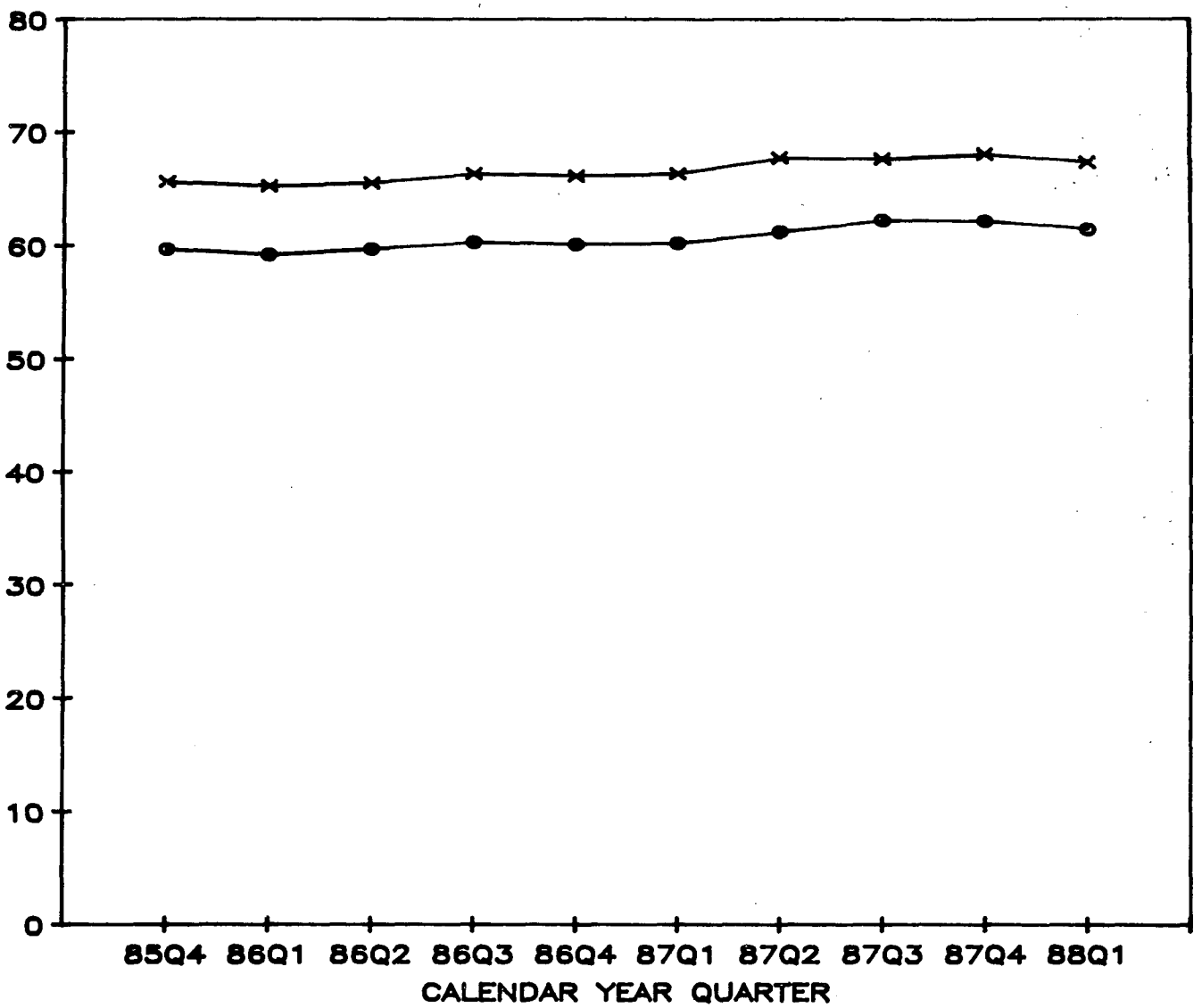
State	85Q4	86Q1	86Q2	86Q3	86Q4	87Q1	87Q2	87Q3	87Q4	88Q1
Arizona	59.9	59.7	58.9	60.9	60.0	60.2	61.4	63.5	62.9	63.0
Arkansas	58.0	59.5	58.9	59.4	60.2	61.1	63.2	61.2	63.1	61.3
California	61.0	61.4	61.2	61.9	62.2	62.6	62.8	62.7	64.1	64.6
Colorado	59.1	58.8	58.8	58.1	58.3	54.3	58.1	58.6	59.6	62.0
Illinois	56.9	58.2	60.4	59.0	60.0	59.3	61.7	62.1	61.6	61.9
Indiana	62.3	59.1	60.4	62.9	62.3	62.3	62.5	64.9	64.2	61.7
Iowa	57.9	58.9	58.4	60.3	57.8	57.3	56.9	59.6	59.4	58.6
Mississippi	60.5	59.0	60.0	61.5	60.9	63.1	64.1	61.6	60.2	60.4
Nevada	61.2	58.9	59.2	59.4	59.5	59.5	57.5	62.8	63.6	63.0
South Dakota	60.6	59.0	58.5	59.9	60.6	62.0	64.9	62.7	63.2	57.5
Tennessee	61.1	60.9	63.4	60.8	60.4	62.5	61.5	63.5	61.4	62.0
Washington	57.7	57.7	58.3	58.5	58.6	59.6	62.1	62.8	62.2	62.5
Wisconsin	59.5	58.5	59.8	61.2	60.1	59.3	59.5	62.3	61.9	59.3
Average	59.7	59.2	59.7	60.3	60.1	60.2	61.2	62.2	62.1	61.4

Table 10-2: Rural Interstate 85th Percentile Speeds (see note below)

State	85Q4	86Q1	86Q2	86Q3	86Q4	87Q1	87Q2	87Q3	87Q4	88Q1
Arizona	66.4	65.6	65.4	66.9	66.4	66.4	67.8	69.0	69.0	69.0
Arkansas	63.7	66.4	64.6	65.1	66.2	67.5	69.9	66.7	69.5	67.8
California	66.1	66.8	66.7	67.5	67.8	68.3	68.7	68.5	71.2	71.9
Colorado	65.2	64.7	64.9	64.8	64.3	63.1	64.8	65.7	66.7	67.9
Illinois	63.2	64.0	66.9	64.8	65.8	64.8	67.7	68.4	67.9	68.2
Indiana	69.1	64.6	65.5	68.1	67.2	67.2	67.6	65.7	65.3	63.7
Iowa	63.8	64.2	63.7	66.1	63.1	63.0	61.3	64.8	63.9	63.2
Mississippi	64.7	66.0	67.1	68.0	67.5	68.5	68.7	67.7	67.3	68.0
Nevada	69.5	65.9	67.1	67.2	67.6	67.4	64.6	70.3	71.2	70.2
South Dakota	65.7	63.0	62.1	63.0	65.0	65.6	68.1	66.2	67.2	61.7
Tennessee	66.9	67.2	69.2	67.5	67.1	68.9	67.7	69.0	67.9	68.0
Washington	63.1	64.1	63.0	64.9	65.1	65.4	68.8	69.6	69.2	69.4
Wisconsin	65.9	64.8	65.7	67.4	66.6	66.1	75.0	67.6	67.3	66.4
Average	65.6	65.2	65.5	66.3	66.1	66.3	67.7	67.6	68.0	67.3

Note: These states increased their rural Interstate speed limit between April and June 1987, and provided data to NHTSA.

Figure 10-1: Rural Interstate Speeds
-- Thirteen States that Increased the Speed Limit in the Spring
(between April and June 1987)



65 mph States:
Arizona
Arkansas
California
Colorado
Illinois
Indiana
Iowa
Mississippi
Nevada
South Dakota
Tennessee
Washington
Wisconsin

Legend:

x 85th Percentile Speed (mph)

o Average Speed (mph)

Table 10-3 Rural Interstate Average Speeds (see note below)

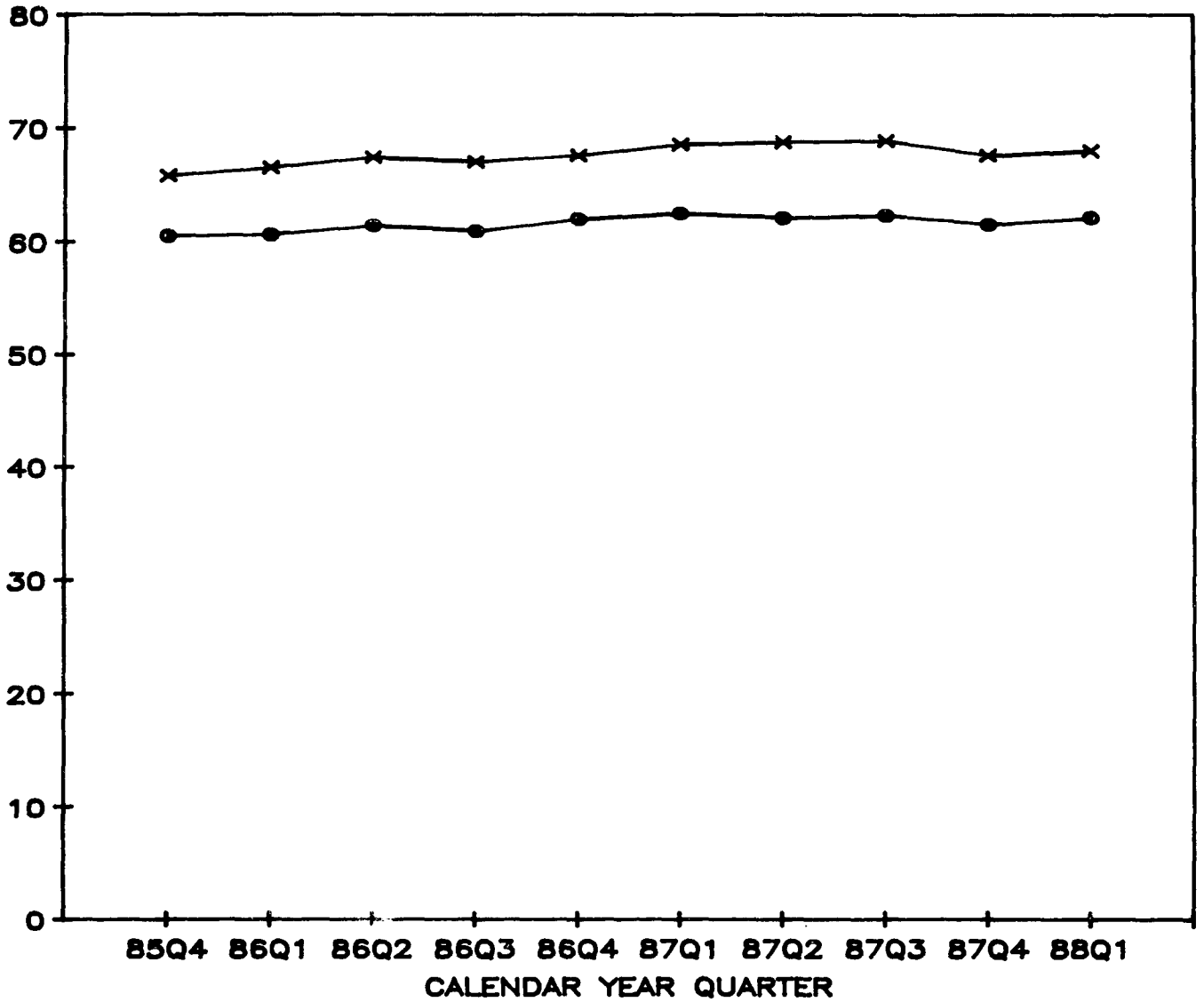
State	85Q4	86Q1	86Q2	86Q3	86Q4	87Q1	87Q2	87Q3	87Q4	88Q1
Connecticut	54.0	55.9	54.8	52.1	62.0	60.1	51.9	51.5	55.8	53.8
Maryland	58.4	58.0	59.0	57.8	65.9	57.3	58.4	53.3	57.2	59.7
Massachusetts	59.9	60.9	55.3	54.9	63.2	62.0	63.6	59.7	63.2	62.4
New Jersey	57.1	53.4	55.3	52.7	55.4	54.8	55.9	53.5	60.2	52.5
New York	59.3	62.7	63.1	64.0	63.0	64.1	64.5	64.7	63.5	63.4
Pennsylvania	59.9	59.2	61.9	59.7	61.7	57.6	61.6	62.0	61.7	60.2
Rhode Island	60.9	57.8	59.4	58.3	58.2	57.1	58.0	58.8	58.2	56.7
Virginia	57.8	60.3	56.3	58.3	56.7	58.9	59.9	57.4	56.7	59.3
Average	58.4	58.5	58.1	57.2	60.8	59.0	59.2	57.6	59.6	58.5

Table 10-4 Rural Interstate 85th Percentile Speeds (see note below)

State	85Q4	86Q1	86Q2	86Q3	86Q4	87Q1	87Q2	87Q3	87Q4	88Q1
Connecticut	60.3	61.8	64.0	57.4	68.9	66.7	58.5	59.7	63.4	60.7
Maryland	64.1	63.7	65.0	64.6	65.9	64.7	65.7	61.5	65.9	68.0
Massachusetts	66.1	67.1	61.0	60.8	70.6	68.2	69.6	66.9	70.6	69.6
New Jersey	61.3	60.1	60.7	57.5	61.0	60.3	60.7	58.0	67.8	58.2
New York	68.5	68.4	68.5	69.3	68.8	69.7	69.3	69.7	69.0	69.1
Pennsylvania	66.7	67.1	69.6	67.5	69.6	65.9	69.9	70.1	69.6	67.4
Rhode Island	69.1	64.5	66.8	65.0	65.2	64.8	64.7	65.8	65.2	64.1
Virginia	63.0	65.0	62.0	64.0	63.0	64.0	65.0	64.0	63.0	65.0
Average	64.9	64.7	64.7	63.3	66.6	65.5	65.4	64.5	66.8	65.3

Note: These states did not increase their rural Interstate speed limit in 1987.

Figure 10-2: Rural Interstate Speeds
-- Eight States that Did Not Increase the Speed Limit
(through December 1987)



55 mph States:
Connecticut
Maryland
Massachusetts
New Jersey
New York
Pennsylvania
Rhode Island
Virginia

Legend:

x 85th Percentile Speed (mph)

o Average Speed (mph)

Table 10-5: Rural Interstate Percent Exceeding 65 mph (see note 1)

State	85Q4	86Q1	86Q2	86Q3	86Q4	87Q1	87Q2	87Q3	87Q4	88Q1
Arizona	19.9	15.4	20.9	25.3	17.5	19.8	27.4	37.6	36.2	45.6
Arkansas	8.0	18.0	13.0	15.0	18.1	22.9	34.4	20.2	3.6	26.2
California	18.0	21.3	20.2	23.4	25.0	27.8	29.3	29.1	40.6	45.0
Colorado	14.5	11.3	13.2	14.1	11.2	9.8	14.1	17.0	20.8	26.5
Illinois	8.3	10.3	19.5	13.5	16.7	13.5	25.0	29.5	30.4	32.7
Indiana	29.6	12.8	16.1	27.0	22.0	22.2	23.7	45.2	41.3	26.8
Iowa	9.9	10.6	8.4	17.4	6.8	6.9	3.3	13.9	13.0	10.5
Mississippi	22.6	19.2	25.5	37.8	27.4	46.4	55.6	32.8	28.1	37.0
Nevada	28.9	14.8	17.8	18.1	19.5	18.7	8.1	34.6	42.3	34.5
South Dakota	17.1	10.7	7.7	10.6	14.9	17.3	35.7	23.8	27.6	8.1
Tennessee	20.8	21.7	34.9	21.7	20.3	30.4	23.4	35.7	26.8	28.8
Washington	5.3	7.4	0.8	9.3	10.0	11.2	27.3	32.9	30.7	31.9
Wisconsin	14.5	11.0	13.7	22.1	17.6	15.5	26.3	26.8	24.2	17.4
Average	16.7	14.2	16.3	19.6	17.5	20.2	25.7	29.2	30.9	28.5

Table 10-6: Rural Interstate Percent Exceeding 65 mph (see note 2)

State	85Q4	86Q1	86Q2	86Q3	86Q4	87Q1	87Q2	87Q3	87Q4	88Q1
Connecticut	4.6	5.9	11.3	0.6	30.4	19.4	0.6	0.8	5.8	3.2
Maryland	5.8	4.6	10.1	10.0	11.9	9.6	12.7	3.1	11.9	22.1
Massachusetts	20.2	22.1	6.1	5.3	34.5	26.5	35.9	17.8	34.5	28.6
New Jersey	1.8	1.9	2.4	1.9	2.3	3.1	6.3	4.0	24.4	2.1
New York	28.1	29.0	30.5	35.8	31.2	37.6	37.5	39.6	34.2	34.1
Pennsylvania	16.4	19.0	29.5	19.3	30.0	15.0	30.8	32.7	30.0	20.4
Rhode Island	23.0	8.8	16.9	10.4	11.7	10.6	9.7	13.9	11.7	8.9
Virginia	6.2	12.2	3.8	8.2	7.2	8.3	12.1	7.7	7.2	11.1
Average	13.3	12.9	13.8	11.4	19.9	16.3	18.2	15.0	20.0	16.3

Note 1 - These states increased their rural Interstate speed limit between April and June 1987 and provided data to NHTSA.

Note 2 - These states did not increase their rural Interstate speed limit in 1987.

Changes in 1987 rural Interstate fatalities are not fully explained by changes in rural Interstate travel. The fatality rate on rural Interstates in those states that increased the speed limit increased 14 percent in 1987 compared to 1986.

Table 11-1 shows travel estimates, provided by the Federal Highway Administration. These data are for the whole years 1986 and 1987, grouped into two categories (Group I - the 38 states that increased the speed limit in 1987 and Group II - the 10 states that did not increase the speed limit).

Table 11-1: Millions of Vehicle Miles Traveled

-- 1986 Travel:

Maximum Speed Limit at the end of 1987	Interstate Rural	Interstate Urban	Non-Interstate Rural	Non-Interstate Urban	Total
Group I (65 miles per hour)	127,563	166,398	464,206	614,563	1,372,730
Group II (55 miles per hour)	31,935	65,619	124,076	240,512	462,142
Total	159,498	232,017	588,282	855,075	1,834,872

-- 1987 Travel:

Maximum Speed Limit at the end of 1987	Interstate Rural	Interstate Urban	Non-Interstate Rural	Non-Interstate Urban	Total
Group I (65 miles per hour)	138,261	175,697	481,263	648,132	1,443,353
Group II (55 miles per hour)	33,605	69,642	128,618	249,109	480,974
Total	171,866	245,339	609,881	897,241	1,924,327

-- Percent Change:

Maximum Speed Limit at the end of 1987	Interstate Rural	Interstate Urban	Non-Interstate Rural	Non-Interstate Urban	Total
Group I (65 miles per hour)	8.4	5.6	3.7	5.5	5.1
Group II (55 miles per hour)	5.2	6.1	3.7	3.6	4.1
Total	7.8	5.7	3.7	4.9	4.9

Table 11-2 shows fatality counts for whole years 1986 and 1987 in these two Groups.

Table 11-2: Fatalities by State Speed Limit Group

-- 1986 Fatalities: Maximum Speed Limit at the end of 1987	Interstate		Non-Interstate			
	Rural	Urban	Rural	Urban	Unknown	Total
Group I (65 miles per hour)	1,839	1,616	19,895	12,500	11	35,861
Group II (55 miles per hour)	292	503	4,458	4,962	11	10,226
Total	2,131	2,119	24,353	17,462	22	46,087

-- 1987 Fatalities: Maximum Speed Limit at the end of 1987	Interstate		Non-Interstate			
	Rural	Urban	Rural	Urban	Unknown	Total
Group I (65 miles per hour)	2,191	1,498	20,046	12,177	32	35,944
Group II (55 miles per hour)	313	603	4,617	4,882	27	10,442
Total	2,504	2,101	24,663	17,059	59	46,386

-- Percent Change: Maximum Speed Limit at the end of 1987	Interstate		Non-Interstate		
	Rural	Urban	Rural	Urban	Total
Group I (65 miles per hour)	19.1	-7.3	0.8	-2.6	0.2
Group II (55 miles per hour)	7.2	19.9	3.6	-1.6	2.1
Total	17.5	-0.8	1.3	-2.3	0.6

Table 11-3 uses data from Tables 11-1 and 11-2 and shows the fatality rates in fatalities per 100 million vehicle miles.

Table 11-3: Fatality Rates by State Speed Limit Group

--1986 Fatality Rate					
Maximum Speed Limit	Interstate		Non-Interstate		
at the end of 1987	Rural	Urban	Rural	Urban	Total
Group I					
(65 miles per hour)	1.4	1.0	4.3	2.0	2.6
Group II					
(55 miles per hour)	0.9	0.8	3.6	2.1	2.2
Total	1.3	0.9	4.1	2.0	2.5

-- 1987 Fatality Rate					
Maximum Speed Limit	Interstate		Non-Interstate		
at the end of 1987	Rural	Urban	Rural	Urban	Total
Group I					
(65 miles per hour)	1.6	0.9	4.2	1.9	2.5
Group II					
(55 miles per hour)	0.9	0.9	3.6	2.0	2.2
Total	1.5	0.9	4.0	1.9	2.4

-- Percent Change:					
Maximum Speed Limit	Interstate		Non-Interstate		
at the end of 1987	Rural	Urban	Rural	Urban	Total
Group I					
(65 miles per hour)	14	-10	-2	-5	-4
Group II					
(55 miles per hour)	0	13	0	-5	0
Total	15	0	-2	-5	-4

Table 11-3 shows that the 1987 rural Interstate fatality rate increased 14 percent in the states that increased the speed limit, and was unchanged in the states that retained 55 mph. The 14 percent in the 1986-1987 fatality rate is consistent with the mathematical model which estimated that rural Interstate fatalities were about 16 percent higher in 1987 than would have been expected from the historical relationship between fatality and travel changes.

Section 12: Research Plans

There are currently five grants and three contracts in progress to study different aspects of the 65 mph speed limit. There are early results from one contract that is nearing completion.

Grants

The agency awarded five grants under the Grant Program for Analyses of 65 mph Speed Limit Effects. Each grant has a different focus, approaching the problem from a different angle or using different data. The duration of each grant is about one year, with scheduled completion dates between March 31 and July 1, 1989. The five grants were awarded for the following research:

1) "The Safety Impact of the 65 mph Speed Limit: Cost and Impairment Impact of the New 65"
   The Urban Institute
   Washington, DC

2) "The Safety Impact of the 65 mph Speed Limit: Assessing the Impact of the 65 mph Limit through Intervention Analysis"
   National Public Services Research Institute
   Landover, Maryland

3) "The Safety Impact of the 65 mph Speed Limit: A Case Study Using Alabama Accident Records"
   Auburn University
   Auburn, Alabama

4) "The Safety Impact of the 65 mph Speed Limit: A Time Series Analysis"
   Northwestern University Traffic Institute
   Evanston, Illinois

5) "The Safety Impact of the 65 mph Speed Limit: An Econometric Approach to Evaluating the New 65"
   Harvard School of Public Health
   Boston, Massachusetts

Each grant will produce a final report describing the research results. The results will be summarized in the September 1989 Report to Congress on the 65 mph speed limit.

Contracts

There are also three contracts to study various speed issues. The three contracts are for the following research.

1) "Media Coverage of Increasing the Speed Limit to 65 mph" was an analysis of news and television spots sampled from eight states to determine the intensity of media activity surrounding the issue of raising the speed limit. The purpose of the data being gathered was to assess the likely effects of anticipation of the speed limit change. The contractor, Walcoff & Associates of Alexandria, Virginia, completed the analysis in September 1988.

2) "Update of Enforcement Technology and Speed Measuring Devices" will update a previously developed document which surveyed speed enforcement techniques and speed technology devices existing around the world. The contract was awarded in September 1988 to Midwest Research Institute. The contract is to be completed one year after award, with a briefing on the status of data collection approximately 6.5 months after award.

3) "Effect of the 65 mph Speed Limit on Travel and Related Crashes" will assess the change in vehicle speeds as a result of raising the speed limit to 65 mph on rural Interstates and the effects on speeds on other roads. The contract will also study any changes in accidents on these roads. The contract was awarded in September 1988 to The Last Resource, Inc. This is a twelve month effort that will produce a final report of the findings.

The September 1989 Report to Congress will include available results from these contracts. It will also include updates of the analysis included in the current (1988) Report to Congress, using an additional year of experience with the higher speed limit and an additional year of data. A final Report to Congress will be provided by December 1990.

APPENDIX I

Letters from States that Responded to the Interim Report

ARKANSAS STATE HIGHWAY COMMISSION

BOBBY HOPPER, Chairman
SPRINGDALE
RAYMOND PRITCHETT, Vice Chairman
MAUMELLE
RON HARROD
PRESCOTT
RODNEY E. SLATER
JONESBORO
L.W. "BILL" CLARK
HOT SPRINGS

P.O. BOX 2261
LITTLE ROCK, ARKANSAS 72203
(501) 569-2000

MAURICE SMITH
DIRECTOR OF HIGHWAYS AND TRANSPORTATION
DAN FLOWERS
ASSISTANT DIRECTOR OF HIGHWAYS AND TRANSPORTATION
CHARLES VENABLE
CHIEF ENGINEER

July 8, 1988

Ms. Diane Steed
NHTSA Administrator
U.S. Department of Transportation
400 7th St., SW
Washington, D.C. 20590

Dear Ms. Steed:

This is to advise that we have reviewed the National Highway Administration's "Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways" and offer the following:

1. The report should stress and underline that the data is limited and that it is much too early to draw any conclusions.

2. In Arkansas, we feel the adjustment to 65 mph has not had an adverse effect on traffic safety. This view is shared by the State Police.

3. There has not been a significant change in average speeds on rural Interstate freeways in Arkansas since the change to 65 mph.

In summary, we feel the motorist in Arkansas has responded to the change to 65 mph in a positive and responsible manner.

Sincerely,

Maurice Smith

Maurice Smith
Director of Highways
and Transportation

cc: Mr. David Hensing, AASHTO

8807200008

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF TRANSPORTATION
OFFICE OF DIRECTOR
1120 N STREET
SACRAMENTO, CALIFORNIA 95814

(916) 445-7892
(TDD: 445-5945)

June 10, 1988

Ms. Diane K. Steed, Administrator
National Highway Traffic Safety
Administration
400 Seventh Street, S.W.
Washington, DC 20590

Dear Ms. Steed:

We wish to compliment you on doing a very good job under a difficult time limit on the May 1988 "Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways". It was unfortunate that Congress again forced a report before sufficient time had elapsed to obtain adequate data. The fact that the report was not widely misquoted is an indication of the good job you did. Except for the Sacramento Union headline, the enclosed articles, for example, seem fairly accurate. The liberal use of caveats, plus including several comparisons, all with different answers, seemed to work this time!

Hopefully, the September 1989 report, but probably not the September 1988 report, will provide definitive answers. It is trusted that it will not be necessary in the latter reports to make the various assumptions regarding small urban areas, exact limits of the 65 mph zones, dates of posting 65 mph, mixing fatalities from pre- and post-65 mph postings, traffic volume changes, etc. Although your preliminary analyses conclude that these assumptions are not critical, we would think that the answer is important enough so as not to make assumptions unless absolutely necessary.

It would be good to eliminate a month or two before and after the date the law changed. In California, the date of law change was May 14, 1987; the Governor signed the bill on May 28, 1987; signs started going up May 29, 1987, but most were installed the week of June 1 through 5, 1987. Talk of the impending law change probably became common in late April or early May, and it took some people a couple of weeks to get used to the new speed limit. Therefore, May, June, and perhaps April, as a minimum, should be excluded from the analyses.

We believe travel changes should be accounted for in the analyses. We see shifting of travel to the 65 mph roadways. Our travel in 1987 compared to 1986 increased 13.7% on roads posted to 65 mph, 10.9% on rural interstates kept at 55 mph, and 9.8% on urbanized interstates. Preliminary analyses of California data also suggest that it can make a difference whether one looks at fatal accidents or at fatalities, and which year(s) is used for the base.

The time series analysis (Section IV) could be very interesting. However, this section is very difficult for a non-statistician to read and understand. An R-square of only 0.65 does not appear particularly good. This is the result quoted by the National Safety Council and others. Obviously, this analysis needs to be conceptually and technically well done as well as well written.

Changes in travel speeds (Section VIII) are indeed important. If average and 85th percentile speeds did only go up 1 or 2 mph, it would be unlikely that fatalities went up 20% or so due to increased speeds.

One final, minor point. California restricts the following vehicles to 55 mph; the remainder can go 65 mph: a motortruck or truck tractor having three or more axles or any motortruck or truck tractor drawing any other vehicle; a passenger vehicle or bus drawing any other vehicle; a schoolbus transporting any school pupil; a farm labor vehicle when transporting passengers; a vehicle transporting explosives.

Again, we believe you did a very good job. If there is any way we can help as you prepare your important final reports, please let us know.

Sincerely,

R. G. Adams

R. G. ADAMS
Deputy Director
Highway Maintenance and
Transportation Operations

Enclosures

cc: D. Hensing - AASHTO
M. Hannigan - CHP
K. Hoffman - Washington Office

The Sacramento Bee Final • Friday, May 6, 1988

65 has no discernable effect on fatalities

By Tim Bovee
Associated Press

WASHINGTON — Higher speed limits on rural interstate highways are having no discernible effect on traffic fatalities, probably due to stricter enforcement, Transportation Secretary Jim Burnley says.

"A 55 mph limit that is not enforced can be more of a problem than a 65 mph limit that is enforced," Burnley said after a speech to the Society of Automotive Engineers.

A law enacted last year over President Reagan's veto allows states to raise the speed limit to 65 mph on rural stretches of interstate highways, 10 mph faster than the national 55 mph speed limit enacted in 1974 as an energy conservation measure.

Forty states have adopted the higher speed limit.

Burnley declined to provide specific figures to support his conclusion, saying they will be provided to Congress in a report being prepared by the Transportation Department.

"We're just not finding any distinction" between fatalities on the 65 mph rural interstate highways and those where the speed limit remained at 55 mph, Burnley said.

The fatality statistics "are all over the board," with deaths rising in some states and falling in others on 65 mph stretches of highway, said Ron DeFore, a Transportation Department spokesman.

The only official statistic on the issue has been provided by Diane Steed, administrator of the National Highway Traffic Safety Administration, in congressional testimony. She said that in the months after the federal law took effect, the agency found increases between 18 percent and 23 percent on rural interstates in states that raised the limit.

DeFore, however, said it is difficult to assess the effect of the higher speed limit because of possible variations in other safety factors, such as enforcement.

In his speech, Burnley said Americans "are becoming more safety conscious," citing a 14 percent decline in the number of drunken drivers involved in fatal auto accidents between 1982 and 1986.

But the National Safety Council told Congress it believes the higher speed limit is causing more deaths.

"We have a very strong and clear indication from across the nation that average speeds have increased and more people are dying and sustaining more severe injuries on these roads," said Judith Stone, the council's federal affairs director, in testimony before the House surface transportation subcommittee.

She said she expects statistics to show 500 additional highway deaths annually as a result of the higher speed limit.

The Sacramento Union, Saturday, May 7, 1988—A13

Highway death rate soaring, agency reports

By DON KIRKMAN
SCRIPPS HOWARD NEWS SERVICE

WASHINGTON — It made little difference last year whether drivers drove 55 mph or 65 mph on rural interstates — the highway death rate rose sharply at both speeds, the National Highway Traffic Safety Administration said Friday.

NHTSA said fatalities increased 18 percent during the first nine months of 1987 on rural interstates that permit 65 mph and soared 17 percent on rural interstates restricted to 55 mph.

"There is very little difference between (the death rates) in states that raised to 65 and those that did not," the report said.

The report analyzed fatalities in 37 states that hiked their speed limits to 65 mph early last year and 10 that retained the 55-mph limit.

Of the states that switched to the higher speed, California, New Mexico, Arizona and Louisiana accounted for 70 percent of rural interstate deaths during the first nine months of the year.

NHTSA said its information may be too preliminary to draw accurate conclusions on how many deaths the 65-mph speed limit is causing.

The report drew instant criticism from National Safety Council vice president Chuck Hurley, who said a close look at the data indicates deaths on 65-mph rural interstates have soared 20 percent.

Hurley criticized Transportation Secretary James Burnley for saying the 65-mph speed limit is not increasing highway fatality rates.

Burnley said speed doesn't matter, but a car traveling 65 mph has 40 percent more energy than a car traveling 55," he said. "Burnley can't repeal the laws of physics — 65 causes more deaths."

Hurley also said Burnley and his predecessor, former Transportation Secretary Elizabeth Dole, have beguiled the nation with disinformation.

"They've been saying for several years that drinking and driving is a social disgrace, but it's perfectly OK to speed," Hurley said.

Florida Department of Transportation

BOB MARTINEZ
GOVERNOR

Haydon Burns Building, 605 Suwannee Street, Tallahassee, Florida 32301-8064, Telephone (904) 488-8541

KAYE N. HENDERSON
SECRETARY

June 7, 1988

Ms. Diane Steed, Administrator
National Highway Traffic Safety Administration
400 7th Street SW
Washington, DC 20590

Dear Ms. Steed:

We have recently reviewed your "Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways". This Report and its successors will have great impact on national policy in setting speed limits, and are deserving of close attention.

The effort which went into the Interim Report is impressive. The limitations on the data were fully realized, the analysis was exhaustive, and the conclusions were carefully drawn. With this kind of work, we expect future Reports to be able to draw some useful conclusions.

As with all things, though, improvements are possible and we wish to offer some comments on the Report and suggest some ways to help make future analyses more conclusive.

Limitations of the Interim Report

As stressed in the Interim Report, the limited time that the higher speed limits have been in effect makes the available data sparse and the analysis difficult. We fully agree with the statement that "...the fatality data for this time frame are not sufficient for determining the long-term safety impact of the rural Interstate speed limit increase. Any trends should be regarded as preliminary, and no firm conclusions should be drawn until more data become available and are carefully analyzed."

The difficulties of drawing conclusions from the presently available data are readily apparent in the state-to-state variability of the data. During the period from the day of the speed limit increase through September 30, fatalities increased in 25 states; the increase was as large as 400% in South Dakota. On the other hand, fatalities decreased or stayed the same in 12 states, including Florida; the decrease was as large as 50% in New Hampshire. Four states (Arizona, California, Louisiana, and New Mexico) accounted for about 70% of the total 1987 increase.

Further evidence of the difficulty of drawing conclusions is the general increase in fatalities on rural Interstate highways during the *early* part of 1987, before any speed limits were raised.

Additional Study

We look forward to future reports which will be able to include more data from longer periods of study. Unfortunately, while more data are necessary, more of the same data, per se, will not be sufficient. We suggest that future reports also consider, to the extent possible, additional factors that have major impacts on fatality rates on highways. These include: speeds (levels and distributions); traffic volumes; seat belt laws, publicity, and usage; drunk driving laws and enforcement; and even episodes of worse-than-usual weather and driving conditions. Some of these items are discussed below.

Changes in the posting of higher speed limits should also be taken into account. The boundaries of urbanized areas can change, and the amount of eligible Interstate mileage that is not posted with higher speed limits because of construction or other hazards can change. In addition, some states have many miles of non-Interstate highways which were built to Interstate standards. Such highways may or may not be posted at 65 mph, making comparisons of Interstate to non-Interstate fatalities within a state more complicated.

Traffic Volumes

Higher traffic volumes have long been correlated with increased fatality rates. Vehicle miles travelled have increased on rural Interstates, and the increase has been larger in states with 65 mph Interstates than in other states. Consideration of the bad effects of such increases should be balanced by attention to any corresponding decrease in travel on less safe non-Interstate roads. As the Interim Report noted, the Interstate highway system is by far the safest highway system in the United States. If making Interstate travel more attractive shifts travellers from more dangerous roads onto Interstates, the net effect could be fewer fatalities overall.

Seat Belts

An analysis by the Florida Department of Highway Safety and Motor Vehicles indicates that the number of fatal accidents on Florida Interstates from 1985 through 1987 was highly correlated with seat belt usage or non-usage, as determined from a survey conducted each year.

It is reasonable to expect that seat belt usage would have an even greater effect on the number of fatalities than on the number of fatal accidents, but this is an area that needs more study.

Speeds

The currently available data on changes in travel speeds on 65 mph Interstates are sparse and inconclusive. An early indication suggested by the Interim Report is that speeds may be up only slightly, with the average speed up a little more than the 85th percentile

speed. The findings for the three states discussed in the Interim Report are similar to the results for a brief study in Florida.

The slight speed increases may be seen as due only to the limited data, especially by those who expected all traffic to move 10 mph faster. There are sound traffic engineering reasons to expect only a small increase, however. Drivers have a tendency to drive at a speed which they perceive to be safe and comfortable for them, based on traffic volume, visibility, road conditions, and any other factors. A wide range of drivers will select a surprisingly narrow range of speeds. In fact, the usual way traffic engineers set a speed limit on a given road is to measure the speed maintained by most (85%) of the drivers. Since most Interstates are designed to move traffic at speeds over 70 mph, it is not surprising that many drivers tend to drive at a speed approaching 70 mph. Changing the posted speed limit does not change the drivers' perceptions of the road conditions, so the natural tendency to drive at speeds approaching 70 mph does not change.

The major change that is expected, and seems to be occurring, is for the few law-abiding citizens who were going 55 mph to speed up slightly. This results in a narrower range between the slowest moving traffic and the fastest moving traffic. Since it is safer for all traffic to move at about the same speed, this is not an inherently bad development.

You have our thanks for your work to improve safety on American highways, and our best wishes in your continued efforts.

Sincerely,

Jack A. Butler, Chief
Bureau of Transportation Statistics

cc: Mr. Ronald Fiedler, AASHTO
Mr. David Hensing, AASHTO
Mr. Nick Serianni, FDOT

STATE OF IDAHO Cecil D Andrus, Governor
TRANSPORTATION DEPARTMENT
P.O. BOX 7129 • BOISE, ID • 83707-1129 • 208/334-8000

August 5, 1988

Mark Edwards
National Highway Traffic Safety Administration
NRD-31
400 Seventh Street Southwest
Washington, DC 20590

Dear Mr. Edwards:

My staff has reviewed your office's May 1988 report entitled, "*Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways,*" at the suggestion of the AASHTO Standing Committee on Highway Traffic Safety. The following observations are offered.

1. The report is an exhaustive preliminary review of available fatal accident data. The conclusions are consistent with the preliminary nature of the data.

2. It is unfortunate that appropriate speed data is not yet available to assess the direct relationship between speed on the rural interstate and fatality experience. Hopefully, year-end speed data will be available in the fall report to Congress to conclusively examine this question.

3. The second conclusion on Page 4 dwells on the relatively small portion of national fatalities occurring on rural interstates. In a rural state like Idaho, up to 13 percent of fatal accidents occur on rural interstate highways.

   Whether this portion is large or small, the relevant issue for policy makers should be the benefits of the 65 mile per hour law versus the potential cost to society in terms of speed induced injury. The conclusions of NHTSA's assessment should focus directly on this question.

4. The Idaho rural interstate fatality rate was 0.25 fatalities per million vehicle miles (MVM) in 1987 and 0.21 fatalities per MVM in 1986. Fatalities were 33 in 1987 and 26 in 1986.

   The above rate comparison time periods do not correspond to the exact time periods of law implementation -- May through December, 1987. Appropriate travel data is not available monthly to enable such a analysis.

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CONTINUED

I look forward to your fall report to Congress. Thank you for the opportunity to review the May 1988 report.

Sincerely,

KERMIT V. KIEBERT
Director

KVK:DA:jms:ctstraffsfty

cc: David Hensing, AASHTO

Illinois Department of Transportation
Office of the Secretary
2300 South Dirksen Parkway/Springfield, Illinois/62764
Telephone 217/782-5597

June 21, 1988

Ms. Diane Steed, Administrator
National Highway Traffic Safety
Administration
400 7th Street, S.W.
Washington, D.C. 20590

Dear Ms. Steed:

We recently received a copy of "Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways." We have reviewed the report and have the following comments to offer.

The interim report does not use the accepted definition of rural interstate highways. Areas of under 5,000 population were used as the cutoff point for rural interstate highways whereas FHWA uses a definition of under 50,000 population as rural interstate. This issue should be corrected in future assessments.

It is important to note that while fatalities are up, it is too early to determine whether they are a direct effect of speed limit increases. For example, there simply are not enough data available yet on personal injury and property damage accidents. The number of fatalities, which is relatively small compared to experience on all of our highways and streets, should not be the only consideration in determining the overall impact on safety.

We are aware of the tremendous pressures on NHTSA to develop statistics regarding this issue. However, the timing of the report may be somewhat premature. Four or five months experience with the higher limits may not be adequate to determine with any degree of reliability the trends that are attributable to revised speed limits. We recommend that NHTSA collect more detailed accident, travel and speed data, and prepare a report based on those data following a longer study period.

Thank you for providing us with a copy of the report and giving us the opportunity to comment.

Sincerely,

Gregory W. Baise
Secretary

cc: Mr. Ronald R. Fiedler
Mr. Francis B. Francois
Mr. David J. Hensing

Iowa Department of Transportation
800 Lincoln Way, Ames, Iowa 50010 (515) 239-1412

July 19, 1988 Ref. No. 592

Mr. William A. Boehly, Director
National Center for Statistics and Analysis
National Highway Traffic Safety Administration
U.S. Department of Transportation
400 Seventh Street S.W.
Washington, D.C. 20590

Dear Mr. Boehly:

RE: May 19, 1988 Interim Report on Safety Consequences of Raising the Speed Limit on Rural Interstate Highways

In my letter dated June 29, 1988 I wrote to you about the preliminary report concerning the impact of the 65 mph speed limit on Interstate highway fatalities, and I provided some comments and additional data in behalf of the State of Iowa and the Iowa Department of Transportation. I have also been asked to comment on the above-referenced Interim Report.

The large amount of data reviewed and the large number of different approaches used made it quite difficult to keep track of all the conclusions that could be drawn from the data. Our comments with regard to this report are listed as follows:

1. None of the FARS data was displayed in the format of accidents/VMT, which would have taken into account at least some measure of exposure.

2. The limited speed changes between the before/after periods did not show variances or discuss the possibility of increased fatalities due to more conflict situations caused by a larger difference in vehicle speeds.

3. No discussion was made about the amount of time required by drivers to becomme acclimated to the higher speed limits and the impact of this on fatalities.

4. Over half the increase in fatalities came from four states. Since three of these states (Arizona, New Mexico and California) are in the southwest, there could be demographic factors at work that have nothing to do with the increased speed limit.

5. The data show that there is a substantial increase in fatalities, but we believe it is almost impossible to determine how much of the increase can be attributed solely to the increased speed limit.

6. Some of the data seems to contradict the increase (See the Sections comparing the January-March period to July-September and the data comparing those states which raised the speed with those that did not for January-September, 1987).

Our final comment is the same as that made in our earlier letter. We believe much more time is required before any comprehensive analysis can be conducted and any judgments or conclusions propounded regarding the impact of this speed limit change.

Sincerely,

Harold C. Schiel

Harold C. Schiel, Director
Bureau of Transportation Safety

HCS:jsb
cc: Robert L. Humphrey, Highway Division Director - Chief Engineer, Iowa DOT
Ronald R. Fiedler, P.E., Chairman, AASHTO Standing Committee on Highway Traffic Safety
David J. Hensing, Deputy Executive Director, AASHTO

Iowa Department of Transportation
800 Lincoln Way, Ames, Iowa 50010 (515) 239-1412

June 29, 1988 Ref. No. 592

Mr. William A. Boehly, Director
National Center for Statistics and Analysis
National Highway Traffic Safety Administration
U.S. Department of Transportation
400 Seventh Street S.W.
Washington, D.C. 20590

Dear Mr. Boehly:

RE: Impact of the 65 mph Speed Limit on Interstate Highway Fatalities

Iowa DOT Highway Division Director-Chief Engineer Robert L. Humphrey is a member of the AASHTO Standing Committee on Highway Traffic Safety, and attended a meeting of that Committee in Charlston, South Carolina on May 9 and 10, 1988. At that meeting NHTSA Administrator Diane Steed addressed the Committee on the subject of the NHTSA report regarding Interstate highway fatalities and the relationship to the 65 mph speed limit.

Ms. Steed invited Interim Report review and evaluation comments, and also any specific accident analysis data that might be available regarding the fatal accidents identified in the report. Mr. Humphrey has asked me to provide that information.

I have enclosed a copy of a report from me to former Iowa DOT Director W. B. Dunham on this subject. The report is dated December 24, 1987, and was a response to fatality data contained in what I will call the NHTSA Preliminary Interim Report. The Preliminary and Interim reports contain the same fatality information for 1987--three from January through March,and nine from May through July.

We checked (agreed with) the totals for both the 1986 control or comparison periods and the 1987 study time periods. However, in examining the accident reports for the 1987 May through July period we found one accident was miscoded and occurred in an urbanized area (55 mph), one was a construction accident in a construction zone in the closed lane, and two were in construction zones with reduced speed limits. Another accident occurred in a construction zone that may have been operating at a reduced speed but no reduction was posted. Disregarding the last construction zone accident, the Iowa total for the "after 65" May-July, 1987, time period would be reduced from nine to five -- a substantial reduction.

We frankly have great misgivings about your efforts to prepare a report on the safety consequences of raising the speed limit on the Interstate highways, but recognize your need to do so in response to the mandate from Congress. Some of our concerns are:

1. The principal data base appears to be limited to the FARS program.
   - This program provides the number of fatal accidents and fatalities only with no other qualifying analytical data.
   - The rural/urban accident classification procedure prescribed in the FARS program does not mesh with the urbanized area boundary split between the 65 and 55 mph speed limit areas.

2. Though limitations are recognized, the report seems to be based largely on the premise that the speed limit element has changed but all other elements such as weather (snow, ice and rain), enforcement, construction and maintenance work zones and use of alcohol and controlled substances, etc., remain the same. We consider these to be variables also.

3. The annual number of Interstate highway fatal accidents and fatalities (13 and 14) respectively in Iowa in 1986) is very small, and the before/after data base for the interim report is only three months before and after the speed limit change date. We believe much more time is required before any comprehensive analysis can be conducted, and any judgments or conclusions advanced regarding speed limit impact.

These comments are based on the preliminary interim report, and to a limited degree, on the much more comprehensive May, 1988 Interim Report. We plan to review that report in more detail and will forward any additional comments we have in the near future.

Sincerely,

Harold C. Schiel

Harold C. Schiel, Director
Bureau of Transportation Safety

HCS:jsb
Enclosure
cc: Robert L. Humphrey, Highway Division Director-Chief Engineer, Iowa DOT
Ronald R. Fiedler, P.E., Chairman, AASHTO Standing Committee on Highway Traffic Safety
David J. Hensing, Deputy Executive Director, AASHTO

IOWA DEPARTMENT OF TRANSPORTATION

Director

December 24, 1987

W.B. Dunham

Harold C. Schiel

Bureau of Transportation Safety

Fatalities on Rural Interstate Highways

The NHTSA is conducting a study of fatal accidents on the rural interstate highways in relation to the change in speed limit from 55 mph to 65 mph. That agency's preliminary report for the state of Iowa is as follows:

Estimated Rural Interstates	Jan. - March	May - July
1986	4	3
1987	3	9

(Iowa raised the speed limit on rural interstates on 5-12-87)

We have checked the Iowa records and examined the accident reports for fatal interstate highway accidents during the time periods reported by the NHTSA. The following information was obtained from those reports:

January - March 1986	Description
1-3-86, Adair Co., I-80	Car struck left rear of truck and rolled into median.
1-4-86, Scott Co., I-80	Westbound car went out of control, crossed median, and was struck broadside by eastbound car.
3-6-86, Poweshiek Co., I-80	Truck-tractor semi-trailer vehicle. Driver fell asleep, ran off road on right side and rolled.
3-6-86, Cedar Co., I-80	Eastbound car. Vehicle ran off road on left side (median), struck and broke through a guardrail.
May - July 1986	**Description**
5-4-86, Mills Co., I-29	Northbound motorcycle. Driver exited I-29 on U.S. 34 off ramp, struck the ramp terminal island at U.S. 34.
5-5-86, Hamilton Co., I-35	Motor home with attached trailer parked on northbound I-35 shoulder. Truck-tractor semi-trailer traveling in same direction veered to right, struck trailer and then motor home.
6-7-86, Pottawattamie Co., I-29	Northbound car ran off road on curve and rolled.

January - March 1987	Description
1-31-87, Pottawattamie Co., I-29	Northbound car struck pedestrian who entered roadway from the median.
2-20-87, Pottawattamie Co., I-29	Southbound car in northbound roadway sideswiped northbound truck and traveled into median
2-23-87, Iowa Co., I-80	Westbound car. Made a U-turn and traveled east in the westbound lane. Met one westbound truck then turned head-on into the path of another truck.

May - July 1987	Description
6-5-87, Fremont Co., I-29	Southbound car. Vehicle ran off roadway into median in advance of bridge and traveled down embankment to gravel road below.
6-6-87, Jasper Co., I-80	Westbound car. Vehicle ran off roadway into median, struck eastbound roadway embankment and rolled.
*6-12-87, Polk Co., I-35/I-80 (speed limit 55 mph)	Westbound car. Vehicle entered construction zone at Ryder Corner, struck concrete barrrier rail, ran off road and rolled.
*6-13-87, Iowa Co., I-80 (speed limit 65 mph)	Eastbound car. Vehicle went out of control near exit end of construction zone, swerved and rolled in the roadway.
*6-25-87, Story Co., I-35 (speed limit not applicable)	Construction vehicle backed over construction worker.
7-3-87, Clarke Co., I-35	Northbound car. Driver apparently fell asleep. Vehicle ran off roadway on right side, struck guardrail, rolled, and landed upside down in creek.
7-23-87, Cedar Co., I-80	Eastbound pickup truck. Vehicle ran off roadway on right side, struck guardrail on overpass bridge, vaulted cross road landing in I-80 ditch on other side.
*7-25-87, Cass Co., I-80 (speed limit 55 mph)	Westbound car. Vehicle traveling west in head-to-head traffic in construction zone. Driver apparently fell asleep and drifted across centerline into path of eastbound truck.

* Note - These are construction work zone accidents.

Comments:

We have confirmed the number of fatal accidents reported by the NHTSA for the study periods. However, one fatal accident in the May-July, 1987 study period was found to have occurred on I-74 in Bettendorf, and must be excluded. This reduces the total to eight for that time period. Of the eight, four occurred in construction zones. Two of the zones had reduced speed limits, and one accident involved a construction vehicle and construction worker. Four of the accidents (including one construction zone accident) may have involved speed, but it would be impossible to state that the change from 55 mph to 65 mph had anything to do with any of these accidents.

jsb
cc: D. Renisnk
I. MacGillivray

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
TRANSPORTATION BUILDING
STATE HOUSE STATION 16 AUGUSTA, MAINE 04333

mdot

DANA F. CONNORS
Commissioner

June 13, 1988

U.S. Department of Transportation
National Highway Traffic Safety Administration
Washington, D.C. 20590

Attn: Diane K Steed, Administrator

Re: Comments on the "Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways".

Dear Ms. Steed:

Upon carefully reviewing and evaluating the Interim Report, I feel that I should relay to you our comments on the issues and procedures as detailed in the report. I fully realize that the analysis presented is preliminary, however, the procedures used to arrive at the statistics lead me to become concerned about your future reporting of the safety implications of raising the speed limit on rural Interstate highways.

Foremost, as stated in the report, the analysis was based primarily on fatal accident statistics obtained from FARS. As a result of the small numbers involved on the rural Interstate System (5% of total) and also the many other possible causes of fatal accidents other than speed such as alcohol, fatigue, weather, mechanical failure and others too numerous to list, any resulting conclusions drawn from this data could prove premature as well as unreliable. In Maine, the use of fatal accident statistics because of the small numbers involved and the resulting low probability of a fatal accident occurring, the resulting analysis of this statistic has proven unreliable in the past.

According to NHTSA statistics, fatalities increased on the rural Interstate System in states that raised the speed limit and also in those states that did not increase the speed limit. This points out the need to examine the accident statistics and their calculation methods on a state by state basis and not rely on national summaries to develop conclusions on the safety implications of raising the rural Interstate speed limit. This is further supported by the recent G.A.O. report on monitoring practices which stated that Maine, which had the second highest percentage of motorists exceeding 55 MPH on the rural Interstate also had the lowest fatal accident rate of those states reviewed by G.A.O.

There are and will continue to be significant differences in historical accident trends in the individual states. Presently, accident rates are not calculated uniformly from state to state, and attempting to develop a national statistic would be difficult due to the differences between the states in the calculating process. The method used to calculate the accident rates is not of primary concern, it is the difference in accident rates (increase or decrease) of the individual state that is important.

For the future reporting to Congress, I would recommend that each state on an individual basis analyze and report on the total accident picture, not just fatals, on the rural Interstate where the speed limit was raised and compare these statistics to previous data. The reporting should include the primary cause of any fatals reported. A period of time, perhaps two years of data as a minimum would be appropriate, before any conclusions on the safety of the rural Interstate can be drawn reliably.

I have enclosed, for your information, copies of our latest fatal accident information that we have available for Maine on the rural Interstate System. If you have any questions or concerns, do not hesitate to contact me.

Sincerely,

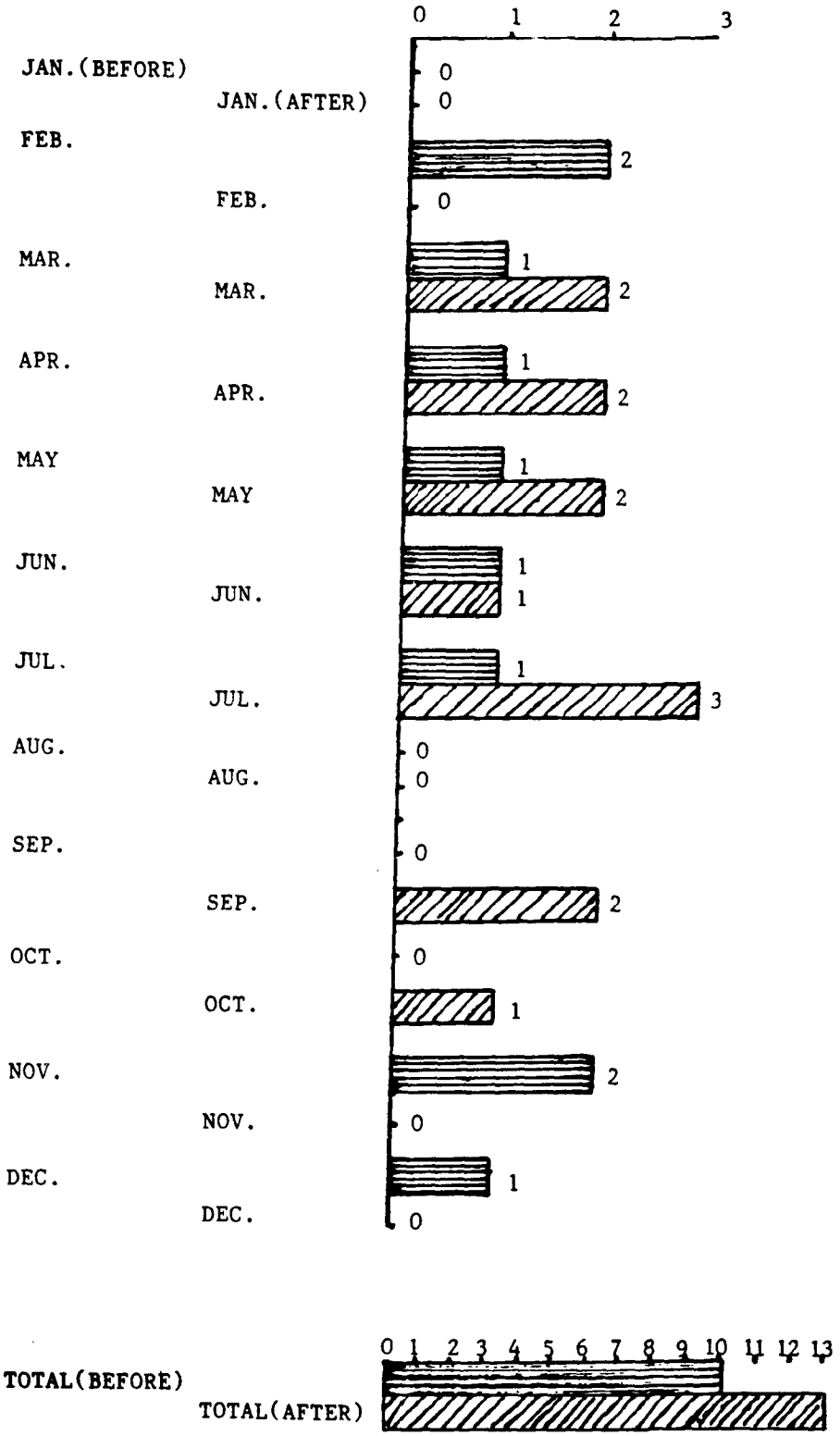
Dana F. Connors
Commissioner

DFC/KLS/rw

Enclosures

cy: Paul J. Minor, Planning
Kenneth Sweeney, Planning
File

FATAL ACCIDENTS BEFORE & AFTER 65 MPH
SIGNING ON INTERSTATE HIGHWAYS



FATAL ACCIDENT CAUSES, BEFORE & AFTER
65 MPH SIGNING ON INTERSTATE HIGHWAYS

CAUSES

	MONTH	SLEEP	OUI	SPEED	INATTEN.	PED.	PHYS. IMP.	AVOID. ANIM.	WRONG WAY	LANE CHANGE	TOTAL
BEFORE	J										
	F		*		*						2
	M	*									1
	A		*								1
	M		*								1
	J	*									1
	J	*									1
	A										
	S										
	O										
	N			*			*				2
	D						*				1
	Total	3	3	1	1		2				10
AFTER	J										
	F										
	M			*		*					2
	A	*								*	2
	M				*				*		2
	J			*							1
	J	*	*					*			3
	A										
	S	*		*							2
	O			*							1
	N										
	D										
	Total	3	1	4	1	1		1	1	1	13

Maryland Department of Transportation
The Secretary's Office

William Donald Schaefer
Governor
Richard H. Trainor
Secretary

June 8, 1988

Ms. Diane Steed
Administrator
National Highway Traffic Safety
Administration
400 7th St., S.W.
Washington, DC 20590

Dear Ms. Steed:

We have received the report issued by your office entitled "Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways." I understand that you requested comments from states on this report at the recent meeting of the AASHTO Standing Committee on Highway Traffic Safety. The following are comments we offer.

Raising the 55 mph speed limit has become a very emotional issue with certain segments of the motoring public. Therefore, it is important that any reporting of state experience with increased speed limits be based on sufficient data and complete analysis. We urge you to make these prime considerations in future reporting.

It is difficult to aggregate data from states that have different design characteristics, operating conditions and travel behavior on high-speed facilities. Factors such as highway geometrics, traffic controls, speed enforcement, seat belt usage, alcohol involvement and emergency medical services certainly have an impact on fatality rates. Consideration should be given to stratifying data on the basis of these and other factors before attempting any aggregate analyses.

Thank you for this opportunity to comment on this most important subject.

Sincerely,

Richard H. Trainor
Secretary

RHT:caq

cc: David Hensing, AASHTO

8806200014

My telephone number is (301)-859-7397
TTY For The Deaf (301) 859-7227
Post Office Box 8755, Baltimore/Washington International Airport, Maryland 21240-0755

STATE OF NEBR

DEPARTMENT OF ROADS

KAY A. ORR
GOVERNOR

G.
DIRECT

[illegible] 1988

Mr. Norman McPherson
National Highway Traffic
Safety Administration
P.O. Box 412515
Kansas City, Missouri 64141

Dear Mr. McPherson:

The Nebraska Department of Roads has been requested to review and comment on the May 19, 1988 Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways. Please forward our comments to the appropriate National Highway Traffic Safety Administration officials.

The authors of this report have expended a great amount of energy analyzing insufficient data. Understandably then, no meaningful conclusion was (or could be) made. It was interesting to note that the problem was reviewed from a number of different angles. That indicates to us that the researchers recognize many of the less obvious influences of the 65 mph speed limit and other factors related to the issue.

One should be cautious about extracting conclusions from individual analysis techniques used in the study because of flaws in their design. However, when viewed as a "package", individual deficiencies are addressed in other techniques.

The authors of this report recognize the difficulty of performing analysis and drawing valid conclusions from inadequate data. While the data used is apparently accurate, it is simply not sufficient to do a proper job of analysis. A similar report using data collected from two years of "65 experience" could be very useful. Any available speed data and/or accident information from Nebraska would be provided for such a report. However, if the final report is only to be a rewrite of the interim report, it will be of little additional use.

The study raises some questions that need to be addressed and, therefore, could serve as a guideline for individual analysis at the state level.

Sincerely,

G. C. Strobel
Director-State Engineer

GCS:KS:z

cc: Ken Sieckmeyer
Ken Gottula
Ron Fiedler
Charles Culp

P.O. BOX 94759, LINCOLN, NEBRASKA 68509-4759, PHONE (402) 471-4567

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
1263 South Stewart Street
Carson City, Nevada 89712

RICHARD H. BRYAN, *Governor*

GARTH F. DULL, *Director*

June 14, 1988

In Reply Refer to:

Ms. Diane Steed, Administrator
National Highway Traffic Safety Administration
400 7th Street S.W.
Washington, D.C. 20590

PSD 1.06

Re: NHTSA'S "Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways"

Dear Ms. Steed:

The "Interim Report" while well prepared, appears to be based on insufficient and inconsistent data relating states' experience with the 65 MPH speed limit. The assessment highlights the fact that for various reasons traffic related trends differ between states and that the determination of national policies and programs on insufficient data and review has many shortcomings.

Attached for evaluation is a review of Nevada's traffic accident experience (Attachment A) since posting of the 65 MPH speed limit as compared to the previous six (6) years. The Nevada Department of Transportation (NDOT) feels the "Interim Reports" evaluation of traffic accident, injury and fatal statistics based on one (1) years (1986) data is not representative of existing trends.

Also provided are Rural Interstate speed data (Attachment B) displaying pre-65 MPH and post-65 MPH (monitored quarterly for 24 hours at five statewide locations) statistics as outlined in Section VIII of the "Interim Report". As the speed data shows between April and September, 1987; the 85th % and average speed increased one to two mph with the % > 65 jumping seven percent. These numbers increased again during the 1st quarter FY 88 monitoring year; however, for the 2nd and 3rd quarter speeds have declined and when compared to pre-65 MPH the average and 85th% show very little change.

8806220014

The following revision corrects "Table VI-1: Interstate Miles Posted at 65 MPH, as of September 30, 1987"; page 67; as reported for Nevada:

Eligible Miles		Posted Miles		Percent Posted	
Rural	Urban	Rural	Urban	Rural	Urban
503	6	492	6	98%	100%

If Nevada can be of further assistance please advise.

Sincerely,

GARTH DULL
Director

GD:DKM:dg

Attach.

cc: Ronald R. Fiedler, AASHTO Standing Comm. Highway Safety
David Hensing, AASHTO Washington, D.C.
A. J. Horner, FHWA, Nevada Division
Mary Lynne Allison, OTS, Nevada DMV & PS
Bob Hilderbrand, Safety Engr. Nevada DOT

STATE OF NEVADA TRAFFIC ACCIDENT DATA

June, 1988

(Attachment A)

One of major concerns encountered in the comparison of the Post 65 MPH vs. the Pre 65 MPH Rural Interstate speed limit, is using the equivalent period for 1986 as the basis of evaluation. From April, 1986 through March, 1987, Nevada had a lower than expected accident rate on the system. Consequently, any accident rates at or slightly above the norm would be construed as showing or being indicative of an excessive increase for the following year, i.e. 1987/1988. As such, comparing one year of data with another year's data could readily lead to fallacious assumptions.

As shown in Table 1, that while the accident rates for the period 1981 through 1988 were spread from 0.92 to 1.14 per million vehicle miles, the fatality rates were fairly consistent. 1987/88 fatality rate was actually lower than the norm for the previous six years.

Table 1

Statewide Rural Interstate

Accident Rates

April 1981 through March 1988

Year	Total Acc.	Fatal Acc.	Fatalities
81/82	0.94	0.04	0.05
82/83	0.97	0.03	0.03
83/84	1.11	0.04	0.05
84/85	0.97	0.04	0.05
85/86	1.14	0.03	0.04
86/87	0.92	0.02	0.02
87/88*	0.95	0.03	0.03

* 87/88 - 65 MPH Speed Limit in effect.

Table 2 shows a breakout of actual numbers of accidents and fatalities. For the seven year period, the mean of Fatalities vs. Total Accidents is approximately 3.8%. The lowest number of accidents occurred in 1982/1983 with 1003. For that year, the Fatality ratio was 3.8%.

Table 2

Statewide Rural

Interstate Accidents

April, 1981 through March, 1988

Year	Total Acc.	Fatal Acc.	Fatalities
81/82	1080	43	51
82/83	1003	36	38
83/84	1182	38	47
84/85	1087	45	57
85/86	1183	29	34
86/87	1078	29	33
87/88*	1198	33	37

* 87/88 - 65 MPH Speed Limit in effect.

One of the higher accident years, 1985/86, had the lowest Fatality vs. Total Accident rate of 2.9%. 1985/86 through 1987/88 have been the three lowest years of the sample with an average rate of 3.0%.

Figure 1 shows the Total Accident Rate for 1981 through 1988 and Figure 2 indicates Fatal Accident Rate and Fatality Rate for the same time period.

Figures 3 and 4 have plots of total numbers of Accidents, Fatal Accidents and Fatal Victims. As can be seen, the graphs have a regression curve indicating a seven year trend. Curve points were calculated using the data from 1981/82 through 1986/87. The curves were extended to show a projected line for 1987/88 using 55 MPH speed limit data only. This would then indicate how much above or below the projected curve the actual post 65 MPH accident/fatality numbers would be.

These graphs readily show that the Nevada Rural Interstate System is subjected to cycle of peaks and valleys regarding accidents and fatalities. Although 1987/88 is close to the projected downward trend for Fatal Accidents and Fatalities, it is believed that there is insufficient data to reach any firm conclusion as to what effect the 65 MPH speed limit has had on fatalities. It is difficult, at this time, to access whether the upward trend in accidents/ fatalities is another spike on the graph or whether it is an adverse indication as a result of the 65 MPH speed limit.

When the 65 MPH speed limit was initiated, the expectation was that severity of accidents would increase. Therefore, whether the total number of accidents increased or decreased, fatalities should become a greater proportion in relation to total accidents. In Nevada, this has not proven to be the case for, at least, the first year of the 65 MPH speed limit. One must, however, be extremely cautious in using the one year of record in drawing conclusions as to what impact, if any, the 65 MPH speed limit is having on fatalities or accident severity.

Fig. 1

RURAL INTERSTATE ACCIDENT RATES

55 MPH VS 65 MPH

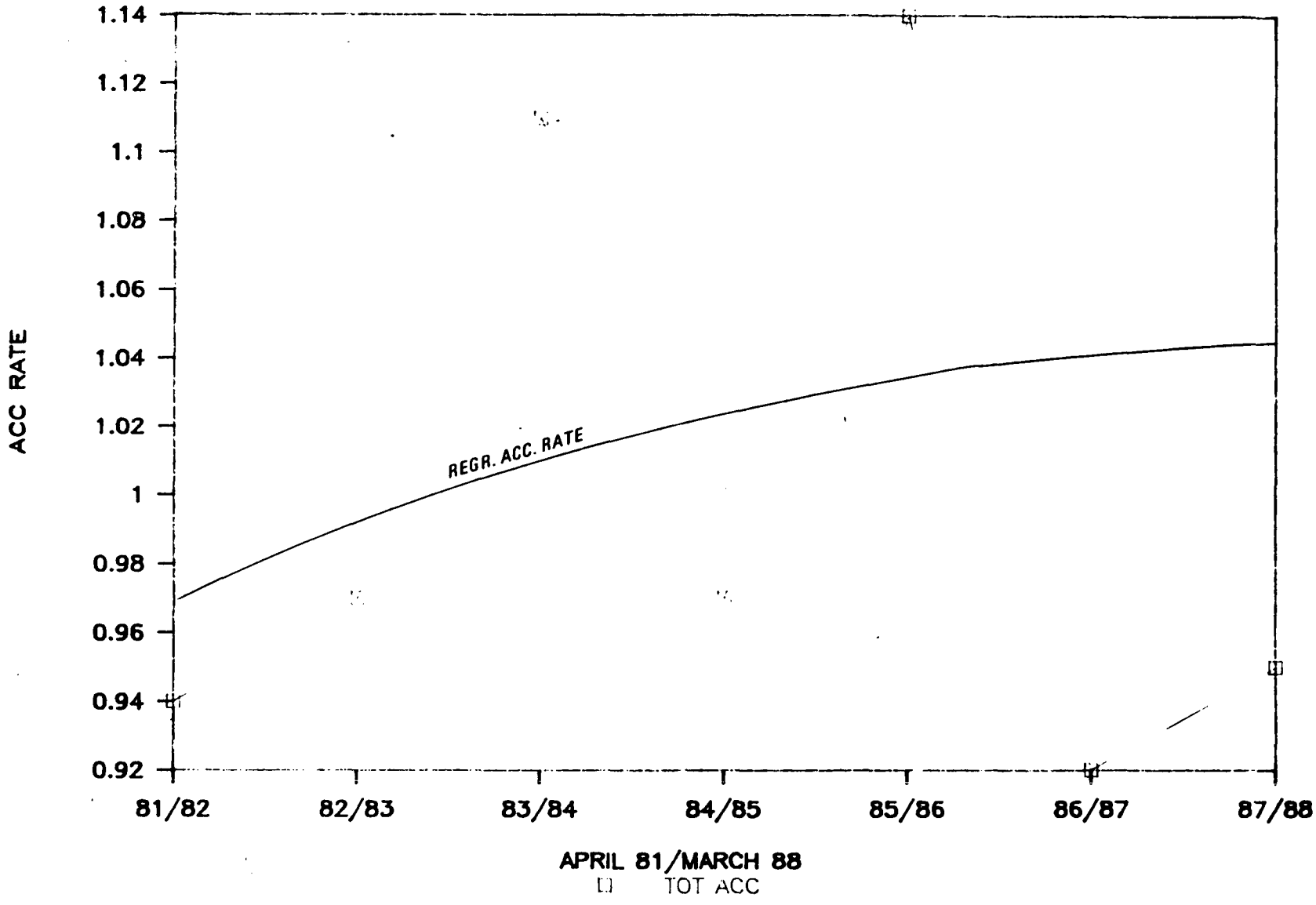


Fig. 2

RURAL INTERSTATE ACCIDENT RATES

55 MPH VS 65 MPH

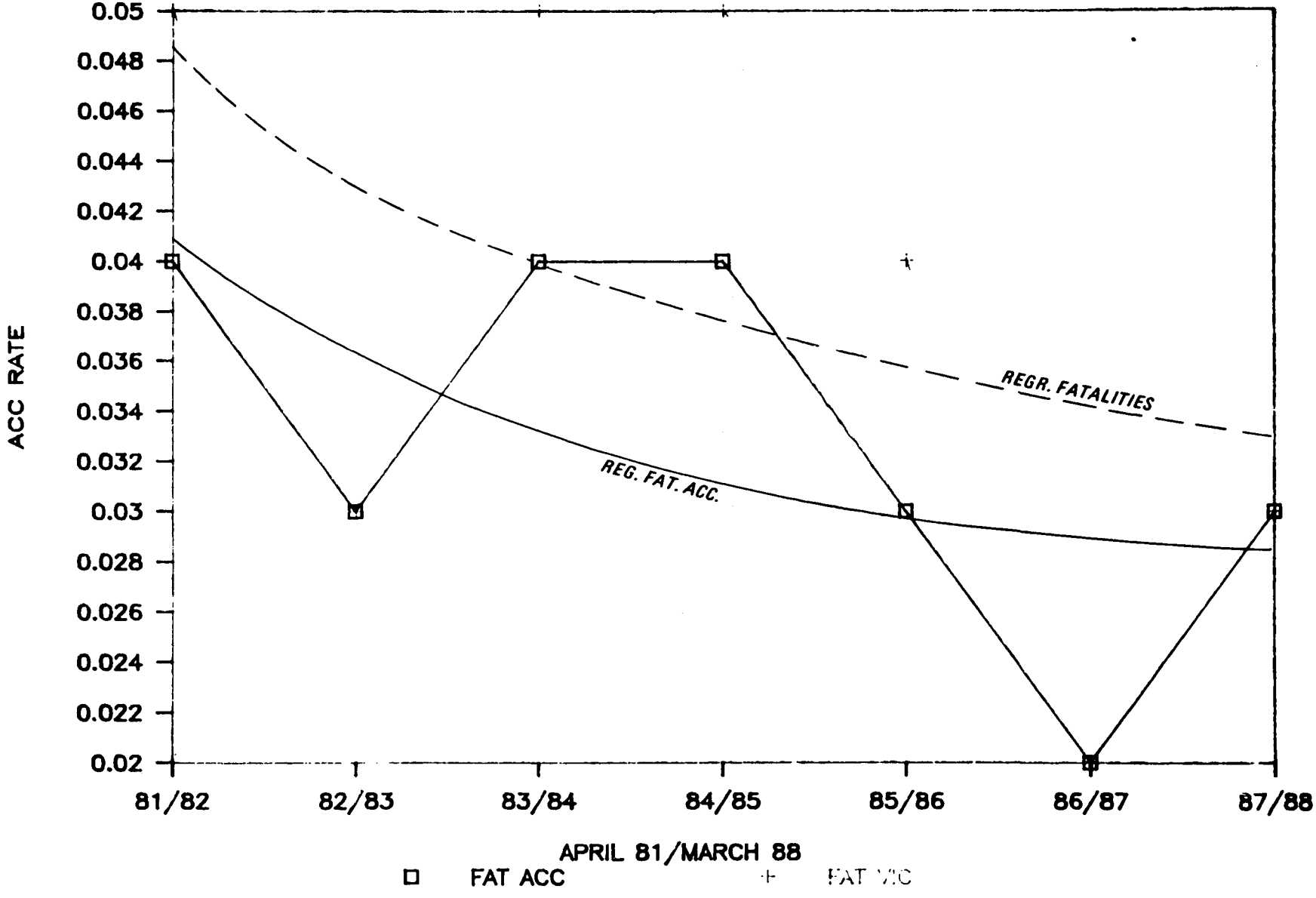


Fig. 3

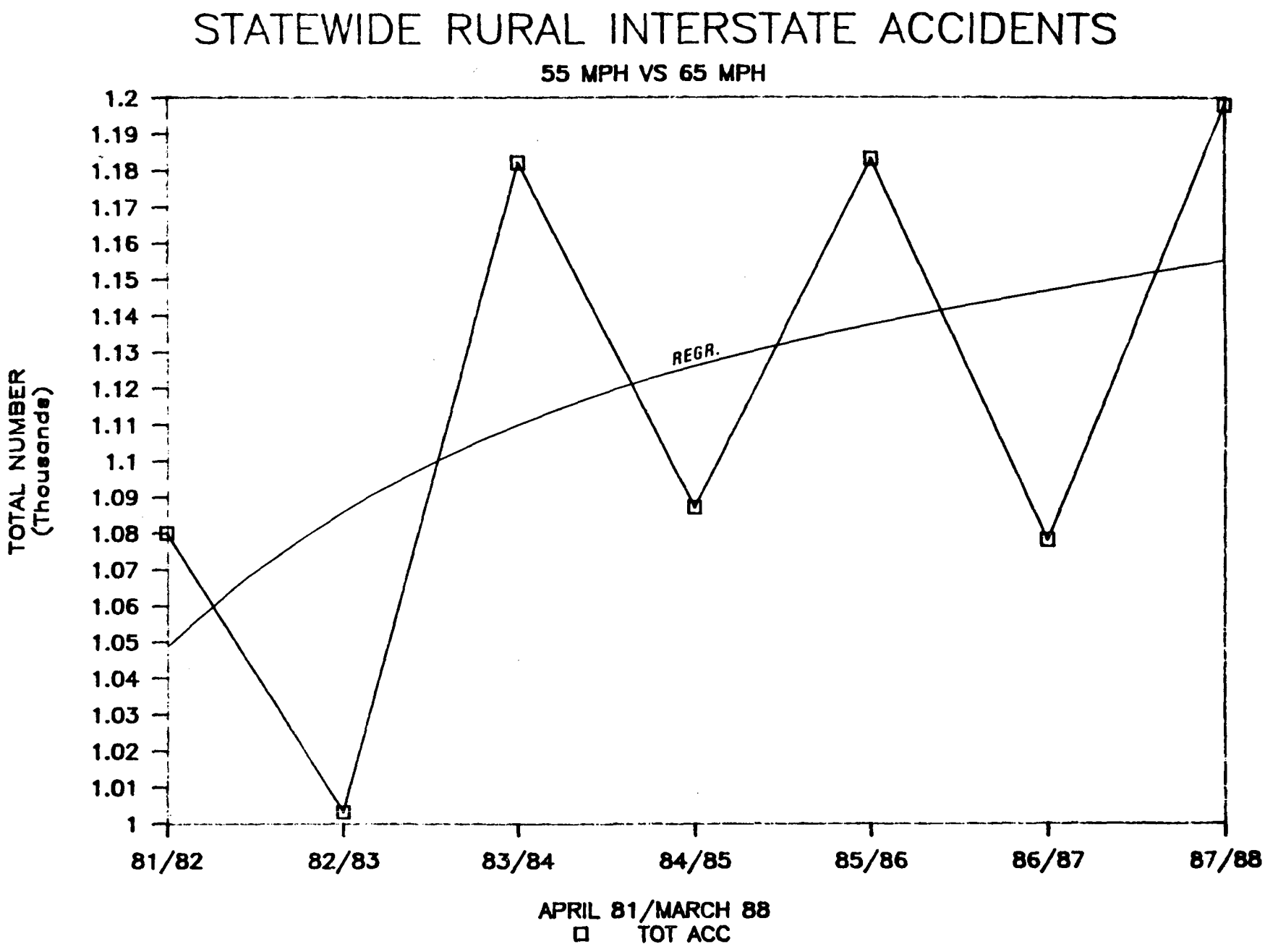
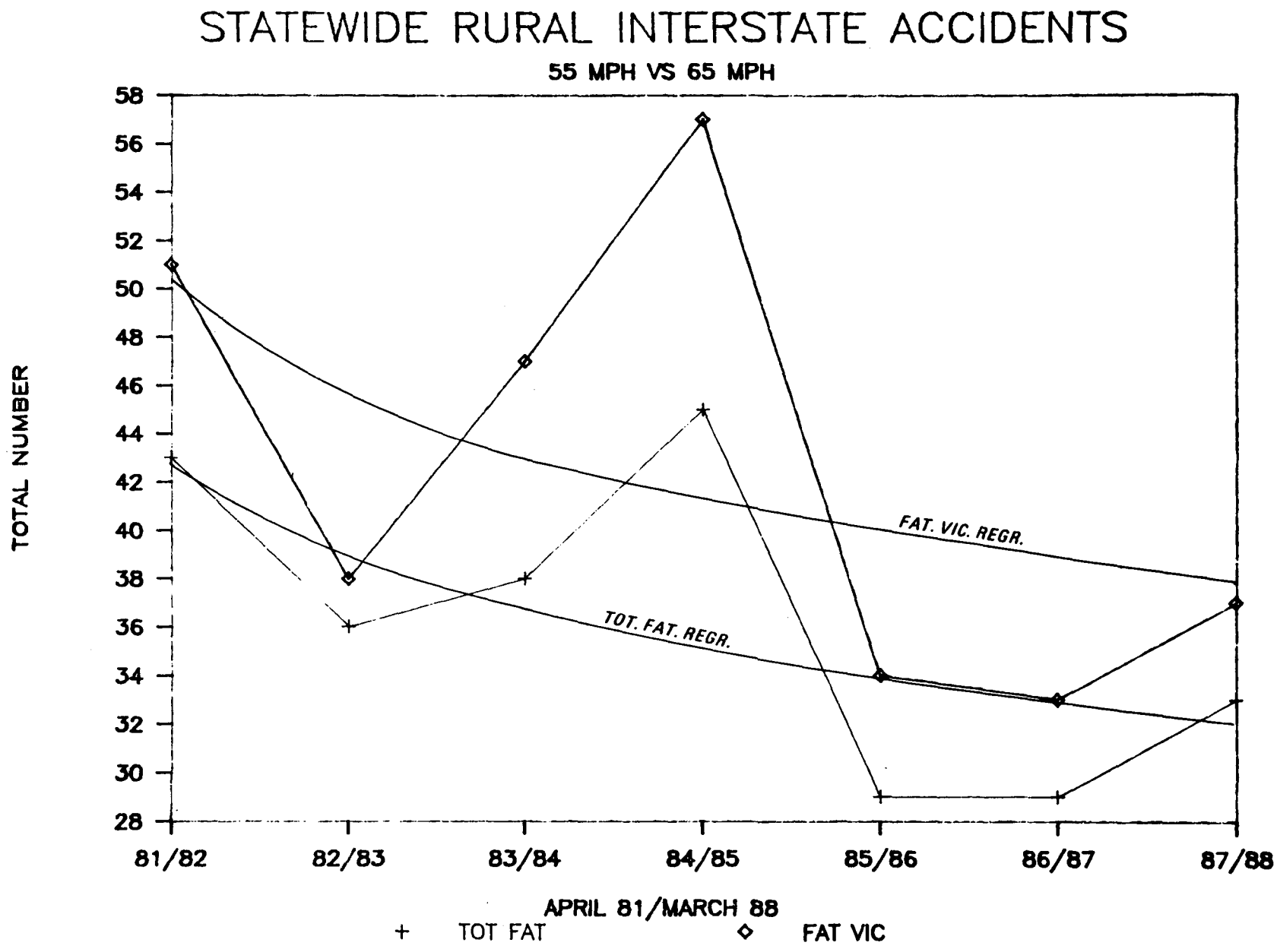

STATEWIDE RURAL INTERSTATE ACCIDENTS
55 MPH VS 65 MPH
TOTAL NUMBER (Thousands)
1.2
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.1
1.09
1.08
1.07
1.06
1.05
1.04
1.03
1.02
1.01
1
REGR.
81/82
82/83
83/84
84/85
85/86
86/87
87/88
APRIL 81/MARCH 88
TOT ACC

Fig. 4


STATEWIDE RURAL INTERSTATE ACCIDENTS
55 MPH VS 65 MPH
TOTAL NUMBER
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
FAT. VIC. REGR.
TOT. FAT. REGR.
81/82
82/83
83/84
84/85
85/86
86/87
87/88
APRIL 81/MARCH 88
+ TOT FAT
◇ FAT VIC

(Attachment B)

STATE OF NEVADA
SPEED DATA
FOR
RURAL INTERSTATE POSTED 65 MPH
JUNE 6, 1988

INTERSTATE SITES FOR PERIOD ENDING SEPTEMBER 30, 1987 (POSTED APRIL 9, 1987)

% > 65 MPH	% > 70 MPH	% > 75 MPH	85TH %	AVG. SPEED
34.6	12.1	1.4	70.3	62.8

INTERSTATE SITES FOR PERIOD ENDING DECEMBER 31, 1987 (1ST QTR FY 88)

% > 65 MPH	% > 70 MPH	% > 75 MPH	85TH %	AVG. SPEED
42.3	15.6	4.8	71.2	63.6

INTERSTATE SITES FOR PEROID ENDING MARCH 31, 1988 (2ND QTR FY 88)

% > 65 MPH	% > 70 MPH	% > 75 MPH	85TH %	AVG. SPEED
34.5	11.4	3.0	70.2	63.0

INTERSTATE SITES FOR PERIOD ENDING JUNE 30, 1988 (3RD QTR FY 88 - MONITORING COMPLETED ON MAY 15, 1988)

% > 65 MPH	% > 70 MPH	% > 75 MPH	85TH %	AVG. SPEED
33.9	10.3	2.4	70.0	62.8

INTERSTATE SITES WHEN POSTED 55 (SAME LOCATIONS FOR COMPARISON PURPOSES)

% > 55 MPH	% > 60 MPH	% > 65 MPH	85TH %	AVG. SPEED
87.3	61.1	27.4	69.3	61.0

INTERSTATE POSTED AT 55 MPH		INTERSTATE POSTED AT 65 MPH	
I-15	16.1 MILES	I-15	107.7 MILES
I-515	5.6 MILES		
I-80	20.5 MILES	I-80	390.1 MILES
I-580	5.0 MILES		
TOTAL-	47.2 MILES	TOTAL-	497.8 MILES

NEIL GOLDSCHMIDT
GOVERNOR

Department of Transportation

TRANSPORTATION BUILDING, SALEM, OREGON 97310

In Reply Refer To
File No.:
TRA

July 15, 1988

Diane K. Steed, Administrator
National Highway Traffic Safety Administration
U. S. Department of Transportation
400 7th Street, S.W.
Washington, DC 20590

In response to Ronald Fiedler's May 20 letter, the Oregon Department of Transportation has evaluated your "Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways". Given the fact that the report contained data through September 1987, our review was limited. However, speed data has been collected on a quarterly basis for the nine-month period following the 65 MPH implementation. With such a short operational period, it is not possible to produce conclusive results.

Oregon does have in effect a dual speed of 55 MPH for trucks rather than a single 65 MPH speed for all vehicles on our rural interstate highways. At this time, we do not have sufficient data to assess the safety impacts relative to this system.

The speed information collected for similar periods before and after implementing the 65 MPH speed suggest the following:

1. There does not appear to be a significant change in speeds at the monitoring locations still posted at 55 MPH speed. These locations are on urban freeways (interstate, noninterstate and expressways) as well as urban principal and minor arterials.

2. Data from the monitoring stations located on the rural interstate freeways which are now posted at 65 MPH indicated that there has not been a change in speeds. Speeds measured prior to the change were already near 65 MPH.

3. Information from the rural nonfreeway highways indicate there may be an increase in speed of two to three miles per hour on sections of highways posted at 55 MPH.

During the nine-month study period after implementing the 65 MPH speed on sections of rural interstate freeway, there were 15 fatal accidents with 17 fatalities resulting from these accidents. In the same period before implementation, there were also 15 fatal accidents with 17 fatalities. No trends or conclusions should be made because of the short time period.

The monitoring studies on the 55 MPH highways as required by the Federal Highway Administration will continue. Although not required, speed and accident monitoring will also continue on the 65 MPH portions of interstate freeways. As data becomes available, further analysis will be made for the 65 MPH portions on the total accident history including severity. A close review of statewide speed will show if there is truly a "spill-over" effect created by the increased freeway speed limit. Nationally, there is dissatisfaction with using the urban boundary as a speed reduction location. In many instances, it is not a good point to change speed, install signing, or to provide enforcement. A future review of speeds around this transition point will be of use to see if the urban boundary is a realistic breaking point for the speed limit changeover.

I hope this information is useful as you prepare your formal report to Congress this fall.

Robert N. Bothman
Director

cc David Hensing
Deputy Executive Director
AASHTO

Ronald R. Fieldler, P.E., Chairman
AASHTO Standing Committee on Highway
Traffic Safety

Department of Transportation

700 Broadway Avenue East
Pierre, SD 57501-2586 605/773-3265

August 12, 1988

Ms. Diane Steed, Administrator
National Highway Transportation Safety Administration
U. S. Department of Transportation
400 7th SW
Washington, D.C. 20590

Dear Ms. Steed:

We have recently completed a review and evaluation of the National Highway Traffic Safety Administration's (NHTSA) "Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways."

I would like to share with you some of our thoughts and recommendations which have emanated from our review of this report.

1. The fatalities reported for South Dakota from FARS as occurring on Rural Interstate are correct, but will include fatalities that occurred on sections of Rural Interstate posted at 55 MPH. Of the ten recorded in your report, nine occurred on Rural Interstate posted at 65 MPH and one occurred in a posted 55 MPH area. This variation may not affect the statistics to a great extent, but it could be significant in future reports and may even now if other states have similar situations. It does indicate the inconsistencies in the data collection procedure.

2. The report shows that fatalities have increased on South Dakota's Interstate System by 400 percent since the speed limit change (April 15, 1987) and 800 percent in a four month period between June and September of 1987. The 400 percent figure is incorrect because of the discrepancy cited in paragraph #1 above. The 800 percent figure is correct for the four month period indicated. However, the comparison is made with the previous year as opposed to a more realistic statistical approach of a three year average. If a three year average is used, the increase would have been 291 percent.

3. To further point out the inconsistency found in this report, I can identify this fact: If we look at the four month period (September through December 1987) in contrast to your reported four month period of June through September 1987 (800 percent increase), we find a 53.8 percent decrease in fatalities on rural interstates in South Dakota.

4. This report presents an implication that the 65 MPH speed limit increase has contributed to higher fatality figures. This is a subjective portrayal of facts. The only way to validate this assertion

is to review the circumstances of each accident involving a fatality to determine if the increased speed limit was contributory. For example, there have been seven fatal accidents on South Dakota's interstate since the speed limit was increased to 65 MPH. Five of these accidents occurred while the vehicles were traveling at less than the posted speed and three of these accidents (43% of the total fatal accidents on the interstate) involved speeds of less than 55 MPH.

5. It is also interesting to note that in the year prior to the Interstate speed limit change in South Dakota the vehicle miles traveled on the Rural Interstate versus other Rural Federal Aid Highways were:

RURAL INTERSTATE	FEDERAL AID HIGHWAYS
UP ----- 4.5%	UP ----- 8.6%

The year following the speed limit change:

RURAL INTERSTATE	FEDERAL AID HIGHWAYS
UP ----- 9.0%	UP ----- 1.5%

These figures, like those in your report, are inconclusive but of interest.

We do not believe any report such as the one reviewed will be of any value until uniform guidelines for data collection are established and followed. Then, the report will be valid only after a sufficient time elapse commensurate with acceptable statistical gathering criteria.

Sincerely,

Richard L Howard

Richard L. Howard
Secretary
Department of Transportation

RLH:jrr

cc: Mr. Ronald Fiedler, Chairman, AASHTO Standing Committee on Highway Traffic Safety
Mr. David Hensing, AASHTO Headquarters

COMMISSION
ROBERT H. DEDMAN, CHAIRMAN
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RAY STOKER, JR.

STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
DEWITT C. GREER STATE HIGHWAY BLDG.
11TH & BRAZOS
AUSTIN, TEXAS 78701-2483

ENGINEER-DIRECTOR
R. E. STOTZER, JR.

June 15, 1988

65 MPH Demonstration Program

IN REPLY REFER TO
D-18STO

Mr. William Boehly, Director
National Center for Statistics and Analysis
National Highway Traffic Safety Administration
400 Seventh St., S.W., Room 6125
Washington, D. C. 20590

Dear Mr. Boehly:

In late May, this Department received correspondence from the American Association of State Highway and Transportation Officials (AASHTO) concerning the National Highway Traffic Safety Administration's (NHTSA) analysis of speed limits on rural Interstate highways. We were asked by Mr. Ronald Fiedler, Chairman of AASHTO's Standing Committee on Highway Traffic Safety, to secure and review a copy of the "Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways." Mr. Fiedler suggested that we submit any comments we might have to the NHTSA.

Early this month, we received a letter from Ms. Barbara Harsha, Executive Director of the National Association of Governors' Highway Safety Representatives (NAGHSR), concerning an evaluation of the effects of speed limits on certain rural non-Interstate highways. She, like Mr. Fiedler, encouraged us to send information to NHTSA. Attached to her memorandum was a letter from you detailing specific information that your organization would need in order to conduct an evaluation.

The purpose of this rather lengthy introduction is to establish a basis for the following:

1. We are most appreciative of the efforts of both AASHTO and NAGHSR to involve the State of Texas in evaluations of speed limits on certain rural Interstate and rural non-Interstate highways. We welcome the continued association and relationship with these two organizations.

2. The State of Texas through the Department of Highways and Public Transportation is more than willing to participate in any evaluation of the effects of raising the speed limits on highways in the state.

3. We have, to date, received no formal notification from NHTSA that our participation in this effort was needed.

4. While we are appreciative of the efforts of AASHTO and NAGHSR, we are cautious about the purpose of the federal evaluation, particularly given the absence of communication from NHTSA.

5. We would appreciate a formal statement, from NHTSA, stating the intent and purpose of the evaluations, as well as a statement of the role of the states in the proposed evaluations.

Having established the basis for an understanding concerning your evaluation efforts, we wish to make the following observations and offers:

1. We appreciate the problems and complexities associated with the evaluations you are tasked to complete and shall be more than willing to assist in any way possible. To this end, we are willing to share accident data we are developing on 65 mph zoned roadways in Texas.

2. Data used in the NHTSA report mentioned above was from the Fatal Accident Reporting System (FARS). The use of FARS data for evaluating the effects of 65 mph speed zoning on rural roadways poses potential problems for the following reasons:

   a. The FARS data, in Texas at least, do not accurately track the 65 mph locations. We have identified these locations by control-section and milepoint location and are able to extract accident data that is both precise and accurate.

   b. The FARS data, to the best of our knowledge, do not differentiate between mainlane and service road accidents. This means that the accident data could be either for a mainlane roadway zoned at 65 mph, or for a frontage road zoned for 55 mph. Since Texas has an extensive frontage road system, the FARS data could be reporting conditions that do not accurately reflect accident experience.

   c. NHTSA analysis was based upon fatalities. In many of our analyses we use fatal accidents, rather than fatalities. In the southern and eastern

sections of Texas, for example, the fatalities-to-fatal accidents ratio is higher than in the northern and western portions of the state. This is a reflection, we believe, of ethnic, environmental and economic conditions. If these conditions exist within a state, it is probable that they exist among the states. It is suggested, accordingly, that fatal accidents, rather than fatalities, be used as a basis for analysis.

d. It is our impression that the FARS database has been developed to answer questions concerning the driver, and possibly the vehicle. The database is being asked questions of the environment (roadway). Is the database structured such that environmental questions can be addressed appropriately? We know that the Texas Accident File, when edited and augmented with roadway information from this Department, is capable of addressing environmental issues. Perhaps consideration should be given to enlisting the assistance of several states that have this capacity and base the evaluation on their databases.

3. Enclosed are data on Texas' accident experience from May 9, 1987 (the date of adoption of the 65 mph limit) through November 30, 1987. These data were used by our State Highway and Public Transportation Commission in the course of the public hearing on raising the speed limits on rural non-Interstate portions of the system. The data, as noted above, are based upon mainlane accidents. We shall send you additional updates on this information as it becomes available. We plan to perform an anniversary analysis beginning in July. The findings will be forwarded as soon as they become available.

4. We shall endeavor to comply with your request for information on accidents on the rural non-Interstate segments of roadway zoned at 65 mph. Two issues, however, need to be resolved:

a. In her cover memorandum Ms. Harsha notes that you are to report to Congress, by October 1, 1988, data through September 30, 1988. Due to the lag time involved in obtaining accident data, our tapes run approximately 90 to 120 days behind accident occurrence. Given an appropriate time

for analysis, we can have the data through September to you by the end of January, 1989. Do you want this data at that time, or do you want what data are available as of September 30, 1988?

b. Texas zoned only 74.002 miles of roadway 65 mph. This is a minuscule portion of the total system (approximately 72,000 miles). Data from these segments of roadway will probably not be in any way representative of the system. The short length of the segments zoned 65 mph which constitute this 74.002 miles also provide the possibility that data spikes could occur and provide false negative information about accident conditions.

c. Some of the questions you ask require some clarification. In question 11: travel speed. Do you want the speed distribution along the zoned stretch of highway or the speed of the vehicles at the moment of impact? Is there any particular reason why vehicle type is needed (question 12)? Will vehicle type affect accident rates?

In closing, let me reiterate that the State of Texas stands ready to cooperate in an evaluation of the 65 mph speed limits. We would like to be reassured, however, that the work is being conducted in a manner that reflects the Texas experience.

Sincerely,

Bob G. Hodge, Chief Engineer
of Safety and Maintenance Operations

RBL:df
Attachment

cc: David Hensing, AASHTO
Barbara Harsha, NAGHSR
Hal R. Hofener, Oklahoma DOT
Georgia Jupinko, NHTSA, Ft. Worth
Ronald R. Fiedler, AASHTO

INFORMATION ABOUT AMENDING
THE EXISTING 65 MPH SPEED LIMIT

Introduction

The State Highway and Public Transportation Commission will conduct a public hearing at 10 a.m. on Wednesday, January 27, to consider adjusting speed limits to 65 miles per hour on more than 74 miles of roadway. The action is in response to recent federal legislation.

Background

Congress enacted the National Maximum Speed Limit (NMSL) of 55 mph in 1973, as an energy-saving measure prompted by the Arab oil embago. State adoption of the federal speed limit was ensured through the threat that non-complying states would lose highway funding.

In 1987, in response to public opinion, Congress relaxed the NMSL standards. States were authorized to raise speed limits on rural Interstate highways to 65. Texas exercised its option and increased speeds effective May 9, 1987.

Current Status

The new speed limit proved popular. In late 1987, in the omnibus appropriations bill, Congress extended the 65 mph option, for a four year (1988-91) demonstration period, on

> " certain qualifying non-Interstate highways located outside an urbanized area of 50,000 population, which are (1) constructed to Interstate standards in accordance with the provisions of Title 23, U.S. Code, S109(b) and connected to an Interstate highway posted 65 miles per hour; (2) a divided four-lane fully controlled access highway designed or constructed to connect to an Interstate highway posted at 65 miles per hour and constructed to design and construction standards as determined by the Secretary of Transportation which provide a facility adequate for a speed limit of 65 miles per hour; or (3) constructed to the geometric and construction of the Interstate system in accordance with the provisions of Title 23 U.S. Code, S139(c)."

Roadways Affected

Analysis of the state's roadway system determined that 17 freeway

sections totaling 104.175 miles met the federal criteria. Based on traffic studies, the department recommended that 74.002 miles of the eligible roadways be zoned 65 mph; and 30.173 miles be zoned at the existing speed limit. The present speed limit will be retained on all frontage roads regardless of mainlane speed limits. Exhibit A lists all eligible sections and those recommended for 65 mph speed limits. Maps indicating the sections recommended for 65 mph speed limits are also attached.

State law requires that the commission take the following steps in order to amend the existing 65 mph speed limit.

1. Under the provisions of Article 6701d, Section 169B, <u>all</u> sections eligible for inclusion under the new speed limit must have maximum speed limits set at 65 mph.

2. Under the provisions of Article 6701d, Section 167, separate action is required to reduce speeds on those sections that need lower speeds as determined by engineering and traffic investigation.

<u>Requirements</u>

A public hearing on raising the speed limits is being held in accordance with the requirements of Article 6701d, Section 169B, as amended, Vernon's Texas Civil Statutes. Notice of the hearing

was published in the January 12 issue of the Texas Register and at least three newspapers of general circulation in the state.

The proposed action by the Commission does not increase the statutory speed limits for certain vehicles (e.g., trucks, school buses, trailers) whose limits are less than 65 mph. This is consistent with action taken by the commission in May when the limits on rural Interstates were increased. Nor does the commission's action affect limits established by city ordinance or its own action taken on the basis of engineering and traffic studies.

Speed and Safety

The issue of safety was raised when the department first considered raising the speed limits on rural Interstates. Nationally, fatalities decreased after the adoption of the 55 mph speed limit. In Texas the fatality rates on rural Interstates peaked in 1983 and have dropped annually since. In 1986 -- the last year for which complete data are available -- the fatality rate hit a low of 1.8 deaths per 100 million miles traveled.

Regardless of the accident rates, Texas drivers have responded indifferently to posted speed limits on the rural sections of Interstates. For the last five years, while the Interstate fatality rate was declining, 80 percent or more of the rural

Interstate drivers did not comply with the posted limits.

What this suggests is that there was no relationship, in Texas at least, between speed compliance and fatality rates. The two appeared to be operating independently of each other.

This does not address what has happened since the speed limit was raised in May 1987. Has there been an increase in fatalities, as some had predicted? What about speed rates? And are there any general conclusions that can be drawn concerning the new limit's effects on safety?

Because the change in the speed limit took place in mid-year and because complete sets of 1987 data are not available, comparisons of one year to another cannot be made. Selected data on the two variables associated with safety -- speeds and accidents -- are available for portions of the year.

Speed Changes After 65 MPH: Speed monitoring data were collected at 11 sites before and after speed limits were raised. After the change, data were collected from five of the sites on two occasions and from six sites on one occasion.

At the sites that were monitored twice, average speeds declined in four locations between the first and second

survey. This suggests that after an initial burst of enthusiasm drivers began moderating their speeds.

The most recent studies at the 11 sites indicated that 85th percentile* speeds increased an average of only 2.8 miles per hour. The median speed at these sites increased an average of 1.9 miles per hour. At only two of the 11 sites (in Wheeler County on the Oklahoma border and Smith county encompassing Tyler) did the average speed exceed the 65 mph limits. These findings do not suggest any substantial increase in speeds due to changes in the speed limits.

Accident Changes After 65 MPH: Accident data are for the period May 9, 1987 (the day the new 65 mph limit went into effect), through November 30, 1987 (the last month for which data are available).

ACCIDENTS ON MAIN LANES ON RURAL INTERSTATES

	Total Accidents	Fatal Accidents
May 9 - Nov. 30		
1986	3,447	105
1987	3,509	101

* 85th percentile: The speed at or below which 85 percent of the motorists drive. This is the figure commonly used by traffic engineers in setting speed limits.

Accidents increased by 1.7 percent. This is less that the 2 percent increase in miles traveled expected for 1987. Fatal accidents decreased by four (a decrease of 3.09 percent).

None of these data are conclusive. They point to no greater increase in safety on the Interstate roadways; but they also indicate no statistically significant rise in traffic deaths.

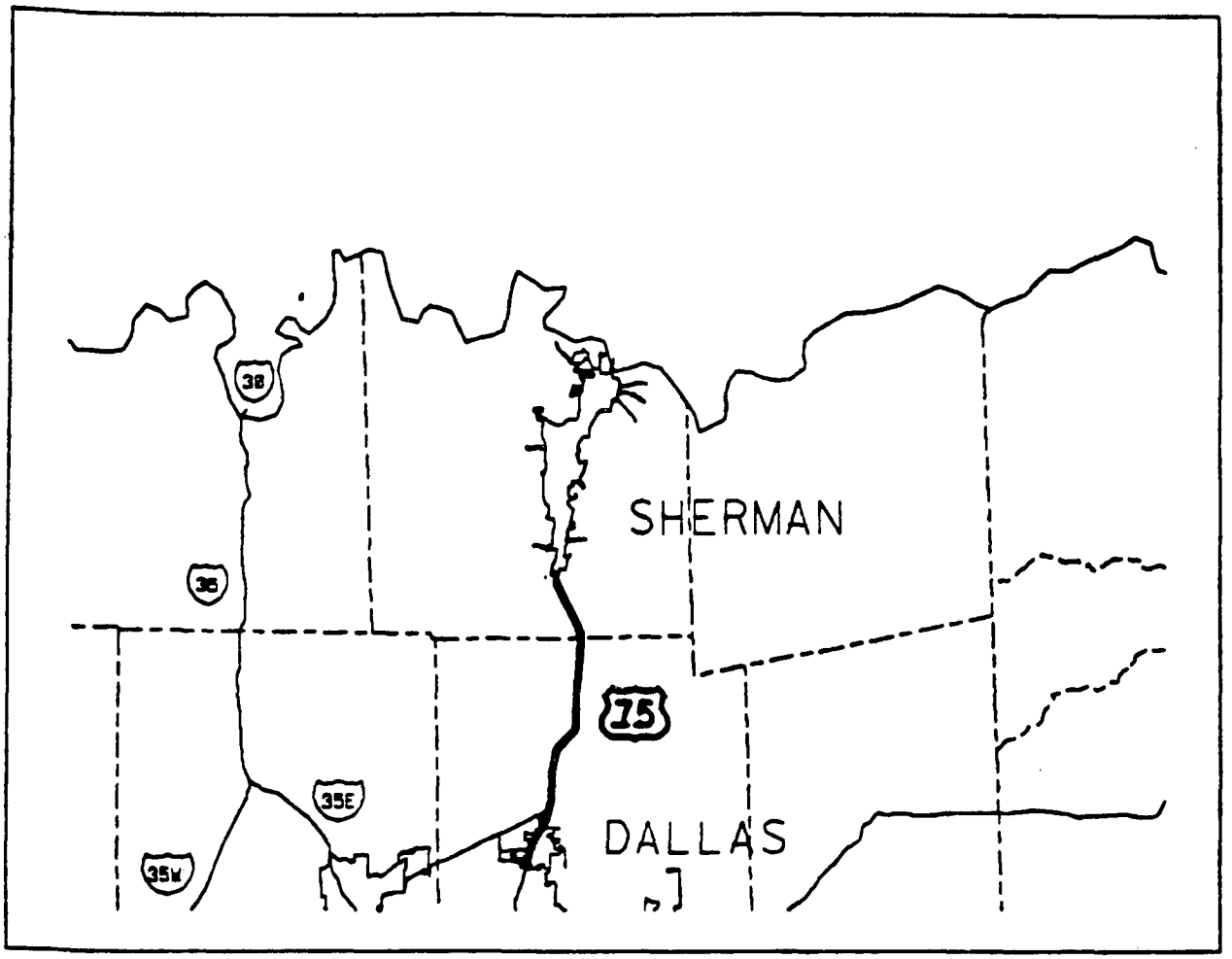
Eligible Non-Interstate Highways
65 MPH Speed Limit

Highway	Section	Length	Length Zoned 65 mph
US 75	From Milepoint 10.000 - Grayson County To Milepoint 13.797 - Grayson County (From Denison to Sherman Urban Limits)	3.797	
US 75	From Milepoint 25.765 - Grayson County To Milepoint 7.752 - Collin County (From Sherman/Denison Urban Limits to Dallas Urban Limits)	29.554	29.554
US 287	From Milepoint 23.242 - Tarrant County To Milepoint 26.663 - Tarrant County (From Arlington City Limit to FM 157 Interchange)	3.421	
US 287	From Milepoint 22.637 - Tarrant County To Milepoint 22.863 - Tarrant County (From Arlington City Limit to Arlington City Limit)	0.226	
US 287	From Milepoint 20.790 - Tarrant County To Milepoint 22.484 - Tarrant County (From Near IH 20 to Arlington City Limit)	1.694	
US 60	From Milepoint 14.237 - Randall County To Milepoint 2.507 - Randall County (From FM 2590 in Canyon to IH 27) (From US 60/87 Interchange to IH 27) 65	3.695	2.507
US 87	From Milepoint 9.815 - Randall County To Milepoint 10.219 - Randall County (From US 60 to Spur 48 in Canyon)	0.404	
US 84	From Milepoint 9.750 - Nolan County To Milepoint 11.189 - Nolan County (From FM 608 Near Roscoe to IH 20)	1.439	
SH 6	From Milepoint 11.895 - McLennan County To Milepoint 14.924 - McLennan County (From Near Spur 412 to North City Limits of Waco)	3.029	
US 190	From Milepoint 21.056 - Bell County To Milepoint 26.587 - Bell County (From Nolanville to Temple/Belton Urban Limit)	5.531	5.531
US 190	From Milepoint 4.850 - Coryell County To Milepoint 6.883 - Coryell County (From Copperas Cove to Killeen Urban Limit)	2.033	

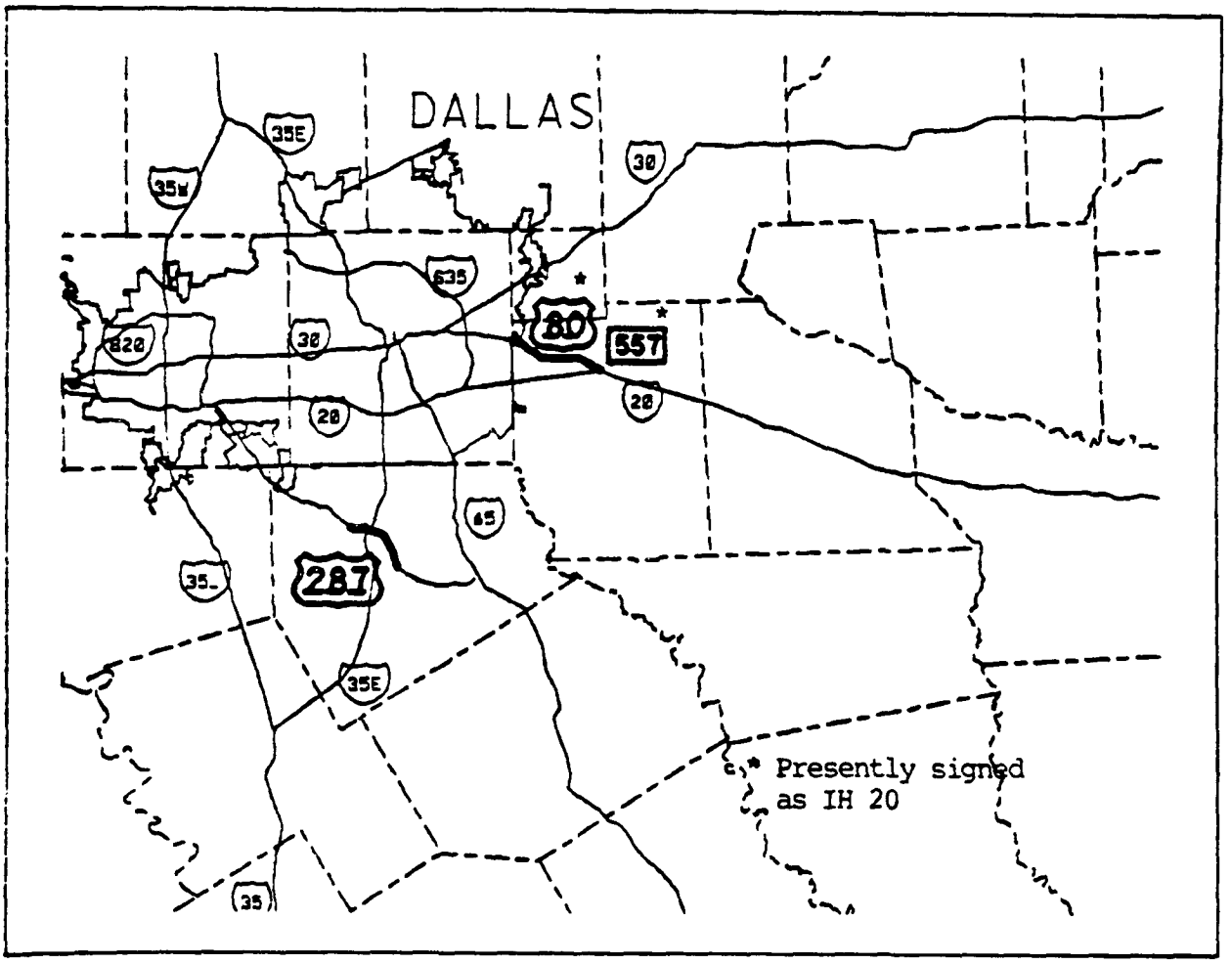
EXHIBIT A

gible Non-Interstate Highways (cont.)

Highway		Length	Length Zoned 65 mph
US 59	From Milepoint 4.667 - Fort Bend County To Milepoint 19.974 - Fort Bend County (From Near SH 6 to West of SH 36) (From Near SH 6 to SH 36) 65	15.307	12.354
US 59	From Milepoint 7.951 - Montgomery County To Milepoint 17.377 - Montgomery County (From San Jacinto River to North of FM 1485)	9.426	
US 90	From Milepoint 5.862 - Bexar County To Milepoint 6.425 - Bexar County (From Cagnon Road to Loop 1604)	0.563	
US 287	From Milepoint 37.087 - Ellis County To Milepoint 47.108 - Ellis County (Waxahachie Bypass)	10.021	10.021
US 80	From Milepoint 0.000 - Kaufman County To Milepoint 4.149 - Kaufman County (From Dallas County Line to Near Terrell- Signed as IH 20)	9.479	9.479
Spur 557	From Milepoint 9.479 - Kaufman County To Milepoint 14.035 - Kaufman County (From US 80 Interchange to Proposed IH 20 Interchange - Signed as IH 20)	4.556	4.556
		104.175	74.002



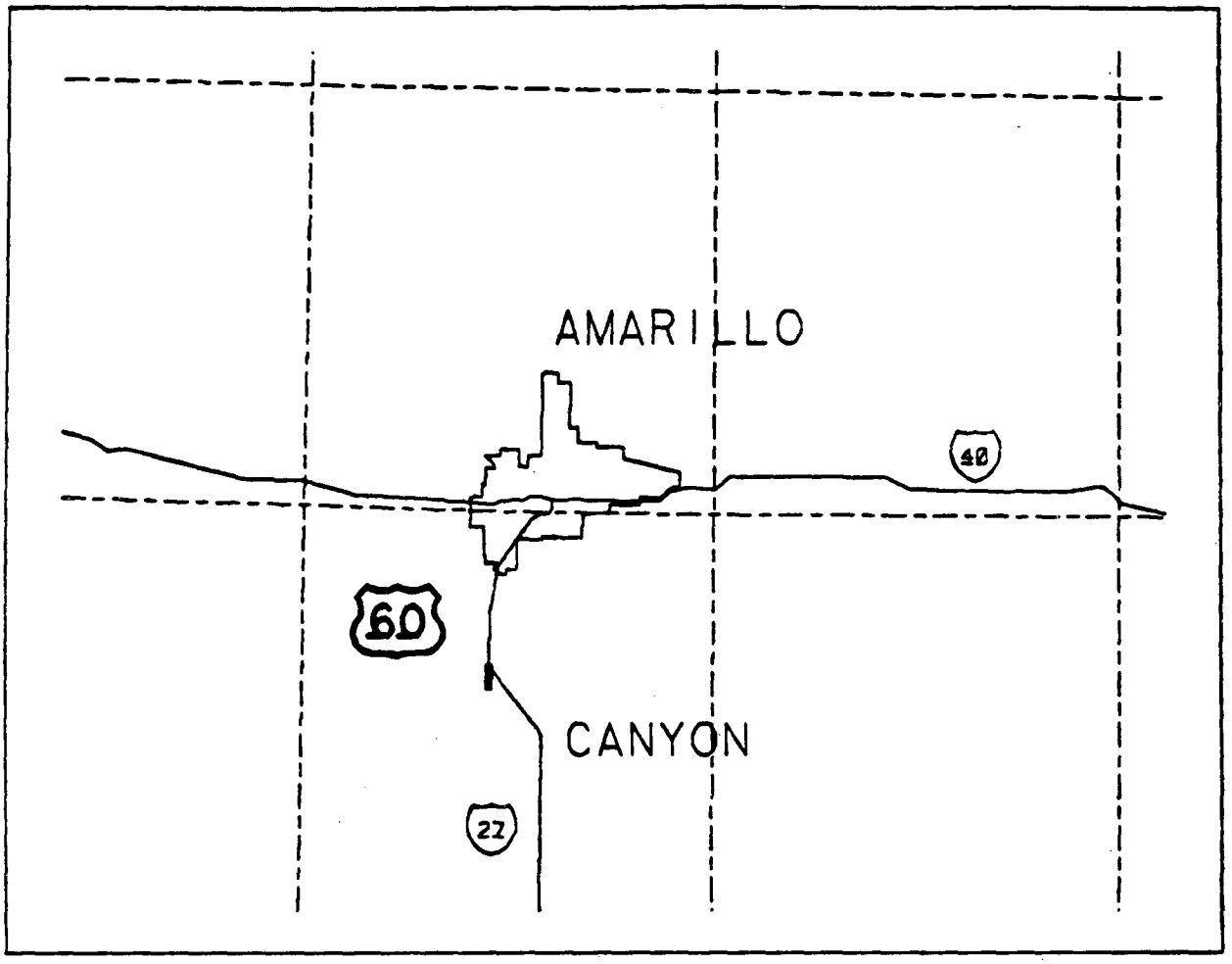
75 from Sherman urban limit to Dallas urban limit



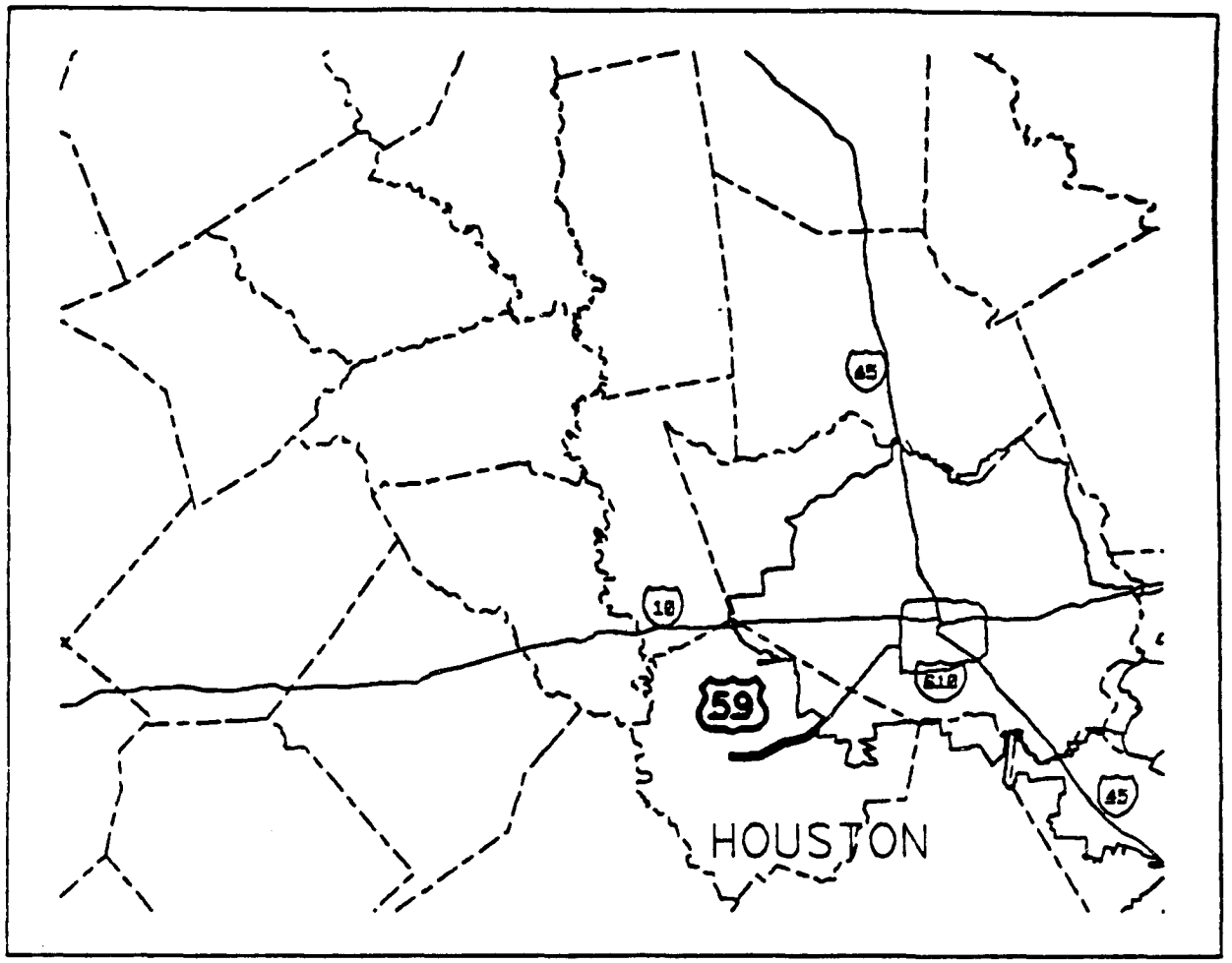
80 from Dallas/Kaufman county line to Spur 557 near Terrell

557 from US 80 to IH 20

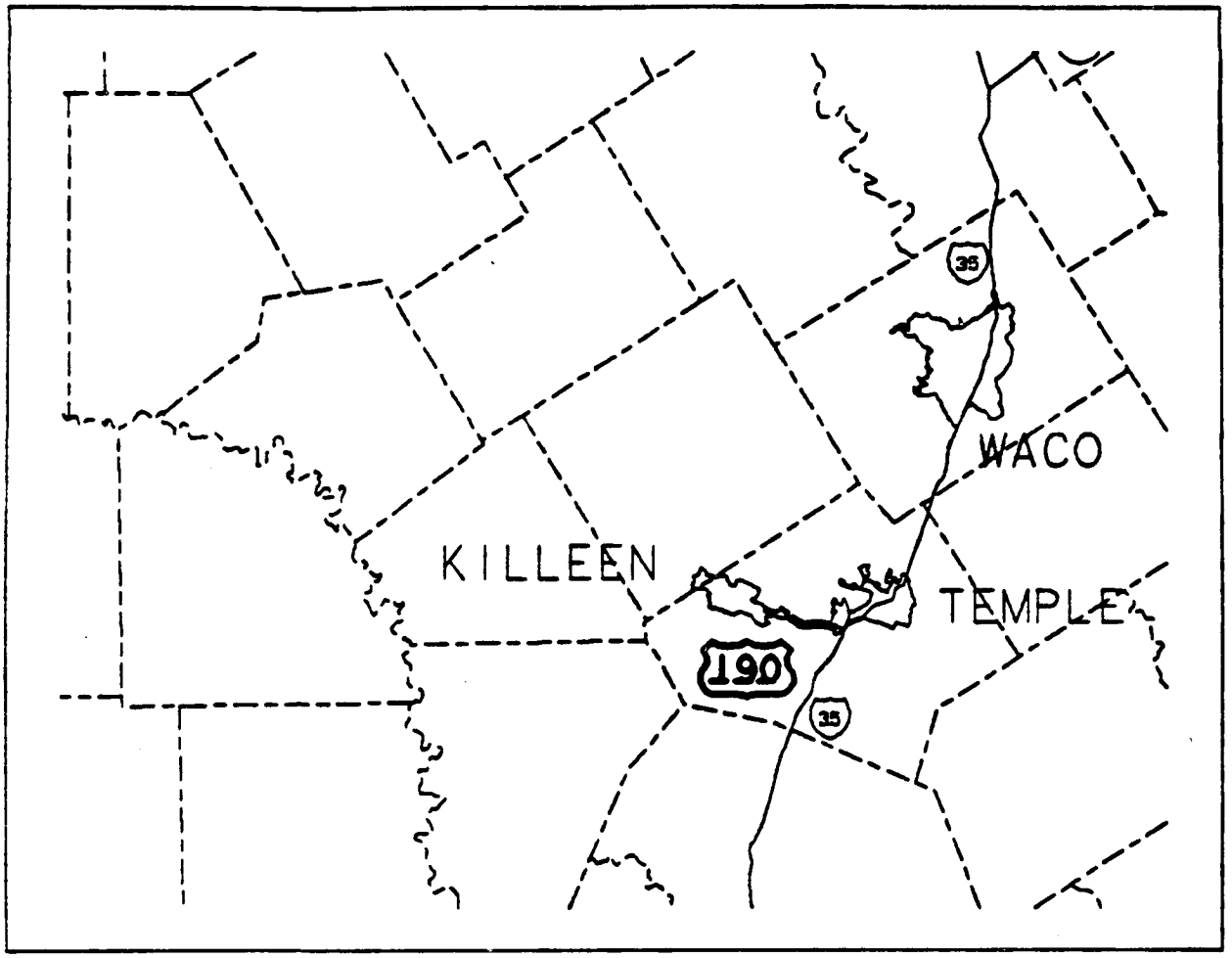
287 Waxahachie bypass



60 from IH 27 to US 87



59 from SH 36 to near SH 6



190 from Nolanville to Temple/Belton urban limit

Norman H. Bangerter
Governor
Eugene H. Findlay, C.P.A.
Executive Director
Glenn Starzenegger, P.E.
Assistant Director

State of Utah

UTAH DEPARTMENT OF TRANSPORTATION

4501 South 2700 West
Salt Lake City, Utah 84119-5998
(801)-965-4000

June 27, 1988

Diane K. Steed
Administration, NHTSA
400 - 7th Street, S.W.
Washington DC 20590

Subject: 65 MPH Speed Limit/Accident Rate Model

Dear Ms. Steed:

We appreciate this opportunity to discuss your interim report. We have not received it, but have its information through professional journal entries. As requested in an AASHTO letter dated May 20, 1988, we have enclosed a copy of the Fatality and Fatal Accidents by month for the period January 1, 1987 to December 1, 1987, as the period with 65 MPH allowed. Also enclosed is the data from one year prior to the change in speed limits. Utah's law was implemented on May 25, 1987, but signing was not complete until June 1. In both years, the weather has been mild. In both years, Utah has been in an economic slow period. In both years, the real operating speed has been nearly the same. The 1987 average speed was 1.7 miles per hour higher than that of 1986. The 1987 Vehicle Miles Travelled (VMT) increased approximately three percent (3%) over the 1986 VMT. Statistically, there is too little information to be conclusive, but indications are as we expected -- no difference. During the first six months, we had two (2) fewer accidents with 65 MPH than with 55 MPH, but no change in number of fatalities. As soon as the 1988 data is available, we will forward it to you.

Utah is extremely interested in this issue. Our Governor has firmly supported the return of speed limit laws to the states. We hope that economic conditions, duration of inclement weather, and actual operating speed will be included in the evaluation made. In the past, attempts have been made to blame or justify all safety performance based on speed limit. We hope that the entire safety program will be given its proper status and that sensationalism will not rule. In Utah, the change in law did not significantly change operating speed. We do not expect performance to be uniform throughout the states. In fact, it is our contention that states should make their own evaluation and be allowed responsibility for their decisions based on sound engineering studies.

(Continued on Next Page)

Enclosed for your information is our Annual Speed Study which details real speeds on Utah roads for the last decade. We support the "ITE Journal"-published criteria, which appear reasonable.

Finally, we have enclosed a Utah Department of Transportation (UDOT) brochure describing speed zoning for all routes. The ideas within it are based on both National and Utah Law, as well as a compendium of studies and experience with implementation.

We hope that this information will help AASHTO in presenting its position, and NHTSA in its appraisal. If questions arise, please contact our Traffic and Safety Studies Engineer, Mr. Blair G. Marsden, telephone (801) 965-4284.

Sincerely,

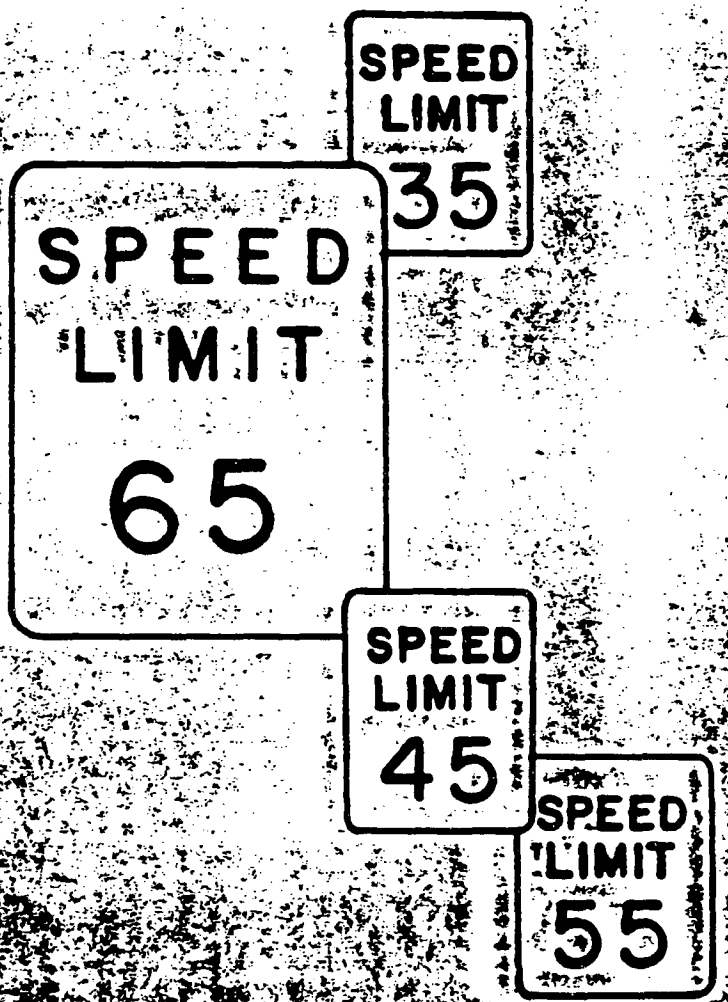
E. H. Findlay, C.P.A.
Executive Director

GF/BGMarsden/bjb

Enclosures

cc: David Hensing, AASHTO w/attachments
Frank Francois, AASHTO
Kathy Womble, FHWA/NHTSA
Jeff S. Wallin, University of Wisconsin-Stout
Ronald R. Fiedler, Wisconsin DOT
Hal Hofener, Oklahoma DOT
Gene Sturzenegger
David Miles
Blair G. Marsden w/attachments
Byron Parker

ANNUAL SPEED STUDY
1987



DIVISION OF SAFETY

UTAH DEPARTMENT OF TRANSPORTATION

UTAH DEPARTMENT OF TRANSPORTATION

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Mark Musuris, P.E.	Engineer for Safety

Prepared by the

SAFETY STUDIES SECTION

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INTRODUCTION

A Statewide speed survey is conducted annually by the Safety Studies Section of the Division of Safety, because it is an inherent state right to establish reasonable and safe speeds.

The purpose of this survey is to evaluate speed trends and patterns at specific stations along Utah Highways. The information, coupled for comparative national speed trends, offers a valuable tool in establishing realistic, enforceable, optimum speed regulations. The Institute of Transportation Engineers' policy is "To advocate that the establishment of speed zones be guided by established traffic engineering principles, and be based realistically on route and traffic characteristics, and not on artificial criteria, jurisdictional boundaries or other considerations not related to the safety and efficiency of vehicle operations." This study forms part of the rationale.

DEFINITION OF TERMS

AVERAGE SPEED	The arithmetic mean of the speeds of all vehicles included in a given study.
CUMULATIVE FREQUENCY	The number of vehicles traveling in excess of any given speed expressed by percentile of the total sample.
MAXIMUM SPEED	The highest speed recorded for a given study.
MEDIAN SPEED	The speed at or below which 50% of the vehicles were observed to travel.
MODE SPEED	The most frequently occurring speed for a given study.
PACE SPEED	A ten-mile increment of speed that includes the greatest percentage of vehicles observed.
STANDARD DEVIATION	A numerical indication of the degree to which the observed speeds tend to vary from the average speed. A higher value indicates a wider numerical band between the lowest and the highest recorded speed.
85TH PERCENTILE SPEED	The speed at or below which 85% of the vehicles were observed to travel.

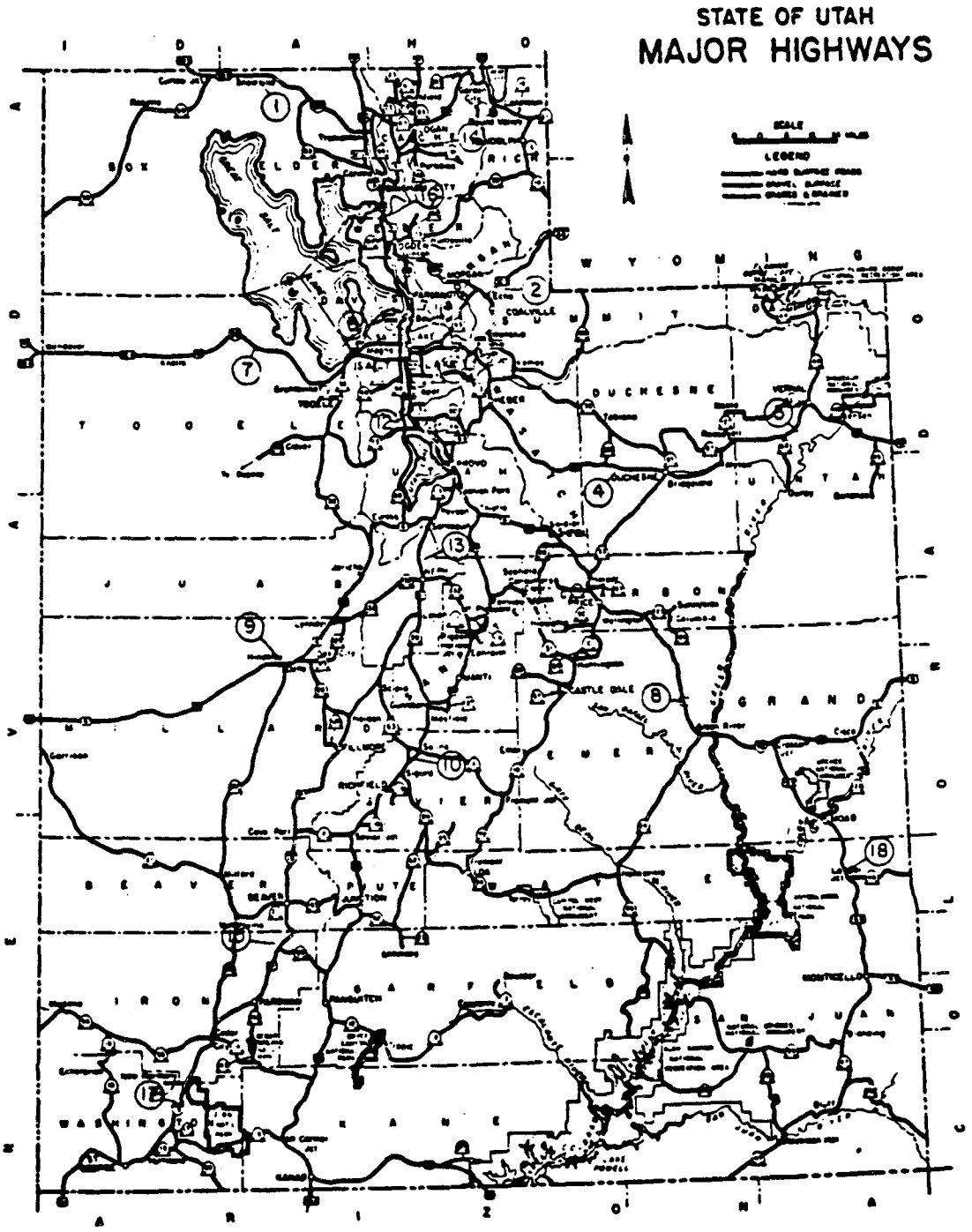
In 1960, eighteen stations along the State Highway System were established for an annual evaluation of the motorist operational speeds. The locations or the checking stations were selected to include four classifications by highway type: Urban Interstate; Rural Interstate; Rural Primary; and Rural Secondary. Each station is observed at a time corresponding to prior observations to avoid seasonal traffic volume distortions. The locations are shown on Page 4 and described on Page 5. In 1974, a national maximum speed limit was compelled on states from U.S. Congress. The 1978 speed survey included seventeen of the eighteen established stations. Night observations were conducted at stations 6, 12, and 13. Where a completed section of Interstate route has replaced or parallels the prior highway, the speed study was conducted along the Interstate route. In 1987, Utah passed a 65 mph maximum speed limit law for rural interstates as allowed by a change in law from U.S. Congress.

Field data from the eighteen stations was processed and tabulated utilizing the Department of Transportation standard computer program. The format for this print-out includes the 85th percentile speed, pace speed, percent of vehicles within the pace speed, standard deviation of the sample, sample size, maximum speed, median speed, minimum speed, average speed, and mode speed. The computer program also grouped the field data in five-mile per-hour increments, calculated the percentage in each group, and the printout reflects the cumulative percent traveling over each five-mile per-hour group. The computer printout for each spot speed study is included in this report as Appendix 1.

Each speed observation was accomplished using calibrated radar equipment placed in an inconspicuous location when possible, to avoid detection by the motorist. The number of observations of sample size at each station exceeds the acceptable minimum number of vehicles for a 95 percent statistical confidence level based on the standard deviation. Because of the low volumes of trucks and buses, no confidence level was established on these vehicles.

Vehicles are classified as local and foreign cars, trucks, and buses. All two-axle vehicles under an approximately gross weight of 9,000 pounds were classified as cars. A further classification of cars was made with all vehicles bearing Utah license plates classified as local and any licensed vehicles from a state other than Utah were classified as foreign. All vehicles with more than two axles, or an approximate gross weight in excess of 9,000 pounds were classified as trucks. The truck classification included recreation vehicles and trailer combinations. Passenger carriers were classified as buses by observation of distinctive markings or characteristics. No registration distinction was made in either of the classifications of trucks and buses.

SPEED STUDY STATIONS



STATION LOCATIONS

Station	Highway	Speed Limit	M.P.#	Locations
** 1	I-84	65 MPH	5.0	5 Miles ± West of Snowville
** 2	I-80	65 MPH	178.7	10 Miles ± East of Echo Junction
3	SR-40	55 MPH	134.8	3 Miles ± East of the Junction of SR-40 and SR-88 East of Roosevelt
4	SR-40	55 MPH	71.7	2 Miles ± East of the Junction of SR-40 and SR-208 West of Duchesne
** 5	I-80	65 MPH	148.5	2 Miles ± East of Kimball Junction
** 6	I-80	65 MPH	109.5	4 Miles ± West of the Salt Lake Airport.
** 7	I-80	65 MPH	72.0	18 Miles ± West of Grantsville
8	SR-6	55 MPH	286.0	9 Miles ± South of Woodside
9	SR-6	55 MPH	84.4	2 Miles ± East of Hinckley
10	SR-24	55 MPH	5.5	5 Miles ± South of Salina
**11	I-15	65 MPH	325.1	2 Miles ± South of Lagoon Junction
**12	I-15	55 MPH	225.2	2 Miles ± South of the Junction of I-15 and SR-71 (Draper Crossroads)
**13	I-15	65 MPH	237.0	East of Mona
* 14	SR-91	55 MPH	22.2	3 Miles ± South of the North Junction of SR-91 and SR-101
**15	I-15	65 MPH	92.1	3 Miles ± South of the Junction of I-15 and SR-20 (South of Beaver)
**16	I-15	65 MPH	359.6	West of Perry
**17	I-15	65 MPH	30.7	1 Mile ± South of Pintura
18	SR-191	55 MPH	116.6	9 Miles ± South of the Junction of SR-191 and SR-46 (LaSal Junction)

* Designates 4-Lane Highway
** Designates 4 to 6-Lane, Divided Highway

RESULTS

Table 1 presents a comparison of the speed trends at the designated 18 stations since 1977 and includes the following:

85th Percentile Speed

Average Speed

Standard Deviation

Percent Exceeding Posted Limits

Mode Speed

Pace Speed

Table 2 presents a tabulation of percentages of vehicles traveling at or in excess of indicated speeds. Average speeds at each station are also shown.

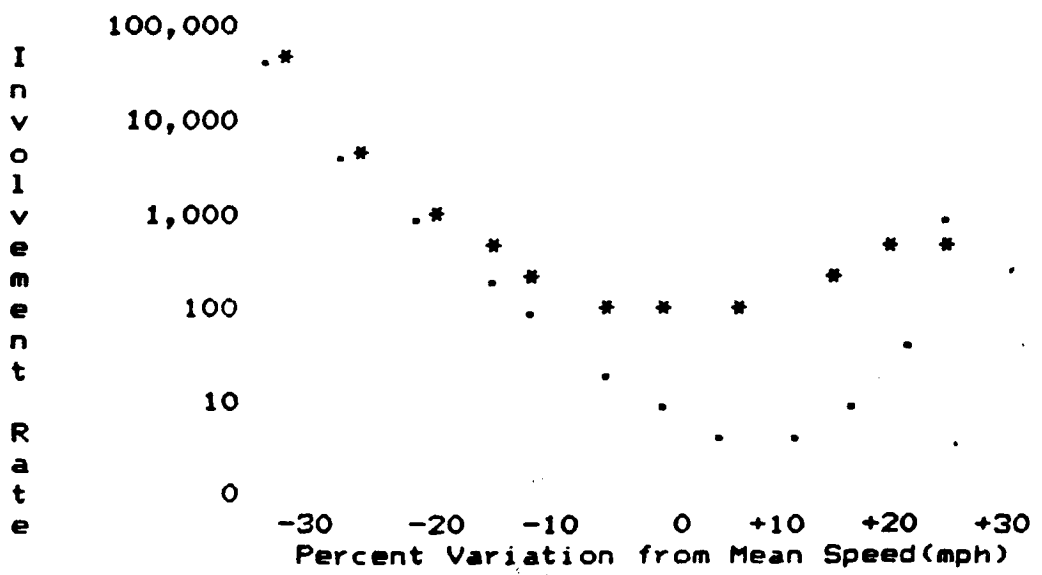
Figure 1 reflects the composite trends for all stations since 1977.

Several myths are disproven by this data set:

Myth: Slower is safer

Rationale for dismissal:

1. Accident rate dropped while real speeds increased.
2. Our fastest roads have the highest design standards which give the lowest accident rates.
3. Graph from page 213 Congressional hearing indicates the 85th percentile speed is the safest speed.



Myth: Speed limits affect speed in direct proportion to what is posted.

Rationale for dismissal:

1. Speed limit increased 10 mph, real speed increased less than 2 mph.

CONCLUSIONS

The results of the 1987 speed study indicate a slight increase in the overall speeds throughout the State. The 55 MPH speed limit was implemented January 2, 1974, and the average speed that year dropped approximately 5 MPH (53.8) compared to the preceding year. The 65 MPH speed limit on rural interstate highways was implemented May 27, 1987. Since that time, the average speed has risen from 58.3 MPH to 60.0 MPH.

The 85th percentile speeds for 1987 deviated from the posted speed as follows:

Ten stations within 5 MPH

Eight stations within 10 MPH

None over 10 MPH

This is a radical improvement over 1985's 16 sites between 6 and 15 MPH. The average 85th percentile speed for all stations in 1987 was 64 MPH. This indicates rural interstate limit at 65 MPH is reasonable. None of the sites posted for 65 MPH have been found with 85th percentile speed in excess of 3 MPH over 65.

The percent of vehicles exceeding the posted speed reduced from 76.7 to 46.9* for all stations. This is 29.8 percent decrease over 1986, and is 24.4 percent lower than the 1977 survey, due to the recent 65 MPH limit.

*The right to set reasonable and safe speed limits is a state right for which states are very qualified and responsible.

Foreign vehicles speeds are approximately 2 MPH faster than local vehicles, with truck speeds about 2 MPH slower, and commercial buses 3 MPH faster than the local vehicles.

The average nighttime travel speeds were observed to be approximately 1 MPH faster than the daytime travel speeds.

Appendix 1 contains "Utah Fatalities on Rural Interstates" and "Utah's 55 MPH Monitoring Locations". Utah's accident rates and fatality rates, overall as well as on rural interstate, are lower but not statistically different from before the speed limit changes. The monitoring locations, the speed law change, and cooperation between the Utah Department of Transportation and the Utah Highway Patrol have resulted in Utah's return to compliance with the law.

ANNUAL SPEED STUDY STATION COMPARISON
TABLE 1
85th PERCENTILE SPEED

SPEED LIMIT - - - - -	65	65	55	55	65	65	65	55	55	55	65	55	65	55	65	65	65	55
YEAR AVERAGES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1977 63	61	65	62	65	64	61	66	65	62	61	61	63	63	59	65	64	66	65
1978 63	66	62	63	64	64	59	62	65	61	60	61	63	64	60	0	62	64	64
1979 62	63	61	60	64	63	61	66	64	61	62	61	61	62	58	0	61	63	63
1980 61	62	62	60	63	62	59	61	64	60	60	60	59	62	59	63	58	62	62
1981 61	60	62	60	63	63	61	65	62	59	59	62	61	60	59	63	59	63	62
1982 62	61	63	62	64	63	63	67	64	58	60	59	61	64	58	65	61	62	63
1983 62	62	64	62	64	62	62	64	65	59	62	61	62	63	60	63	61	62	60
1984 63	66	60	63	63	62	64	66	63	60	62	63	62	64	59	65	63	64	64
1985 63	64	66	60	63	64	64	66	64	60	61	64	64	64	59	65	64	66	61
1986 63	63	66	60	65	63	65	66	64	59	61	63	62	63	61	64	63	65	66
1987 64	67	67	61	64	66	66	67	63	62	62	65	63	67	62	68	68	68	63

AVERAGE SPEED

YEAR	AVERAGES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1977	57.7	56.7	59.4	57.3	59.6	58.3	53.7	60.1	59.7	54.0	55.8	56.1	57.6	57.9	54.6	59.9	59.0	60.0	58.6
1978	57.3	59.7	56.9	57.4	58.5	58.5	52.5	57.6	59.3	54.6	55.2	56.1	58.5	58.9	55.1	00.0	57.8	59.1	58.0
1979	57.1	58.0	57.1	55.9	58.4	57.5	56.0	59.9	58.9	54.1	57.2	57.4	56.8	58.1	53.7	00.0	57.3	57.6	57.8
1980	56.4	57.5	57.1	55.7	58.1	57.1	54.6	57.1	58.6	52.8	55.0	56.3	55.6	58.2	54.3	57.8	54.6	57.6	56.6
1981	56.5	56.1	57.2	55.1	58.1	57.1	57.2	59.4	57.4	52.2	54.8	57.7	57.3	56.8	54.4	58.1	54.9	57.8	56.5
1982	57.3	56.5	58.6	57.3	58.5	58.7	58.5	61.0	58.3	52.1	55.5	55.8	57.1	59.0	54.1	60.2	57.5	56.5	56.9
1983	57.6	57.7	59.4	57.6	59.6	58.1	57.4	59.2	59.2	53.1	57.5	57.4	58.3	58.4	55.1	57.6	57.1	57.7	55.6
1984	58.0	60.4	54.8	58.1	57.1	57.1	59.1	60.7	58.3	53.8	57.5	58.9	58.0	59.7	54.8	60.2	58.5	59.2	57.8
1985	58.5	59.5	60.7	55.6	57.8	58.9	59.0	61.5	59.2	54.4	56.7	58.9	60.4	59.3	54.9	60.1	59.6	60.2	56.0
1986	58.3	58.5	60.9	56.4	58.9	58.7	60.2	61.3	59.8	53.2	56.9	58.2	58.4	58.7	55.7	59.3	58.3	59.6	57.5
1987	60.0	62.0	62.2	57.2	59.4	61.2	60.2	61.8	58.3	55.6	57.0	61.4	58.7	61.6	57.3	62.8	63.2	62.2	59.5

STANDARD DEVIATION

YEAR	AVERAGES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1977	5.40	4.82	5.05	5.03	6.55	5.47	6.82	5.88	5.81	7.99	5.87	4.23	4.57	5.42	5.90	5.20	4.57	4.92	6.28
1978	5.21	5.37	4.30	5.27	5.77	5.09	6.45	4.76	6.09	6.40	4.96	4.01	4.34	4.82	5.02	0.00	3.92	5.05	6.92
1979	5.22	5.25	5.03	4.57	5.56	5.95	5.88	5.71	5.77	5.50	5.05	3.84	4.42	4.62	4.50	0.00	3.92	5.00	6.23
1980	4.90	4.87	4.70	4.94	5.28	4.90	4.19	4.45	5.10	7.38	5.30	3.95	3.96	4.50	4.87	4.72	4.06	4.46	6.51
1981	4.98	4.90	4.48	4.77	5.62	5.39	4.36	5.22	4.72	6.80	4.31	4.04	4.24	4.34	4.51	4.80	4.06	7.45	5.66
1982	4.94	4.61	4.42	5.23	5.84	4.59	5.27	5.75	5.63	6.21	4.37	3.02	3.94	4.53	4.57	5.23	3.76	5.80	6.14
1983	4.92	4.23	4.96	4.94	5.17	4.57	4.96	5.13	6.00	5.66	4.72	4.28	4.06	4.71	4.91	5.21	3.64	4.89	5.57
1984	4.89	5.25	5.27	4.50	5.67	4.62	5.15	4.98	4.84	5.75	4.75	3.93	3.71	4.59	5.14	4.96	4.36	4.93	5.69
1985	4.89	4.51	5.08	3.59	5.57	5.02	5.39	4.69	5.44	6.52	4.43	4.70	4.24	4.57	4.32	4.57	4.11	6.11	5.28
1986	5.04	5.25	5.16	4.09	5.55	4.56	4.40	4.62	5.20	6.72	4.38	4.56	4.00	5.07	5.17	4.60	4.62	5.72	6.96
1987	4.95	4.84	4.91	4.26	5.34	4.62	6.25	4.89	4.56	6.79	5.44	3.98	4.14	5.18	4.15	5.46	4.29	5.70	4.47

ANNUAL SPEED STUDY STATION COMPARISON
TABLE 1
(continued)
PERCENT EXCEEDING POSTED SPEED LIMIT

SPEED LIMIT - - - - -	65	'65	55	55	65	65	65	55	55	55	65	55	65	55	65	65	65	55
YEAR AVERAGES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1977 71.3	67.8	80.8	69.1	78.3	74.4	44.4	83.1	81.4	50.0	61.6	60.2	79.5	71.9	50.4	84.0	82.4	85.1	72.5
1978 67.8	82.0	64.3	67.1	73.2	77.5	37.0	70.3	78.4	48.2	49.1	59.9	81.7	81.0	55.5	00.0	77.4	79.5	69.9
1979 67.9	71.1	71.1	58.3	73.7	70.2	57.3	82.1	75.6	47.5	68.8	75.2	69.0	77.7	39.9	00.0	73.1	70.7	72.8
1980 63.1	70.3	70.7	55.7	75.5	68.7	48.1	69.7	78.9	40.9	50.7	67.7	55.6	79.7	45.5	71.9	46.9	76.5	63.2
1981 66.8	62.2	71.7	46.3	72.8	65.2	72.0	83.9	71.0	34.2	48.6	75.2	73.0	61.1	48.2	75.2	48.8	59.4	63.2
1982 69.3	64.6	81.1	66.1	74.1	80.8	80.6	85.7	76.0	31.9	55.8	60.2	71.8	82.0	44.3	84.4	76.4	63.5	66.4
1983 72.1	74.4	81.5	70.6	83.7	79.1	73.3	81.2	77.3	36.2	72.7	74.8	81.7	78.9	53.1	72.6	72.3	73.6	60.4
1984 73.7	86.5	50.0	75.9	64.0	66.8	81.0	88.6	78.8	42.9	68.0	84.5	83.0	84.4	56.8	88.4	77.5	82.0	68.3
1985 76.3	84.5	90.1	49.3	72.4	81.4	78.4	92.1	82.6	50.4	66.8	79.5	90.9	83.8	54.9	87.7	87.1	81.5	59.7
1986 76.7	77.0	92.6	68.2	78.1	78.5	89.9	95.3	82.6	40.3	64.2	77.8	84.9	80.2	59.4	85.5	83.4	81.7	62.1
1987 46.9	24.5	29.4	74.5	82.8	19.9	17.6	23.3	77.7	55.8	62.9	16.4	83.7	25.3	71.8	30.0	32.4	30.3	87.3

MODE (MPH)

YEAR	AVERAGES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1977	58	56	60	58	60	59	55	62	60	56	56	55	58	59	56	60	60	60	60
1978	57	58	57	56	58	58	52	58	60	54	54	55	59	57	56	00	58	59	58
1979	57	58	58	56	60	58	56	58	58	52	56	58	58	58	54	00	58	56	56
1980	56	58	58	56	56	56	54	56	58	52	56	58	54	58	54	58	54	56	58
1981	56	56	56	54	56	56	56	58	58	52	56	56	58	58	56	58	54	58	56
1982	57	56	60	58	58	58	58	60	56	54	56	56	58	60	56	60	56	56	56
1983	57	56	60	56	60	58	56	58	58	50	58	56	60	60	56	56	58	58	56
1984	57	60	54	58	56	56	58	62	56	54	56	58	58	58	58	60	58	58	56
1985	59	60	60	54	60	58	60	62	60	56	56	58	60	58	56	60	60	60	56
1986	59	62	62	56	60	60	60	62	62	54	54	60	58	58	58	60	56	60	54
1987	60	62	64	58	58	62	60	62	58	58	54	62	60	62	60	62	64	60	60

PACE (MPH)

YEAR	AVERAGES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1977	54-64	51-61	54-64	52-62	54-64	53-63	50-60	56-66	54-64	50-60	52-62	50-60	53-63	53-63	48-58	56-66	53-63	54-64	54-64
1978	52-62	54-64	51-61	52-62	52-62	53-63	58-68	52-62	54-64	50-60	50-60	51-61	54-64	54-64	52-62	00-00	53-63	55-65	52-62
1979	52-62	56-66	52-62	52-62	52-62	52-62	51-61	56-66	52-62	50-60	52-62	52-62	52-62	52-62	58-68	00-00	52-62	52-62	52-62
1980	51-61	52-62	52-62	50-60	52-62	52-62	50-60	52-62	52-62	50-60	50-60	52-62	50-60	52-62	50-60	52-62	50-60	52-62	52-62
1981	51-61	50-60	52-62	50-60	52-62	52-62	52-62	54-64	52-62	48-58	48-58	52-62	52-62	52-62	50-60	52-62	50-60	52-62	52-62
1982	52-62	52-62	54-64	52-62	52-62	54-64	54-64	56-66	54-64	48-58	50-60	50-60	52-62	54-64	50-60	54-64	52-62	52-62	52-62
1983	52-62	52-62	54-64	52-62	54-64	54-64	52-62	54-64	54-64	48-58	54-64	52-62	54-64	54-64	50-60	54-64	52-62	52-62	52-62
1984	53-63	56-66	50-60	52-62	52-62	52-62	54-64	54-64	54-64	50-60	52-62	54-64	54-64	54-64	50-60	54-64	54-64	54-64	54-64
1985	53-63	54-64	56-66	50-60	52-62	54-64	54-64	56-66	54-64	50-60	52-62	54-64	54-64	56-66	50-60	56-66	54-64	54-64	52-62
1986	53-63	54-64	56-66	52-62	54-64	54-64	54-64	56-66	54-64	48-58	52-62	54-64	54-64	54-64	52-62	54-64	54-64	54-64	50-60
1987	54-64	58-68	58-68	52-62	54-64	56-66	54-64	56-66	52-62	50-60	50-60	56-66	54-64	58-68	52-62	58-68	58-68	58-68	54-64

TABLE #2
AVERAGE SPEEDS & PERCENTAGE OF
VEHICLES AT OR IN EXCESS OF VARIOUS SPEEDS
FOR 1987

Sta. No.	Average Speed					% AT OR EXCEEDING 45MPH					50MPH					55MPH				
	X	F	TR	B	T	X	F	TR	B	T	X	F	TR	B	T	X	F	TR	B	T
1	61	63	60	0	62	100	100	100	100	100	98	100	97	100	98	88	95	89	100	92
2	64	63	59	0	62	100	100	100	0	100	100	100	98	0	99	100	96	86	0	93
3	57	56	56	0	57	99	98	100	0	99	96	90	98	0	95	78	65	67	0	74
4	58	61	58	58	59	98	100	100	100	99	94	98	97	100	95	81	90	76	100	82
5	62	62	58	0	61	100	100	100	0	100	99	100	99	0	99	97	96	82	0	92
6	60	61	57	0	60	99	100	98	0	99	97	96	93	0	96	80	83	68	0	78
7	62	63	59	66	61	100	100	100	100	100	99	100	99	100	99	94	95	87	100	92
8	58	58	56	0	58	100	100	100	0	100	98	98	96	0	98	77	79	75	0	77
9	55	57	50	0	55	95	97	77	0	94	82	90	55	0	80	56	70	25	0	55
10	57	57	54	0	57	98	100	100	0	99	95	95	86	0	93	72	60	46	0	62
11	61	62	59	0	61	100	100	100	0	100	100	100	95	0	99	94	92	86	0	93
12	58	60	58	0	58	100	100	100	0	100	97	100	95	0	97	86	86	73	0	83
13	61	63	59	63	61	100	100	96	100	99	100	100	93	100	98	90	95	80	85	89
14	57	57	55	62	57	100	100	100	100	100	95	96	90	100	95	72	83	57	100	71
15	63	64	60	0	62	98	100	100	0	99	98	97	100	0	98	97	94	87	0	93
16	64	64	60	0	63	100	100	100	0	100	100	100	100	0	100	98	100	88	0	96
17	63	63	58	0	62	100	100	98	0	99	99	98	95	0	97	97	94	81	0	92
18	58	60	58	0	59	100	100	100	0	100	99	97	97	0	97	86	90	82	0	87
Avg.	59	60	57	13	59	99	99	98	27	99	97	97	93	27	96	85	86	74	26	83
6N*	61	0	56	0	60	100	0	98	0	99	99	0	98	0	97	91	0	67	0	86
12N*	59	0	57	0	59	100	0	100	0	100	100	0	100	0	100	86	0	86	0	86
13N*	60	0	59	0	60	100	0	100	0	100	100	0	100	0	100	91	0	91	0	91
Avg.	60	0	57	0	59	99	0	99	0	99	99	0	99	0	99	89	0	81	0	87

KEY
X = Local Passenger Cars and Pickups
F = Out of State Passenger Cars and Pickups
TR = Commercial Trucks
B = Buses
T = Total Vehicles
N = Night Study

* No Distinction Made Between Local and Out of State Cars and Pickups

TABLE #2
(Continued)
AVERAGE SPEEDS & PERCENTAGE OF
VEHICLES AT OR IN EXCESS OF VARIOUS SPEEDS
FOR 1987

Sta. No.	% AT OR EXCEEDING 60MPH					65MPH					70MPH				
	X	F	TR	B	T	X	F	TR	B	T	X	F	TR	B	T
1	67	75	59	100	68	20	34	14	0	24	4	6	2	0	4
2	89	76	42	0	66	45	36	11	0	29	5	7	1	0	4
3	26	23	19	0	25	4	1	0	0	3	0	1	0	0	0
4	38	65	41	16	44	12	18	7	0	12	4	3	2	0	4
5	68	72	37	0	60	25	26	5	0	19	1	2	0	0	1
6	52	63	37	0	52	18	24	6	0	17	7	10	1	0	6
7	73	74	47	100	65	28	31	7	100	23	10	8	0	0	6
8	34	37	14	0	32	7	10	2	0	8	0	4	0	0	1
9	25	33	13	0	25	7	8	7	0	7	0	4	0	0	1
10	25	26	8	0	22	7	9	0	0	6	6	2	0	0	2
11	69	74	50	0	66	18	22	4	0	16	2	3	1	0	2
12	34	50	33	0	36	6	18	10	0	8	0	0	1	0	0
13	66	73	48	78	64	23	37	10	57	25	7	8	0	0	5
14	32	26	8	83	29	2	0	0	0	2	0	0	0	0	0
15	79	83	56	0	74	34	37	14	0	30	8	14	2	0	9
16	39	42	5	0	32	7	11	1	0	6	0	0	0	0	0
17	78	73	35	0	66	36	39	8	0	30	9	8	1	0	7
18	37	50	37	0	44	3	13	5	0	8	0	4	0	0	2
Avg.	51	56	32	20	48	16	20	6	8	15	3	4	0	0	3
6N*	58	0	26	0	51	18	0	5	0	15	2	0	0	0	2
12N*	38	0	17	0	35	9	0	2	0	8	3	0	0	0	2
13N*	52	0	44	0	51	11	0	2	0	9	3	0	0	0	2
Avg.	49	0	29	0	45	12	0	3	0	10	2	0	0	0	2

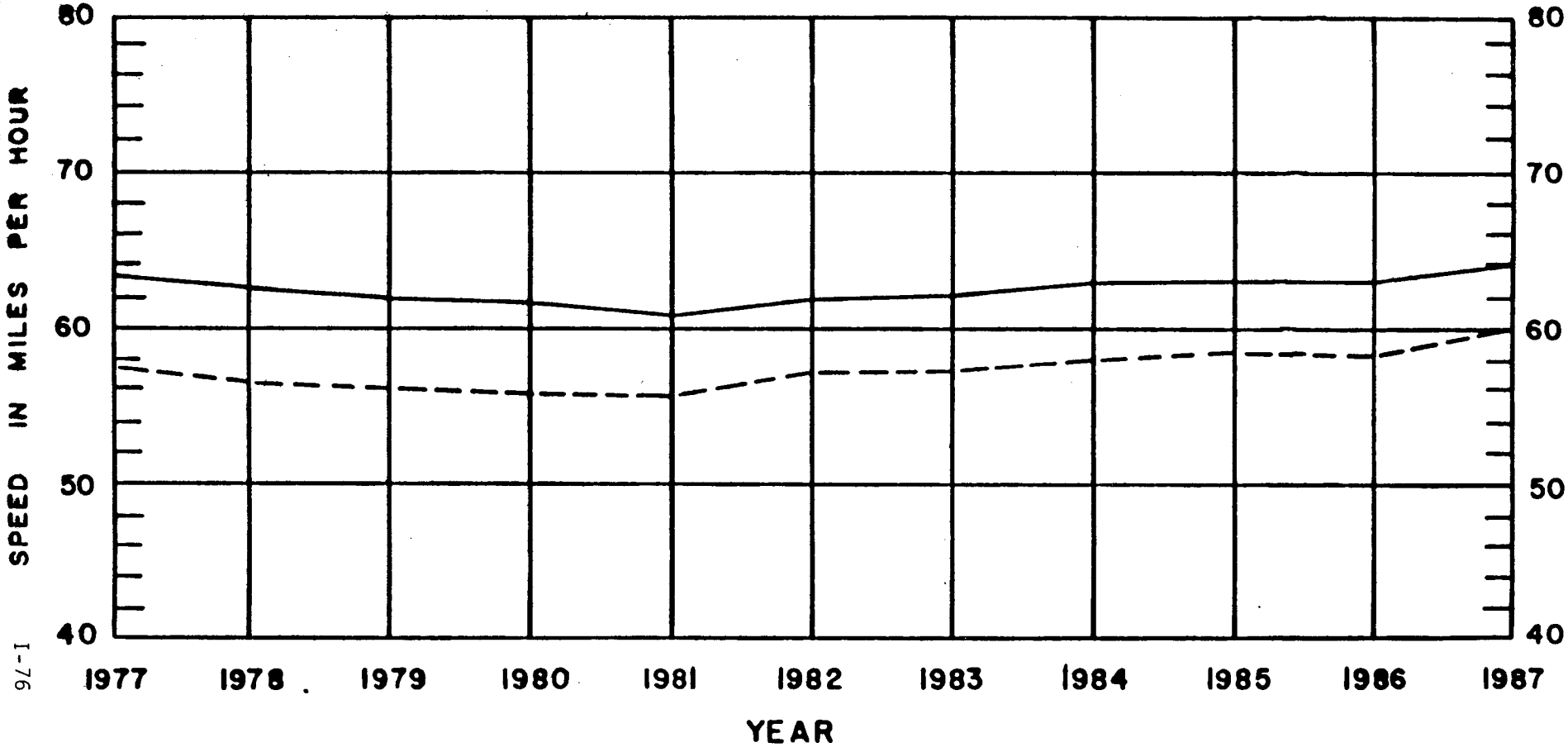
KEY X = Local Passenger Cars and Pickups
F = Out of State Passenger Cars and Pickups
TR = Commercial Trucks
B = Buses
T = Total Vehicles
N = Night Study

* No Distinction Made Between Local and Out of State Cars and Pickups

COMPOSITE SPEED TRENDS

ALL STATIONS

FIGURE 1



Washington State Department of Transportation
Transportation Building KF-01
Olympia, Washington 98504-5201
(206) 753-6005

Duane Berentson
Secretary of Transportation

June 6, 1988

National Highway Traffic
Safety Administration
400 - 7th Street, SW
Washington, D.C. 20590

Gentlemen:

The state of Washington offers the following comments on the Interim Report on the Safety Consequences of Raising the Speed Limit on Rural Interstate Highways.

We fully agree with the conclusions regarding the 65 mph speed limit stated on page 4, and would emphasize that a multi-year observation period is required before any meaningful trend in the long-term safety impacts can be identified. We are pleased that NHTSA's study plan includes three annual reports through 1990 for long-term trend identification.

In reference to use of accident data from the Fatal Accident Reporting System (FARS), we also emphasize that fatalities actually occurring in posted 55 mph and 65 mph areas should be used for comparison rather than utilizing the FARS rural/urban definition which results in data from some 55 mph sections being included in the 65 mph data. Because of the sensitivity of this issue, we believe reported data must be as factual as possible.

For the final reports we recommend that the accident and speed data be presented concisely, especially for the first year, to minimize the potential misinterpretation inherent to lengthy documents. We further recommend that reported data be specifically requested from the states by NHTSA rather than using FARS data.

I trust Washington's comments are helpful in developing final reports on the impact of the 65 mph speed limit.

Sincerely,

DUANE BERENTSON
Secretary of Transportation

DB:sd

cc: Francis B. Francois, AASHTO
Ronald R. Fiedler, AASHTO
David Hensing, AASHTO

Wisconsin Department of Transportation

DIVISION OF PLANNING & BUDGET
P.O. Box 7913
Madison, WI 53707-7913

June 15, 1988

Ms. Diane Steed, Administrator
National Highway Traffic
Safety Administration
U.S. Department of Transportation
400 Seventh Street, S.W.
Washington, D.C. 20590

Dear Ms. Steed:

Attached is our latest accident information on the rural interstate since we went to the 65 mph speed limit. We do allow 65 mph on some additional STH, but lack enough months of experience. We will produce a short report in 2-3 weeks.

Sincerely,

Kenneth J. Leonard

Kenneth J. Leonard, Director
Bureau of Policy Planning and Analysis

KJL/jj

Attachment

DT109

8806220009

JUN 1 1982

For more information: Kenneth Leonard (608) 267-7754

FIRST ANNIVERSARY OF 65 MPH IS JUNE 17, DEATH/INJURY RATES NOT AFFECTED

Transportation Secretary Ronald R. Fiedler said today he is satisfied with the first year's data on the 65 mph speed limit on rural Wisconsin Interstate highways.

The first anniversary of the higher speed limit is June 17, traffic is up 9.8%, and accident rates have remained consistent with previous years.

Fiedler said the increase in traffic can be attributed, in part, to drivers opting to take advantage of the travel time savings on the Interstate instead of two-lane roads.

"We predicted that this diversion would occur. Moving traffic to freeways provides a real safety benefit because the rural interstate is four times safer than other state highways, six times safer than county highways, and at least nine times safer than town roads," he said.

"While we wish there were no crashes at all, we are pleased to note that there was no major change in injury or death rates that can be attributed to the 65 mph speed limit," Fiedler said.

Analysis of the first 11 months of data found that while the number of deaths and injuries were up slightly over the same previous 11-month period, they were lower than in each of the previous four years.

Fiedler said that since there are always year-to-year fluctuations, the data were compared with the same period in the past four years. "The findings are that the numbers since the higher speed limit went into effect are higher than in some previous years and lower than in others," he explained. "In sum, the total accident, injury and fatal accident rates are well within the normal range of fluctuation," he added.

There were 15 fatal accidents on the rural Interstate after 65 compared to 10 in the same 11 months of 1986-87, 16 in 1985-86, 17 in 1984-85 and 20 in 1983-84.

When adjusted for the increased mileage, Fiedler said the fatal accident rate per 100 million miles of travel was 0.53, compared to 0.39 in 1986-87, 0.66 in 1985-86, 0.72 in 1984-85 and 0.87 in 1983-83. All rates are for the rural portions of I-90,I-94 and I-43 from Milwaukee to Green Bay, for the 11-month period from June through April.

The rates do not include the new portion of I-43 between Milwaukee and Beloit which was added to the Interstate system in January, nor US 51 and US 12 where the speed limit was increased to 65 in March and April. Fiedler said the accident statistics for those roads will be analyzed when more data are available.

Because the total number of fatal accidents on the Interstate system is so small, Fiedler said the study also looked at injury accidents and accidents involving only property damage.

"There were 689 injury accidents after the speed limit went up, which is somewhat higher than the previous high of 659 in 1984-85," Fiedler said. "However the injury accident rate was 24 per 100 million miles, compared to a high of 28 injury accidents in the 1984-85 period and a low of 18 in 1986-87. We'll continue to monitor these figures, but we're not alarmed about them," he added.

The total number of accidents was 2,593 after 65 went into effect, which is higher than previous years. However the rate per 100 million miles was 91, compared to a high of 102 in 1984-85, and a low of 80 in 1986-87," Fiedler said.

The average speed on Wisconsin rural Interstate highways is now 64 mph, compared to 60 when the speed limit was 55 mph. Citations have dropped substantially, since the compliance rate with the 65 speed limit is considerably better than when the speed limit was 55.

Fiedler said there were 11,704 citations for speeding in the 65 zones from July through March, compared to 35,661 on the same roads in the same period when the speed limit was 55.

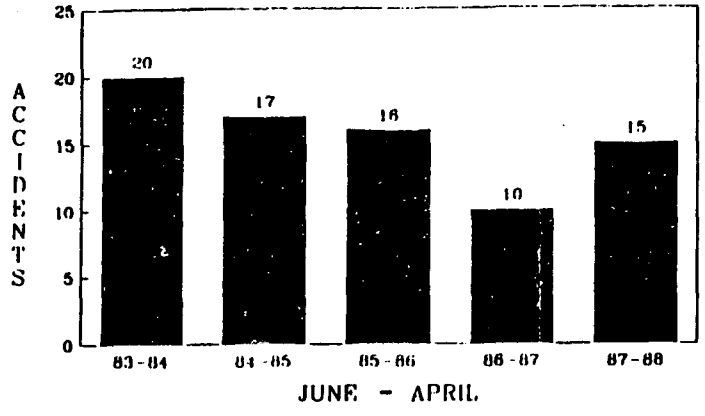
"We have seen reports from other states with 65 where accidents went up and some where the number dropped," Fiedler said. "We believe that Wisconsin travelers have adapted well to the higher speed limit, and that the State Patrol has continued to do a good job of enforcement. Both these factors have helped keep speeds and accidents down," he said.

The study was unable to detect any major "spillover" effect on other highways.

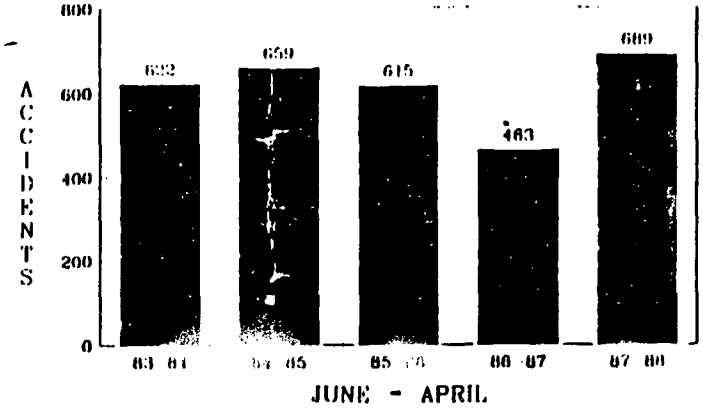
Fiedler said speeds increased about one mile per hour on urban interstates and on other non-interstate rural freeways, but remained the same on other 2-lane rural roads.

# # #

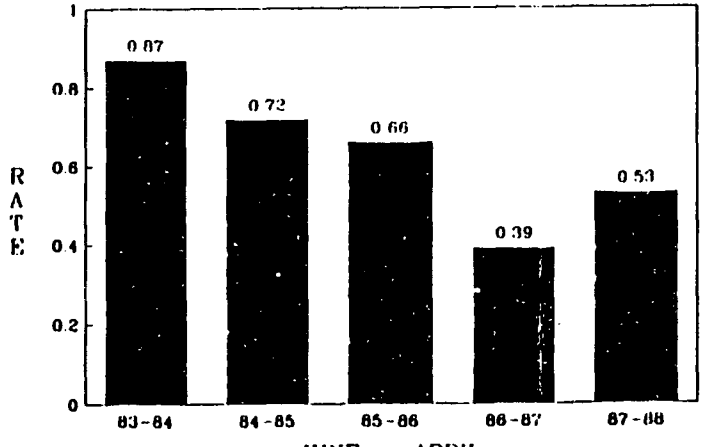
RURAL INTERSTATE SYSTEM FATAL ACCIDENTS



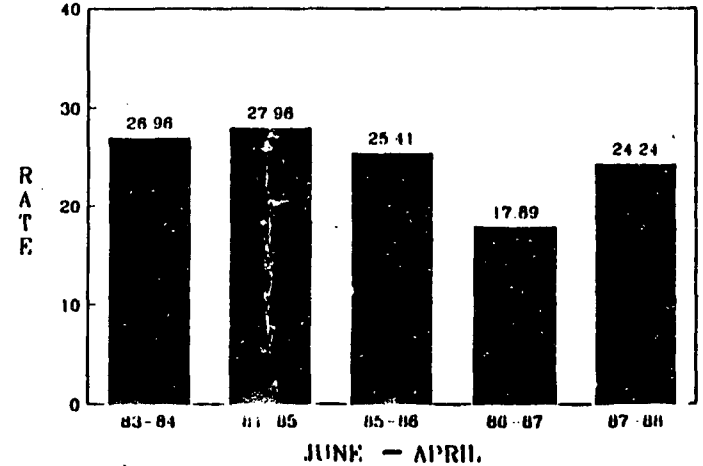
RURAL INTERSTATE SYSTEM INJURY ACCIDENTS



FATAL RATE



INJURY RATE



Appendix II - Time Series Analysis of Rural Interstate Fatality Changes

As part of the analysis of rural Interstate fatality changes, mathematical time series models were constructed to estimate 1987 fatalities on these highways. The model that had the best capability to estimate 1987 rural Interstate fatalities was one that was based on the historical relationship between rural Interstate fatalities and fatalities on all other roads. Over the twelve years 1975 through 1986, this was a very strong and consistent relationship. Additional flexibility is gained by using the relationship in individual states, producing a model with 490 observations and 451 degrees of freedom. This pooled time-series, cross-sectional model produces an estimate that rural Interstate fatalities were, on average, 18 percent higher in the period after the speed limit was increased than would have been expected from the historical relationship. The model has an adjusted R-square of 0.87, meaning that it explains 87 percent of the variability in the data.

An aggregated national model of fatality change produces essentially the same result, using changes in fatalities on other roads and changes in rural Interstate travel to estimate changes in rural Interstate fatalities. Over the twelve years 1975 through 1986, there was a moderately strong relationship between these changes. The model has an adjusted R-square of 0.68 with thirteen observations and nine degrees of freedom. It produces an estimate that fatalities were, on average, 16 percent higher after the speed limit increase than would have been expected from the history of changes. This point estimate is not significantly different from the 18 percent estimate produced by the more detailed model.

Controlling for the effects of vehicle travel results in an estimate that rural Interstate fatalities were about 16 percent higher in 1987 than would have been expected based on the historical relationship between fatalities and vehicle travel. This model result is used in the report.

This time series analysis seeks only to determine what happened to rural Interstate fatalities in the thirty-eight states that raised the speed limit in 1987. The results are based on between eight and nine months of experience at most (in eighteen of the thirty-eight states) and as little as one month (in Michigan). Thus, the results must be considered preliminary -- applicable only to the months and states used in the analysis. The results should not be considered a forecast of what would happen in other states that implement a higher speed limit or what will happen in the future in higher speed limit states. Nor can this analysis predict any effect from spillover into states that retain the 55 mph limit.

Approach

Types of Models:

Two related methods of analysis were used. The first approach used a time series of thirteen observations of rural Interstate fatalities formed from the aggregate of states that increased the speed limit. The 1987 observation includes all fatalities that occurred in states after the speed limit increase. The 1975 through 1986 observations include the corresponding fatalities (same states and days) for the previous twelve years.

For instance, Colorado rural Interstate fatalities that occurred between April 6 and December 31 were added to Michigan rural Interstate fatalities that occurred between November 29 and December 31, for each year. Data from the other thirty-six states that increased the speed limit in 1987 were tabulated and combined in the same way for each of the thirteen years. Each year includes the same days from the same states. Differences between states and seasonal patterns are accounted for by this method.

Table II-1 presents the aggregated time series data. There were 1,512 fatalities in 1987 after the speed limit was increased. This is 21 percent more than the 1,247 that occurred in 1986. Only 1978 had more fatalities (1,539) than 1987.

Table II-1: Thirteen Years of Rural Interstate Fatalities Corresponding to Days with a Higher Speed Limit in 1987

Year	Fatalities
1975	1,163
1976	1,204
1977	1,380
1978	1,539
1979	1,403
1980	1,353
1981	1,368
1982	1,173
1983	1,266
1984	1,336
1985	1,287
1986	1,247
1987	1,512

The second analytical approach used fatality counts for each state, derived in the same manner but not added together. There were thirty-eight observations for each of the thirteen years, for a total of 494 observations. The technical term for this summary is a pooled time-series, cross-section.

Quantitative analysis of this pooled time-series, cross-sectional data has important limitations. The results estimate the average national effect, but the effects in individual states may differ greatly from this average. The result in a state may reflect the types of roads on which the limit was increased, the types of vehicles in use on those roads, the resulting speeds (as well as the distribution of those speeds) on those roads, and traffic enforcement on those roads.

Another limitation of this method is that it can identify only certain types and magnitudes of change. The fatality change must be substantial and broad-based to be accurately measured. These modeling techniques will not pick up, at least not in the short run, patterns of gradual growth, decline, or diffusion. The analysis will be confounded by any spillover effects, such as anticipation of the law change (spillover into earlier time periods), generalization from the law change (spillover onto other roads), and confusion over law applicability (spillover into other states without a law change).

For each of the two methods (using aggregated national data and using the pooled time-series, cross-section data), it was necessary to find a reliable companion series for comparison. Evaluating the fatality effects of the 65 mph speed limit is primarily an exercise in finding the proper companion series from which to compare fatalities before and after the speed limit increase. A useful companion series has three characteristics. First, it is conceptually related to the rural Interstate fatality series (it makes sense as a companion series). Second, it is statistically related over time to the rural Interstate series (it has demonstrated value as a companion series). And third, it is uncontaminated by the 65 mph intervention in the rural Interstate fatality series (it provides an objective baseline from which to measure changes in that series).

The first characteristic can be evaluated from knowledge of accident and injury causation. The second characteristic can be evaluated from empirically testing candidate companion series for statistical correlation. It is important that this testing include not only a variety of series, but also different functions of the same series. The third characteristic can be very difficult to evaluate, especially if there is reason to suspect that all candidate companion series have been affected (to a greater or lesser degree) by the intervention being studied. In doing empirical work of this nature, it is not always possible to be completely satisfied that a series has all three characteristics. Some trade-offs are necessary.

At least three methods of modeling rural Interstate fatalities could be tried, and it is possible to combine these methods. One method is to model rural Interstate fatalities using variables believed to cause fatality change. The constraint to this approach is that many of the factors which cause change are not readily quantified. One such potential cause, vehicle travel, is available for testing and modeling. A second method is to use past rural Interstate fatality counts to predict future values. Such an approach may not work well when rural Interstate fatalities are affected by forces (such as sudden economic changes) that affect the amount and riskiness of driving. A third method is to model rural Interstate fatalities using fatalities unaffected by changes in the speed limit. Several series are available and can be tested against the three characteristics of a useful companion series.

Potential Companion Series:

Table II-2 shows the results of evaluating six possible companion series using twelve observations (1975 through 1986) of the aggregated fatality series. In each case, the data were transformed to their natural logarithms, and a line was fit through the twelve data points to evaluate the historical relationship between the two series. The data tested were transformations of the yearly level of rural Interstate fatalities and of each candidate companion series.

Table II-2: Candidate Companion Series for Rural Interstate Fatalities
Yearly Level Basis

Modeled series: Rural Interstate fatalities after the speed limit increase

Candidate companion series:	Fit through 1975-1986 Data		
	R-square	Coefficient	t-statistic
In states with law changes:			
Days after the change:			
All other fatalities	0.66	0.91	4.37
Urban Interstate fatalities	0.28	0.20	1.96
Rural Interstate fatalities			
January-March (3 months)	0.51	0.57	3.20
Three months before implementation	0.59	0.98	3.82
Rural Interstate travel	0.03	0.14	0.58
In all other states:			
Rural Interstate fatalities	0.21	0.31	1.65

As expressed on a yearly level basis, the best companion series found in terms of statistical compatibility was all other fatalities (fatalities on urban Interstate and non-Interstate roads combined) in states that implemented the higher speed limit. This complementary fatality series is the preferred companion series of those tested here because it is statistically and conceptually related to the modeled series and is believed to be the least contaminated by anticipation of, or spillover from, speed limit law changes.

Two other companion series with moderate historical relationships were examined. They were fatalities on rural Interstates in the same states during the previous winter months (January through March) and fatalities on rural Interstates during the three months preceding the speed limit change in each state. These companion series are statistically and conceptually related to the modeled series. However, it is possible that anticipation of the speed limit changes contaminated these series.

Two other fatality series were tested as controls. Both are conceptually related to the modeled series. However, neither has a strong statistical relationship with the modeled series, and both may have been contaminated by spillover from the speed limit change. Urban Interstate fatalities in states that raised speed limits have an association with rural Interstate fatalities in those states, but not enough for modeling and forecasting. This candidate control series is contained in the larger (and more stable) series of all fatalities on other than rural Interstates.

Rural Interstate fatalities in states that did not raise speed limits has a weak historical relationship with the modeled series. This may be caused partly by the small counts, which can vary widely by chance. But it may also indicate that different forces act to produce the fatalities in other states. The states that did not raise speed limits tend to be industrial eastern states, subject to different economic conditions.

Annual rural Interstate travel in the states that increased the speed limit in 1987 was tested as a companion series. Rural Interstate travel was not available by state for 1987. The data used are preliminary estimates of the annual aggregation of the thirty-eight states that raised speed limits in 1987. In the yearly level form, rural Interstate travel has a very weak relationship with rural Interstate fatalities.

The annual percentage change in rural Interstate travel has a stronger relationship with annual percentage change in the number of rural Interstate fatalities. Table II-3 gives the results of testing the relationship between annual rural Interstate fatality changes and annual changes in each of six candidate companion series.

Table II-3: Candidate Companion Series for Rural Interstate Fatalities
Percentage Change Basis

Modeled series: Rural Interstate fatalities after the speed limit increase

Candidate companion series:	Fit through 1975-1986 Data R-square	Coefficient	t-statistic
In states with law changes:			
Days after the change:			
All other fatalities	0.50	1.11	3.00
Urban Interstate fatalities	0.24	0.30	1.66
Rural Interstate fatalities			
January-March (3 months)	0.36	0.49	2.25
Three months before implementation	0.41	0.83	2.49
Rural Interstate travel	0.50	2.09	2.98
In all other states:			
Rural Interstate fatalities	0.11	0.24	1.05

The results indicate, with one exception, a weaker statistical relationship between annual percentage changes than between yearly levels. The R-square values in Table II-3 are generally lower than those in Table II-1. Only rural Interstate travel change has a relatively high correlation with rural Interstate fatality change. Because travel has such potential theoretical importance for understanding fatalities, it is necessary to pursue this relationship further. It does not seem necessary to further examine the relationship of the other five candidate percentage change companion series.

The candidate companion series with the greatest potential for explaining rural Interstate fatality levels, based on this screening, were used in several types of models.

Results

Rural Interstate fatalities in the thirty-eight states that raised the speed limit in 1987 were structured into two series. The only difference between the two series was whether the state-days were aggregated or left disaggregated. In each, a reasonable companion series on a yearly basis was found to be statistically related to the rural Interstate series.

In modeling either the aggregated or cross-sectional series, the basic assumption is that the rural Interstate series and the companion series move well enough together historically that a deviation in the historical pattern can be interpreted as the result of the higher speed limit in 1987. This assumption is justified as long as no other changes affected the relationship between the two series. This consideration is not a statistical concern but one requiring knowledge about the highway safety environment.

Aggregated Model:

The aggregated model is simpler to describe than the cross-sectional model because it involves only thirteen observations, rather than 490. Table II-4 shows the aggregated rural Interstate fatality data and counts of fatalities on other roads, which serve as a companion series. In 1987 these rural Interstate fatalities (1,512) were higher than in all other years between 1975 and 1986 except 1978, when there were 1,539 fatalities. More indicative of what may have happened is that rural Interstate fatalities as a percentage of fatalities on all roads were higher in 1987 (6.6 percent) than at any other time since FARS began in 1975.

Table II-4: Fatalities in States that Increased Speed Limits during 1987 -- Days Under the Higher Speed Limit

Year	Rural Interstates	Other Roads	All Roads	Percent on Rural Interstates
1975	1,163	20,375	21,538	5.4%
1976	1,204	20,963	22,167	5.4%
1977	1,380	22,613	23,993	5.8%
1978	1,539	24,314	25,853	6.0%
1979	1,403	24,108	25,511	5.5%
1980	1,353	24,289	25,642	5.3%
1981	1,368	22,971	24,339	5.6%
1982	1,173	20,709	21,882	5.4%
1983	1,266	20,076	21,342	5.9%
1984	1,336	21,002	22,338	6.0%
1985	1,287	20,458	21,745	5.9%
1986	1,247	21,366	22,613	5.5%
1987	1,512	21,231	22,743	6.6%

Table II-5 describes the aggregated model used to estimate 1987 rural Interstate fatalities. An intervention variable is used to measure the effect on fatalities. This variable has the value zero for 1975 through 1986 and the value one for 1987. Both the dependent variable (rural Interstate fatalities in the thirty-eight states with the higher speed limit) and the independent variable (all other fatalities in those states on the same days) have been transformed to their natural logarithms, making the variable distributions more normal. The model has an R-square of 0.73 with 10 degrees of freedom using 13 observations. The adjusted R-square (adjusted for the degrees of freedom) is 0.68.

Table II-5: Results of the Aggregated National Model
for States that Raised the Speed Limit in 1987
Using All Other Fatalities in the Same States, on the Same Days
through the End of the Year

Ln (rural interstate fatalities)

= - 1.891
+ 0.907 * Ln (all other fatalities)
+ 0.174 [if the year is 1987]

Parameter	Coefficient	t-statistic	Probability of a Greater t
Intercept	-1.891	-0.91	0.3834
Ln (all other fatalities)	0.907	4.37	0.0014
Dummy for 1987	0.174	3.29	0.0081

R-square = 0.73
Adjusted R-Square = 0.68

The model can be used to estimate the number of 1987 rural Interstate fatalities. The result is an estimate that there would have been 1,270 fatalities instead of the 1,512 that actually occurred. There were 242 (19 percent) more rural Interstate fatalities in 1987 after the speed limit increased than the number that would have been expected (based on the number of other fatalities and the historical relationship between the two series).

It would be useful to know how the 19 percent estimate has changed over time. Although the most time that has elapsed in any of the thirty-eight states is nine months, a first attempt to provide an answer can be made. The last three months of the data were removed from the model, and a new estimate was made. By removing the last three months of data, one state (Michigan) dropped out of the analysis, and several others contributed no more than a few months of fatalities. (Searching for changes in effects might also be done by following a consistent group of states over time.) The results of the truncated model are presented in Table II-6.

Table II-6: Results of the Aggregated National Model
for States that Raised the Speed Limit in 1987
Using All Other Fatalities in the Same States, on the Same Days
through September 30

Ln (rural interstate fatalities)

= - 1.288
+ 0.846 * Ln (all other fatalities)
+ 0.185 [if the year is 1987]

Parameter	Coefficient	t-statistic	Probability of a Greater t
Intercept	-1.288	-0.67	0.5197
Ln (all other fatalities)	0.846	4.16	0.0019
Dummy for 1987	0.185	3.58	0.0051

R-square = 0.72
Adjusted R-Square = 0.66

The model has an adjusted R-square of 0.66 with 10 degrees of freedom using 13 observations. The equation produces an estimate that fatalities increased 19 percent after the speed limit increase, through the end of September. This is the same estimate produced from all available state-day data through the end of December. Thus, there was no apparent change in the effect of the 65 mph speed limit between September and December 1987.

Another question is whether the model detects significant differences between the fatality series in years other than 1987. If many years have a measurable effect, the intervention method is less useful for detecting a difference in 1987.

Table II-7 gives the results of singling out one year from the other twelve and estimating a model each time. Using the standard that the t-statistic have a value of 2.76 for a two-tailed test of significance at the 99 percent level, the results of shifting the value of the intervention variable is significant only for 1987. It appears that the aggregated national model does find a meaningful difference between the two fatality series in 1987.

Table II-7: Results of Estimating a Dummy Variable for Each of the Thirteen Years, in Thirteen Separate Models for the Aggregated Data

Year	Coefficient	t-statistic	Adjusted R-square
1975	-0.08	-1.11	0.40
1976	-0.07	-0.89	0.37
1977	0.02	0.22	0.33
1978	0.09	1.09	0.39
1979	-0.03	-0.34	0.33
1980	-0.09	-1.08	0.39
1981	-0.01	-0.10	0.32
1982	-0.09	-1.17	0.40
1983	0.03	0.42	0.33
1984	0.05	0.65	0.35
1985	0.03	0.42	0.33
1986	-0.04	-0.58	0.34
1987	0.17	3.29	0.67

The procedure used to estimate rural Interstate fatalities can be used to evaluate the relationship between rural Interstate and other fatalities in the ten states that chose not to raise speed limits in 1987. Table II-8 describes the historical relationship between aggregated rural Interstate fatalities and other fatalities for these ten states from April 1 to December 31 of each year. There does not appear to be any special change in the relationship between the two series in 1987. Although rural Interstate fatalities were 11 percent higher in 1987 than in 1986, the 1986 value appears unusually low, as compared to other fatalities.

Table II-9 describes the aggregated model of the relationship between the two series over time. The model has an adjusted R-square of 0.31 with 10 degrees of freedom using 13 observations. The value of the intervention variable coefficient and the lack of strong statistical significance indicate that there was no special effect in 1987.

Table II-8 Fatalities in States that Retained Speed Limits through 1987
-- April 1 through December 31

Year	Rural Interstates	Other Roads	All Roads	Percent on Rural Interstates
1975	275	7,553	7,828	3.5%
1976	290	7,533	7,823	3.7%
1977	306	7,898	8,204	3.7%
1978	345	8,442	8,787	3.9%
1979	257	8,266	8,523	3.0%
1980	289	8,375	8,664	3.3%
1981	251	7,842	8,093	3.1%
1982	258	7,170	7,428	3.5%
1983	226	6,968	7,194	3.1%
1984	246	7,060	7,306	3.4%
1985	245	7,178	7,423	3.3%
1986	234	7,748	7,982	2.9%
1987	260	7,988	8,248	3.2%

Table II-9: Results of the Aggregated National Model
for the States that Retained the Speed Limit through 1987
Using All Other Fatalities in the Same States
April through December

Ln (rural interstate fatalities)

= - 5.035
+ 1.188 * Ln (all other fatalities)
+ 0.076 [if the year is 1987]

Parameter	Coefficient	t-statistic	Probability of a Greater t
Intercept	-5.035	-1.29	0.2257
Ln (all other fatalities)	1.199	2.73	0.0214
Dummy for 1987	-0.076	-0.74	0.4766

R-square = 0.43
Adjusted R-Square = 0.31

Cross-Sectional Model:

The cross-sectional model is more difficult to describe because of the large number of observations, but it has the potential to account for more state variation than is possible in an aggregated model. The same steps followed in estimating the aggregated model were taken in doing the analysis with the cross-sectional model. First, an estimate was made of the effect. Second, a test was done to determine if the effect was changing over time. Third, the uniqueness of the relationship across time was investigated.

Table II-10 describes the cross-sectional model. The model controls for the possibly unique relationship in each state between rural Interstate fatalities and all other fatalities. The relationship between these two series can be different for each state. There were thirteen years for each of the thirty-eight states that raised the speed limit in 1987. This is a total of 494 observations. Four of these observations were zero. These had to be deleted from the analysis because the natural logarithm of zero is undefined. The model has an adjusted R-square of 0.87 with 451 degrees of freedom and 490 observations.

The estimate from the model is that there would have been 1,285 rural Interstate fatalities in 1987 if that year had followed the pattern. The 1,512 fatalities that actually occurred means that rural Interstate fatalities were on average 18 percent higher in 1987 than fatalities would have been based on the historical trend. The 18 estimate is statistically significant at the 99 percent confidence level using a two-tailed test of significance. This estimate is essentially the same as the 19 percent estimate produced by the aggregated national model.

Table II-10: Results of the Cross-Sectional Model
for States that Raised the Speed Limit in 1987
Using All Other Fatalities in the Same States

Ln (rural interstate fatalities)

= 0.944
+ 0.557 * Ln (all other fatalities)
+ 0.163 [if the year is 1987]
+ [37 state dummy variables]

Parameter	Coefficient	t-statistic	Probability of a Greater t
Intercept	0.944	1.71	0.0872
Ln (all other fatalities)	0.557	4.85	0.0001
Dummy for 1987	0.163	2.78	0.0057
[State dummy variables]			

R-square = 0.88
Adjusted R-Square = 0.87

The cross-sectional model fits better than the aggregated national model and has more degrees of freedom. For this reason, the 18 percent estimate appears to be the best available point estimate of the increase in 1987 rural Interstate fatalities in states that increased the speed limit. Fatalities were about 18 percent higher on rural Interstates than would have been expected in 1987 in the thirty-eight states which adopted a higher speed limit. It should be borne in mind, however, that any model which produces a slightly higher or lower point estimate than the 18 percent may not be indicating a statistically different effect. The cross-sectional model can be used to make individual state forecasts of how many fatalities would have been expected if the lower speed limit had been retained. This property is used in the next section to explore similarities among states that had large fatality increases after the speed limit increase.

The model estimates might be done by the weighted least squares (WLS) rather then the ordinary least squares (OLS) method used here. OLS gives the same weight to each of the states in determining the value of the intervention variable. Since some states have very low fatality counts which can be dominated by random variation, these observations should not be weighted as much as the larger fatality states. Two WLS estimations were done using different weighting factors. Both produced little appreciable difference in the estimate of the fatality effect of the change to a 65 mph speed limit.

To test the possibility that the speed limit effect may have changed since the implementation of the 65 mph speed limit began, the estimate was done with the last three months omitted. The results are shown in Table II-11. The point estimate of the increase is higher, as indicated by the higher intervention variable coefficient for 1987. This indicates that the effects of the 65 mph increase may have lessened in the states that implemented earlier or that the effects were not as great in the states that implemented later. More data and work are needed to further address this issue.

Table II-11: Results of the Cross-Sectional Model
for States that Raised the Speed Limit in 1987
Using All Other Fatalities in the Same States
through September 30

Ln (rural interstate fatalities)
= 1.173
+ 0.463 * Ln (all other fatalities)
+ 0.212 [if the year is 1987]
+ [37 state dummy variables]

Parameter	Coefficient	t-statistic	Probability of a Greater t
Intercept	1.173	2.05	0.0411
Ln (all other fatalities)	0.463	3.58	0.0004
Dummy for 1987	0.212	3.05	0.0024
[State dummy variables]			

R-square = 0.86
Adjusted R-Square = 0.85

To test how the cross-sectional model performs in identifying significant differences in the relationship between the two series over time, the intervention variable was shifted over time, and a new estimate made for each of the shifts. The results are presented in Table II-12.

Table II-12: Results of Estimating a Dummy Variable for Each of the Thirteen Years, in Thirteen Separate Models for the Cross-Sectional Data

Year	Coefficient	t-statistic	Adjusted R-square
1975	-0.03	-0.56	0.87
1976	-0.07	-1.25	0.87
1977	-0.01	-0.08	0.87
1978	0.14	2.36	0.87
1979	-0.07	-1.16	0.87
1980	-0.09	-1.47	0.87
1981	-0.04	-0.64	0.87
1982	-0.11	-1.90	0.87
1983	0.09	1.49	0.87
1984	0.09	1.57	0.87
1985	0.07	1.14	0.87
1986	-0.13	-2.20	0.87
1987	0.16	2.78	0.87

The standard is that a t-statistic of 2.36 or greater represents statistical significance for a two-tailed test at the 99 percent confidence level. Only 1987 and 1978 are significant at this level, and 1986 is nearly significant. In 1986, rural Interstate fatality counts were slightly lower than would have been estimated from the number of other fatalities that year and the historical relationship between the two series.

This is important if 1987 rural Interstate fatalities are compared to 1986 counts. Rural Interstate fatalities increased 21 percent, from 1,247 in 1986 to 1,512 in 1987. However, if 1986 rural Interstate fatalities were a little below average, this 21 percent increase over the 1986 level is slightly high. In addition, there were small changes in other fatalities that are useful in estimating what would have happened if 1987 had followed the historical trend. The estimates produced from the models -- 18 percent (from the cross-sectional model) and 19 percent (for the aggregated national model) -- reflect these small changes from the longer trend.

Annual Change Model:

The aggregated national and the pooled time-series, cross-sectional models were based on fatality counts (transformed by the natural logarithm of the value) for each year. However, Table II-1 identified a relationship between the percentage change in rural Interstate travel (how much travel increased or decreased from the previous year) and the percentage change in fatalities on these roads (how much fatalities increased or decreased from the previous year). An aggregated national model of travel and fatality changes can use this relationship to explore the 1987 rural Interstate fatality increase.

Table II-13 presents the absolute and percentage change in rural Interstate fatalities and rural Interstate travel. Rural Interstate travel had a relatively large yearly change in 1987, as compared to the previous eight years. For the thirteen years available here, only the 1976, 1977, and 1978 had comparable increases. In those three years fatalities also increased, by 3.5 percent, 14.6 percent, and 11.5 percent, respectively. These increases are not quite as large as the 21.3 percent fatality increase of 1987 over the previous year.

Table II-13: Absolute and Percentage Changes in Rural Interstate Travel and Fatalities in 38 States that Raised the Speed Limit

	Travel All Year		Deaths After 65	
Year	Millions	Change	Number	Change
1975	88,299	-	1,163	-
1976	93,863	6.3 %	1,204	3.5 %
1977	100,722	7.3 %	1,380	14.6 %
1978	108,981	8.2 %	1,539	11.5 %
1979	106,892	-1.9 %	1,403	-8.8 %
1980	107,442	0.5 %	1,353	-3.6 %
1981	111,089	3.4 %	1,368	1.1 %
1982	113,736	2.4 %	1,173	-14.3 %
1983	116,196	2.2 %	1,266	7.9 %
1984	119,336	2.7 %	1,336	5.5 %
1985	123,265	3.3 %	1,287	-3.7 %
1986	127,489	3.4 %	1,247	-3.1 %
1987	136,923	7.4 %	1,512	21.3 %

Rural Interstate travel increased 2.4 percent in 1982, yet fatalities on those roads dropped 14.3 percent. This suggests two things about the relationship between travel and fatalities. First, although there is a statistical correlation between changes in rural Interstate travel and changes in rural Interstate fatalities over twelve years, they do not correspond exactly. Percent travel changes do not map neatly into percent fatality changes.

Second, changes in the risk distribution of travel may be more important than changes in the overall amount of travel. In 1982, the average risk of travel on rural Interstates appeared to drop. In 1987, increases in rural Interstate travel appear to have occurred in an environment of higher risk relative to the historical average.

Aggregated national models can be used to investigate the effects of rural Interstate travel on rural Interstate fatalities. Table II-14 describes a model of annual rural Interstate fatality change estimated from rural Interstate travel change. The adjusted R-square for this model is 0.59. The t-statistic for the travel series is 2.98, indicating statistical significance for a two-tailed test. This significance indicates that the historical correlation of annual percentage change in rural Interstate travel with fatality change must be considered in an analysis of the effects of raising the speed limit. The coefficient of the intervention variable indicates that after accounting for increases in rural Interstate travel, fatalities were still 12 percent higher than would have been expected.

Table II-14: Results of the Percentage Change Aggregated National Model for the States that Raised the Speed Limit in 1987 Using Rural Interstate Travel

Percent change (rural interstate fatalities)

= - 0.062
+ 2.092 * percent change (rural Interstate travel)
+ 0.120 [if the year is 1987]

Parameter	Coefficient	t-statistic	Probability of a Greater t
Intercept	-0.062	-2.00	0.0770
Travel change	2.092	2.98	0.0153
Dummy for 1987	0.120	1.63	0.1378

R-square = 0.66
Adjusted R-Square = 0.59

Changes in fatalities on other roads also provide important information about changes in rural Interstate fatalities. Other fatalities were 0.6 percent lower in 1987 than in 1986 (21,231 versus 21,366). Table II-15 describes the regression of the rural Interstate fatality series on the all-other fatality series. The adjusted R-square is 0.67, and the all-other fatality series has a t-statistic of 3.00. The coefficient of the intervention variable for 1987 indicates that rural Interstate fatalities were 22 percent higher in 1987 than would be expected from the historical relationship.

Table II-15: Results of the Percentage Change Aggregated National Model for the States that Raised the Speed Limit in 1987 Using All Other Fatalities

Percent change (rural interstate fatalities)

= 0.004
+ 1.110 * percent change (all other fatalities)
+ 0.216 [if the year is 1987]

Parameter	Coefficient	t-statistic	Probability of a Greater t
Intercept	0.004	0.18	0.8651
Other fatality change	1.110	3.00	0.0151
Dummy for 1987	0.216	3.18	0.0113

R-square = 0.67
Adjusted R-Square = 0.59

Each of the single-variable change models includes important information, and each has an important omitted variable. The travel model needs the information contained in the all-other fatality series -- the other fatality decline is information needed in determining the best estimate of the rural Interstate fatality increase. Likewise, the all-other fatality model needs the information that rural Interstate travel increased in 1987.

Table II-16 presents a model that uses both rural Interstate travel and all other fatalities to estimate rural Interstate fatalities. The adjusted R-square is 0.68, as compared to 0.59 for each of the previous two models. This rise in the adjusted R-square indicates that there is separate information in both the travel and the all-other fatality series. If the two series were highly correlated, the adjusted R-square would not increase. Both series, when expressed in a yearly percent change form, should be used to estimate 1987 rural Interstate fatalities.

Table II-16: Results of the Percentage Change Aggregated National Model for the States that Raised the Speed Limit in 1987 *Using Rural Interstate Travel and All Other Fatalities*

Percent change (rural interstate fatalities)

= - 0.041
+ 0.722 * percent change (all other fatalities)
+ 1.354 * percent change (rural Interstate travel)
+ 0.158 [if the year is 1987]

Parameter	Coefficient	t-statistic	Probability of a Greater t
Intercept	- 0.041	- 1.36	0.2102
Other fatality change	0.722	1.84	0.1037
Travel change	1.354	1.83	0.1055
Dummy for 1987	0.158	2.30	0.0505

R-square = 0.76
Adjusted R-Square = 0.68

The value of the intervention variable indicates that fatalities were about 16 percent higher in 1987 than would have been expected from the historical relationship between fatality and travel changes. This estimate is substantively the same as the 18 percent estimate produced by the cross-sectional model using yearly levels.

Models of other functional forms and specifications were tried, including one for which both rural Interstate and all other fatalities were normalized by travel. These models also produce estimates consistent with the 18 percent fatality increase.

All these comparisons will benefit from additional data. Not only will the analysis be more reliable with more months of data, but the long-term changes in rural Interstate fatalities may differ from the immediate effects addressed here. It may be possible from a longer data series to separate short-term from longer-term effects. It may also be possible to model the data from some of the larger states (such as Arizona, California, Florida, and Texas) or to group the data into clusters of similar states for comparative analysis.

Appendix III: Exploration of State Differences

This report presents data that indicated rural Interstate fatalities increased in the period after the rural Interstate speed limit increased. Although the fatality increase is associated with the speed limit increase, other factors were involved. Further, the increase in fatalities does not distinguish between states with large fatality increases and all other states, yet there were large differences among states. Understanding the reasons for these differences may suggest ways to reduce any safety effects of the speed limit increase.

States that had large rural Interstate fatality increases in the period after the speed limit was increased tended to have lower economic indicators (lower retail sales per person, higher percent of the population living below the poverty level, and lower personal income per person) and to have had higher rural Interstate fatality rates (fatalities per vehicle mile traveled, on all roads) before the speed limit increase. This provides a fertile area of speculation about why some states had substantial increases in rural Interstate fatalities and what they might do to reduce the fatality increases in their state.

Conclusion

The main conclusion of the exploration is that states with the largest rural Interstate fatality increases (relative to fatality changes on other roads) tended to be:

States that already had high rates of fatalities per vehicle mile of travel for all types of travel and

States which have certain characteristics in their economic environment.

The implication of this association is that there were not just one or two tangible factors in a state which determined the rural Interstate fatality increase. Rather, the overall fatality atmosphere or environment of each state was important. This suggests that subtle influences may have been involved in the fatality increase that followed the speed limit increase. To the extent that the factors are difficult to identify, remedies will also be hard to find.

The remainder of this section is a discussion of the statistical methods used to explore the reasons why fatalities increased substantially in some states, but not in others.

Approach

The exploration of state differences in the effects of the speed limit increase addressed whether the national average increase in rural Interstate fatalities (estimated from the time series analysis) that followed the speed limit increase was evenly distributed across states, or whether some states experienced much larger fatality increases than others. For this purpose, it was necessary to develop a measure of state fatality changes that allows comparisons across states.

Then, after state differences were found, the exploration attempted to explain the differences by identifying common characteristics of states with large fatality increases which distinguish those states from states with small or no fatality increases.

Fatality Change Measures:

Table III-1 shows the number of rural Interstate fatalities after the speed limit increase in 1987 and for the corresponding days of 1986 for each of the thirty-eight states that raised the speed limit in 1987. Twenty-seven of those states had more fatalities in 1987 than in 1986, while eleven states remained the same or had a decrease.

Some of these percentage increases are quite large. This simple percentage comparison introduces problems of interpretation. First, the changes include a random element; fatality changes in states with few annual fatalities and in states that implemented late in 1987 may reflect random variation in the fatality counts. Second, the simple comparison does not take into account other changes that may have occurred and influenced safety in 1987; while a change may be meaningful, it may have been caused by something else. Third, the comparison year (1986) may have been unusual; a change may simply reflect a return to more normal fatality levels.

Table III-1 illustrates the first of these considerations. Some of the smaller states and states that raised the speed limit late in 1987 have very large percentage changes from 1986 to 1987. For example, Vermont had two rural Interstate fatalities between April 20 and December 31 in 1986. On these same days in 1987 there were five fatalities on these roads, an increase of 150 percent. On the other hand, North Carolina did not raise the speed limit until August 10, 1987. This was late in the year compared to other states, however, between August 10 and December 31 there were 12 rural Interstate fatalities in 1986 and 33 in 1987, a 175 percent increase.

Table III-1: Changes in Rural Interstate Fatalities
-- Days Under the Higher Speed Limit in 1987

State	1986	1987	Change
Colorado	63	43	-32%
Montana	28	20	-29%
Florida	98	77	-21%
New Hampshire	5	4	-20%
Oregon	7	6	-14%
Maine	9	8	-11%
Oklahoma	40	38	-5%
Indiana	35	34	-3%
Michigan	2	2	0%
West Virginia	13	13	0%
North Dakota	4	4	0%
Alabama	27	29	7%
California	166	181	9%
Missouri	49	54	10%
Texas	147	163	11%
Washington	23	26	13%
Kentucky	18	21	17%
Wyoming	27	32	19%
Kansas	15	18	20%
Illinois	44	53	20%
Idaho	21	26	24%
Nevada	25	31	24%
Louisiana	39	53	36%
Tennessee	42	59	40%
South Carolina	25	36	44%
Arkansas	18	26	44%
Mississippi	30	44	47%
New Mexico	63	94	49%
Utah	28	45	61%
Nebraska	8	13	63%
Arizona	75	131	75%
Minnesota	9	17	89%
Ohio	14	29	107%
South Dakota	5	11	120%
Wisconsin	6	15	150%
Vermont	2	5	150%
North Carolina	12	33	175%
Iowa	5	18	260%
Total	1,247	1,512	21%

Table III-2 presents changes in rural Interstate fatalities using a method which handles the first and second of the considerations discussed above. The table includes only the twenty-one states with more than 20 rural Interstate fatalities on the relevant days in 1986. The table shows rural Interstate fatalities corresponding to days after the speed limit increase, for 1987 and 1986. All other fatalities (urban Interstate and non-Interstate) are also listed for the same years. For each state and year, a ratio can be formed from the number of rural Interstate fatalities divided by all other fatalities. The change in the ratio is calculated by subtracting the 1987 ratio from the 1986 ratio. The difference is shown in the table.

For example, in 1986 Utah had 28 rural Interstate fatalities and 200 other fatalities. The ratio of these is 0.1400. In 1987, the ratio was 0.2848. The difference between these is 0.1448. The data in the table have been multiplied by 100 (to simplify scanning the column for differences), yielding a fatality ratio difference measure of 14.48. Of the twenty-one included states, seventeen had a fatality increase in 1987, using this measure.

Table III-2: Changes in the Ratio of Rural Interstate Fatalities to All Other Fatalities in Twenty-One States that Raised the Speed Limit in 1987

	Rural Interstates		All Other Roads		Change in Ratio
State	1986	1987	1986	1987	* 100
Montana	28	20	151	151	-5.30
Colorado	63	43	435	442	-4.75
Florida	98	77	1,803	1,841	-1.25
Alabama	27	29	408	458	-0.29
Indiana	35	34	644	625	0.01
Washington	23	26	512	553	0.21
Oklahoma	40	38	474	438	0.24
California	166	181	3,472	3,493	0.40
Illinois	44	53	1,180	1,165	0.82
Missouri	49	54	770	685	1.52
Texas	147	163	2,246	2,016	1.54
South Carolina	25	36	530	551	1.82
Tennessee	42	59	780	818	1.83
Nevada	25	31	163	180	1.88
Mississippi	30	44	531	547	2.39
Idaho	21	26	180	174	3.28
Louisiana	39	53	661	559	3.58
New Mexico	63	94	324	366	6.24
Arizona	75	131	669	591	10.96
Utah	28	45	200	158	14.48
Wyoming	27	32	99	76	14.83

This basis for measuring fatality change is an improvement over the simple comparison of fatality counts because it includes information on the complementary fatality series (all other fatalities). That series, the complement of the rural Interstate fatality series, should be acted on by similar forces to those that cause rural Interstate fatalities to change. Forces like localized social, demographic, and economic conditions which affect rural Interstate fatalities should also affect the all other fatality series. Any differences between the two series could be the result of the changes in rural Interstate speed limit.

However, using just the 1986 ratio as a comparison is not ideal because 1986 may be atypical. This was the third of the interpretative considerations listed previously. Later analysis will use the disaggregated model (based on twelve years of fatality experience before the speed limit increase) to generate expected values of rural Interstate fatalities. This analysis uses the number of other fatalities and the historical relationship between these and the number of rural Interstate fatalities.

Table III-2, even with this shortcoming, suggests several interesting ideas. The ranking of the twenty-one states in Table III-2 is different from the ranking of those same states produced by the simple percent change from 1986, shown in Table III-1. This shift illustrates that measuring and ranking the increases can be quite sensitive to the method employed. It is important that any search for discriminating factors among states with different degrees of change be based on a ranking that is analytically reliable.

Another interesting observation from Table III-2 (and from Table III-1 as well) is that most states had a rural Interstate fatality increase in 1987. If the changes in these states were related mainly to the speed limit increase, then the speed limit acted in a broad-based fashion. The nationwide rural Interstate fatality increase comes from a large number of states. The more broad based the increase was, the less likely that the increase was from local factors peculiar to a state or region.

Table III-3 produces another ranking of the twenty-one states that had more than 20 fatalities in 1986. This ranking uses a mathematical model that was developed in the time series analysis to produce a point estimate of the average national effect. The model was run using observations for all states for 1975 through 1986. The parameters produced from the estimation describe the historical relationship between rural Interstate fatalities and all other fatalities in a state. Each state has a separate parameter which reflects differences in that relationship for the individual state. For instance, the relationship might be different for a state with more non-occupant fatalities than the average state.

Table III-3: Ranking of Twenty-One States
that Raised the Speed Limit in 1987
by Actual versus Expected Rural Interstate Fatalities

State	1987 Fatalities		Difference	
	Actual	Projected	Straight	Percent
Montana	20	25.279	-5.279	-26.4
Nevada	31	38.615	-7.615	-24.6
Indiana	34	40.500	-6.500	-19.1
Colorado	43	48.138	-5.138	-12.0
California	181	169.466	11.534	6.4
Tennessee	59	54.604	4.396	7.5
Texas	163	145.745	17.255	10.6
Wyoming	32	28.254	3.746	11.7
Oklahoma	38	33.460	4.540	12.0
Illinois	53	44.463	8.537	16.1
Missouri	54	44.241	9.759	18.1
Washington	26	20.899	5.101	19.6
Florida	77	60.625	16.375	21.3
Alabama	29	21.804	7.196	24.8
Idaho	26	19.411	6.589	25.3
South Carolina	36	25.594	10.406	28.9
New Mexico	94	60.691	33.309	35.4
Utah	45	28.643	16.357	36.4
Arizona	131	76.003	54.997	42.0
Louisiana	53	29.933	23.067	43.5
Mississippi	44	24.618	19.382	44.1

Using the parameters and the 1987 value of all other fatalities, the number of rural Interstate fatalities that would have been expected based on historical trends was predicted for each state. This predicted value was compared to the actual 1987 value. The difference was divided by the predicted value to form a percent change. It is this percent change, shown in Table III-3, that was used as a basis for understanding state differences from the national average fatality increase and to search for factors which may have caused the differences among states.

The percent differences between the expected and actual values of rural Interstate fatalities in 1987 produces a distribution of values. Four states, Montana, Nevada, Indiana, and Colorado, actually had decreases from the expected values. The seventeen states that had an increase form a progression in value, from 6.4 percent for California to 44.1 percent for Mississippi.

Effect of Deleted States:

Two issues are addressed before using the percent differences between the expected and actual values of rural Interstate fatalities in the search for discriminating factors among different magnitudes of change. First, as mentioned above, the technique for dealing with percent values calculated on small bases can cause distortion. In omitting the observations, the assumption was made that the missing states were like the included states.

The cross-sectional, disaggregated model can be used to give some indication of the similarities between the group of seventeen smaller, deleted states and the twenty-one larger, included, states. The model was estimated after dropping the observations for the seventeen smaller states.

The results are presented in Table III-4. The comparison of the estimated coefficient of the intervention variable for all thirty-eight states (0.163) with the results here (an estimated coefficient of 0.209) indicates that the seventeen larger states had, on average, smaller differences between expected and actual values.

Table III-4: Results of the Cross-Sectional Model
Using All Other Fatalities in the Same States
for Twenty-One States that Raised the Speed Limit in 1987
and Had More than 20 Fatalities in 1986

Ln (rural interstate fatalities)

= - 0.243
+ 0.807 * Ln (all other fatalities)
+ 0.209 [if the year is 1987]
+ [20 state dummy variables]

Parameter	Coefficient	t-statistic	Probability of a Greater t
Intercept	-0.243	-0.44	0.6592
Ln (all other fatalities)	0.807	6.97	0.0001
Dummy for 1987	0.209	3.74	0.0002
[State dummy variables]			

R-square = 0.86
Adjusted R-Square = 0.85

A second issue develops from examining the ranking based on the amount of difference. This issue is the degree to which the 18 percent point estimate is a function of the states which had the largest increases. Table III-5 shows the results of estimating the disaggregated model parameters after eliminating the five states (Arizona, Louisiana, Mississippi, New Mexico, and Utah) with the largest percentage increase. Dropping the five states changes the coefficient of the dummy intervention variable from 0.163 (Table 4-10) to 0.104. The results of the restricted estimation are less statistically significant as well. Thus, the experience of the five states with the largest increases is important to the analysis and contributes significantly to the national average effect.

Table III-5: Results of the Cross-Sectional Model
Using All Other Fatalities in the Same States
for States that Raised the Speed Limit in 1987
Excluding Five States with the Largest Fatality Increases

Ln (rural interstate fatalities)

= 1.385
+ 0.464 * Ln (all other fatalities)
+ 0.104 [if the year is 1987]
+ [32 state dummy variables]

Parameter	Coefficient	t-statistic	Probability of a Greater t
Intercept	1.385	2.32	0.0206
Ln (all other fatalities)	0.464	3.73	0.0002
Dummy for 1987	0.104	1.63	0.1040
[State dummy variables]			

R-square = 0.88
Adjusted R-Square = 0.87

Screening for Explanatory Variables:

The search for factors or conditions that discriminate between states with smaller versus larger fatality changes involved the use of statistical methods to discover hypotheses, rather than to prove them. To a degree, this was also true in the search for an adequate companion series for the rural Interstate fatality time series described in Section 4 and Appendix II. However, the search there was only for a series that moved with the rural Interstate fatality series through time -- for a close statistical fit. The theory of which series to consider is well understood. In the search for factors or conditions that produce differences in the degree of change among states, there is no such agreed upon theory that can be used. Hence, there cannot be both a discovery and proof on a statistical basis from the same data set. It is therefore important that the hypotheses generated here be considered by experts, and that further empirical work be done.

The analysis to find the factors or conditions was based on screening a number of variables representing a variety of concepts of what might have caused the differences. The six concepts analyzed were as follows:

(1) the overall economic environment in a state;

(2) the general safety environment, as measured by the total fatality rate of a state;

(3) rural Interstate speed, as measured by the average speed and the 85th percentile speed of vehicles on these roads prior (1986) to the speed limit change;

(4) the characteristics of the speed limit change, as measured by the percentage of eligible miles on which the speed limit was increased and whether a state restricted truck speeds;

(5) alcohol consumption, as measured by the per capita consumption of beer in a state; and

(6) the characteristic of the vehicle fleet, as measured by the percentage of trucks and busses in the fleet.

The screening described here was not an exhaustive search of all possibilities: there are other concepts which might be important, and in some cases the most recent information could not be obtained. Alternatively, it is possible that the observed fatality differences were not based on any concepts, but were simply random.

The screening was done by regressing each factor from each concept category on the percentage ranking series of Table III-3. The results are presented in Table III-6. The adjusted R-square indicates which variables may be related to fatality differences among states. An adjusted R-square as high as those of the best companion series found in the time series work was not expected. In the time series work, the search for a companion series was limited to fatality series from the same state and time. Here, the screening involved more distant relationships between a series measuring changes in fatalities and general conditions in a state.

Table III-6: Screening for Factors
Associated with the Magnitude of State Changes
in Rural Interstate Fatalities in 1987

Dependent variable: Percent difference between actual and predicted rural Interstate fatalities in twenty-one states

Candidate explanatory variables:	Year	Fit through 1975-1986 Data R-square	Coefficient	t-statistic
Concept 1: Economic				
Per capita retail sales	1986	0.35	-0.02	-3.18
Population below poverty level	1979	0.34	3.10	3.11
Per capita personal income	1986	0.22	-0.01	-2.30
Unemployment rate	1987	0.12	4.69	1.64
Change in unemployment rate	1987-1986	0.11	-11.52	-1.51
Concept 2: Fatalities per travel				
Total fatalities	1986	0.26	16.61	2.57
Rural Interstate fatalities	1986	0.00	-0.06	-0.03
Concept 3: Rural Interstate speed				
Average speed	1986	0.13	-3.79	-1.69
85th percentile speed	1986	0.09	-2.92	-1.33
Concept 4: Speed Limit				
Percentage of rural Interstate mileage posted at 65 mph	1987	0.11	-0.41	-1.50
Dummy variable for truck dual speed limit	1987	0.06	-11.01	-1.08
Percent of total roads that are rural	1986	0.00	-0.14	-0.20
Percent of total travel which is on rural roads	1986	0.01	0.13	0.30
Concept 5: Alcohol				
Adult per capita beer consumption	1985	0.06	-0.84	-1.18
Concept 6: Vehicle fleet				
Trucks and buses as percent of registered vehicles	1984	0.01	-0.24	-0.35

Three of the economic variables have R-square values that suggest a relationship. These three variables are per capita retail sales, percent of population below the poverty level, and per capita personal income. These variables indicate the economic environment of a state relative to other states, rather than the current economic conditions of a state. The variables which measure current economic conditions (the unemployment rate and the change in the unemployment rate) did not correlate well with rural Interstate fatality changes.

For example, Texas had a relatively high unemployment rate in 1987, reflecting current business conditions. Yet, Texas has a healthy economic environment, as measured by retail sales, personal income, and people living below the poverty level. These three economic variables indicate a relationship between the fatality change and permanent conditions in the state; they do not suggest that changes in economic conditions account for the fatality differences. Indeed, the poor correlation of fatality change with the unemployment rate and unemployment rate change suggest the opposite.

One other variable listed in Table III-6 is of interest. States that have a high overall fatality rate (total fatalities divided by total vehicle miles of travel) tended to have larger rural Interstate fatality changes in 1987.

Table III-7 presents a ranking of states by total fatality rate. States which did not enact a 65 mph speed limit have a tendency to be nearer the top of the ranking, with relatively low fatality rates.

It is interesting that the state rural Interstate fatality rate (rural Interstate fatalities divided by rural Interstate travel) in 1986 is not associated with differences among states in percent increases in rural Interstate fatalities in 1987. It is possible that this lack of relationship is caused by nothing more than the inherent random variation present in the small counts of the rural Interstate fatality series. In any case the overall fatality series, as well as the economic variables, point to the importance of background conditions, as opposed to a specific factor, in determining the magnitude of changes in rural Interstate fatalities among states.

Table III-7: Total Fatalities per 100 Million Vehicle Miles, 1986
(* indicates no rural Interstate miles or no law change)

State	Fatality Rate
* District of Columbia	1.34
Minnesota	1.69
* Hawaii	1.72
North Dakota	1.78
* Massachusetts	1.84
* Connecticut	1.87
* New Jersey	1.88
Wisconsin	1.94
Washington	1.95
Ohio	2.06
Maine	2.12
Illinois	2.15
South Dakota	2.15
Iowa	2.16
New Hampshire	2.17
* Virginia	2.18
Michigan	2.21
* Maryland	2.23
* New York	2.23
Oklahoma	2.26
* Rhode Island	2.28
Vermont	2.28
Colorado	2.29
Nebraska	2.30
* Delaware	2.36
Texas	2.40
California	2.44
* Pennsylvania	2.44
* Alaska	2.52
Kansas	2.52
Indiana	2.55
Utah	2.59
* Georgia	2.69
Missouri	2.72
Oregon	2.72
Kentucky	2.75
Montana	2.87
Nevada	2.92
Tennessee	3.11
Louisiana	3.12
North Carolina	3.12
Wyoming	3.13
Alabama	3.18
Florida	3.24
Idaho	3.32
West Virginia	3.34
Arkansas	3.43
South Carolina	3.75
New Mexico	3.79
Mississippi	4.01
Arizona	4.43

Results

Table III-8 shows the ranking of the twenty-one states used in this analysis by the magnitude of the increase in rural Interstate fatalities in 1987. The three variables selected from the screening -- the total fatality rate of the state in 1986 and the two economic variables with the highest R-square values (per capita retail sales and the percent of the population living below the poverty level) -- are also listed.

Table III-8: Comparison of States
Ranked by Rural Interstate Fatality Changes
Using Correlated Safety and Economic Variables

State	Percent Change	Fatality Rate	Retail Sales	Poverty Level
Montana	-26.4	2.87	5,759	12.3%
Nevada	-24.6	2.92	7,807	8.7%
Indiana	-19.1	2.55	6,026	9.7%
Colorado	-12.0	2.29	6,822	10.1%
California	6.4	2.44	6,577	11.4%
Tennessee	7.5	3.11	6,003	16.5%
Texas	10.6	2.40	6,198	14.7%
Wyoming	11.7	3.13	7,600	7.9%
Oklahoma	12.0	2.26	5,958	13.4%
Illinois	16.1	2.15	5,721	11.0%
Missouri	18.1	2.72	6,292	12.2%
Washington	19.6	1.95	5,851	9.8%
Florida	21.3	3.24	6,753	13.5%
Alabama	24.8	3.18	4,726	18.9%
Idaho	25.3	3.32	4,981	12.6%
South Carolina	28.9	3.75	5,410	16.6%
New Mexico	35.4	3.79	5,784	17.6%
Utah	36.4	2.59	4,854	10.3%
Arizona	42.0	4.43	5,807	13.2%
Louisiana	43.5	3.12	5,427	18.6%
Mississippi	44.1	4.01	4,657	23.9%

In order to improve the identification of factors associated with the magnitude of fatality change after the speed limit increase, it is necessary to understand the relationships among the most useful variables. The analysis can be improved by combining more than a single explanatory variable only if the variables are not all measuring the same condition in a state -- if the explanatory variables are not actually surrogates for each other.

There are three economic variables that seem to contain information about the effect of the speed limit increase on fatality change. One of these could be combined with the best non-economic variable (overall fatality rate) if the information contained in the variables was not redundant. To evaluate the possible redundancy versus information gain, a line was fit through the fatality rate and each of the three economic variables separately. The results are shown in Table III-9.

Of the three regressions on the overall fatality rate, the percent of the population living below the poverty level and per capita personal income have the best fits. This relationship indicates that states with higher economic conditions have lower total fatality rates.

Table III-9: Relationships between the Fatality Rate and Measures of Economic Conditions in Twenty-One States that Increased the Speed Limit in 1987

Dependent variable: Total fatalities per vehicle miles traveled

		Fit through 1975-1986 Data		
Measure of Economic Conditions	Year	R-square	Coefficient	t-statistic
Population below poverty level	1979	0.32	0.0921	2.98
Per capita personal income	1986	0.29	-0.0002	-1.18
Per capita retail sales	1986	0.07	-0.0002	-1.18

Per capita retail sales is essentially unrelated to the total fatality rate. Combining these two measures should improve the the fit of the regression on rural Interstate fatality changes -- there is little redundancy in the information provided by these variables.

Table III-10 shows the results of using both the total fatality rate and per capita retail sales to model rural Interstate fatality change after the speed limit increased in 1987. The adjusted R-square is 0.43, an increase over this measure of fit resulting from any of the one-variable regressions tested. This indicates that both the economic condition and the total fatality rate are important in understanding differences in the effect of the 65 mph speed limit. These results do not suggest the mechanism of the different fatality effects after raising the rural Interstate speed limit. The variables tested here have some explanatory power in a statistical sense, but do not explain how these state environmental characteristics acted or for what other mechanisms they may be surrogates.

Table III-10: Regression of Standardized Fatality Changes Using the Total Fatality Rate and Retail Sales

Dependent variable: Percent difference between actual and predicted rural Interstate fatalities in twenty-one states

Parameter	Coefficient	t-statistic
Total fatality rate	12.43	2.16
Per capita retail sales	-0.01	-2.79

R-square = 0.48
Adjusted R-Square = 0.43

Appendix IV - Internal and External Comparisons of Rural Interstate Fatalities

Internal Comparisons

After the speed limit increase, there were 1,219 fatalities on rural Interstates posted at 65 mph (Table IV-1). There were also a small number of fatalities reported on rural Interstates posted at 60 mph (13 fatalities), urban Interstates posted at 65 mph (55 fatalities), and non-Interstates reported as having a speed limit of 60 mph (2 fatalities) or 65 mph (26 fatalities).

The change in the national maximum speed limit allowed states to raise speed limits to 65 mph on Interstates through rural and small urban areas. In addition, a federal demonstration project initiated late in 1987 allows up to twenty states to raise speed limits on non-Interstate roads that meet certain Interstate design standards. The fatalities reported on non-Interstate roads with speed limits over 55 mph may have occurred on a demonstration project road or may represent a small number of coding errors.

On rural Interstates, single-vehicle accident fatalities increased more (23 percent) than did multiple-vehicle fatalities (17 percent). The number of fatalities in single-vehicle and in multiple-vehicle urban Interstate accidents declined. There were only small changes on non-Interstate roads (Table IV-2).

Table IV-1: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Speed Limit of the Road on which the Fatality Occurred

	Rural Interstate			Urban Interstate			Non-Interstate		
Speed Limit	1986	1987	Change	1986	1987	Change	1986	1987	Change
Under 55	35	36	3%	111	102	-8%	9,735	9,802	1%
55 mph	1,204	223	-81%	945	793	-16%	10,126	10,102	-0%
60 mph	0	13		0	0		0	2	
65 mph	0	1,219		0	55		0	26	
Unknown	8	21		16	11		433	338	
Total	1,247	1,512	21%	1,072	961	-10%	20,294	20,270	-0%

Table IV-2: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Vehicles Involved in the Accident

	Rural Interstate			Urban Interstate			Non-Interstate		
Vehicles Involved	1986	1987	Change	1986	1987	Change	1986	1987	Change
One	813	1,004	23%	615	596	-3%	11,387	11,161	-2%
Two	346	406	17%	301	262	-13%	7,773	7,940	2%
More	88	102	16%	156	103	-34%	1,134	1,169	3%
Total	1,247	1,512	21%	1,072	961	-10%	20,294	20,270	-0%

Fatalities increased on both straight and curved rural Interstate roads (Table IV-3). The increase was greater on level rural Interstates (27 percent) than on grades (13 percent, from Table IV-4). Both day and night fatalities increased on rural Interstates (Table IV-5).

Table IV-3: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Alignment of the Road on which the Fatality Occurred

Roadway	Rural Interstate			Urban Interstate			Non-Interstate		
Alignment	1986	1987	Change	1986	1987	Change	1986	1987	Change
Straight	1,062	1,284	21%	870	783	-10%	14,560	14,599	0%
Curved	185	226	22%	202	177	-12%	5,681	5,628	-1%
Unknown	0	2		0	1		53	43	
Total	1,247	1,512	21%	1,072	961	-10%	20,294	20,270	-0%

Table IV-4: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Grade of the Road on which the Fatality Occurred

Roadway	Rural Interstate			Urban Interstate			Non-Interstate		
Grade	1986	1987	Change	1986	1987	Change	1986	1987	Change
Level	868	1,101	27%	813	751	-8%	14,835	14,668	-1%
Grade	342	388	13%	236	193	-18%	4,705	4,846	3%
Crest	16	13	-19%	9	9	0%	490	517	6%
Sag	3	2		1	3		53	69	
Unknown	18	8		13	5		211	170	
Total	1,247	1,512	21%	1,072	961	-10%	20,294	20,270	-0%

Table IV-5: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Light Condition under which the Fatality Occurred

Light	Rural Interstate			Urban Interstate			Non-Interstate		
Condition	1986	1987	Change	1986	1987	Change	1986	1987	Change
Daylight	582	709	22%	356	332	-7%	8,986	9,275	3%
Dark	531	672	27%	336	292	-13%	7,341	7,091	-3%
Lighted	65	57	-12%	333	296	-11%	3,090	2,993	-3%
Dawn	47	45	-4%	17	22	29%	287	303	6%
Dusk	20	26	30%	26	12	-54%	524	531	1%
Unknown	2	3		4	7		66	77	
Total	1,247	1,512	21%	1,072	961	-10%	20,294	20,270	-0%

Vehicle Factors:

The largest fatality increases on rural Interstates occurred among occupants of vans and utility vehicles (Table IV-6). Fatalities in vans increased from 68 in 1986 to 104 in 1987 -- an increase of 53 percent on rural Interstates after the speed limit increase (Table IV-6). Van occupant fatalities increased 57 percent (from 21 to 33) on urban Interstates, but by only 2 percent (from 377 to 384) on non-Interstates.

Fatalities in utility vehicles increased by a comparable amount -- from 48 in 1986 to 72 in 1987 (by 50 percent) on rural Interstates. Utility vehicle occupant fatalities decreased (from 29 to 25) on urban Interstates and increased by 2 percent on non-Interstate roads.

Car, motorcycle, and pickup occupant fatalities increased on rural Interstates; they increased less, or decreased, or other roads. Heavy truck occupant fatalities on rural Interstates were essentially unchanged; there were 115 in 1986 and 110 in 1987.

Nonrollovers, first-event rollovers, and subsequent event rollovers all increased by about 20 percent on rural Interstate roads (Table IV-7).

Table IV-6: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Body Type of the Vehicle in which the Fatality Occurred

	Rural Interstate			Urban Interstate			Non-Interstate		
Body Type	1986	1987	Change	1986	1987	Change	1986	1987	Change
Car	642	761	19%	571	463	-19%	10,549	10,568	0%
Motorcycle	35	43	23%	95	70	-26%	2,313	2,103	-9%
Van	68	104	53%	21	33	57%	377	384	2%
Utility	48	72	50%	29	25	-14%	448	454	1%
Pickup	199	236	19%	103	108	5%	2,736	2,974	9%
Heavy truck	115	110	-4%	40	49	23%	375	339	-10%
Other	1	6		0	0		123	160	
Unknown	3	5		2	2		118	90	
Total	1,111	1,337	20%	861	750	-13%	17,039	17,072	0%

Table IV-7: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Rollover Occurrence of the Vehicle in which the Fatality Occurred

	Rural Interstate			Urban Interstate			Non-Interstate		
Rollover	1986	1987	Change	1986	1987	Change	1986	1987	Change
No rollover	547	655	20%	578	477	-17%	12,420	12,283	-1%
Rollover:									
First event	319	384	20%	86	99	15%	1,884	1,988	6%
Subsequent	245	298	22%	197	174	-12%	2,735	2,801	2%
Total	1,111	1,337	20%	861	750	-13%	17,039	17,072	0%

Very few rural Interstate fatalities were occupants of articulated vehicles. However, the incidence of vehicle jackknife increased from 6 in 1986 to 22 in 1987 after the speed limit increase. Fatalities in jackknifed vehicles decreased on other roads. However, these small numbers are subject to large random year-to-year fluctuations (Table IV-8).

There were a larger number of occupant fatalities on rural Interstates after the speed limit increase in each of the four impact types used by FARS. There were more occupant fatalities in noncollisions, in striking vehicles, in struck vehicles, and in vehicles involved as both striking and struck unit (Table IV-9) after the speed limit increase in 1987 than on the same days in 1986.

Table IV-8: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Jackknife Occurrence of the Vehicle in which the Fatality Occurred

	Rural Interstate			Urban Interstate			Non-Interstate		
Jackknife	1986	1987	Change	1986	1987	Change	1986	1987	Change
Not applicable	1,016	1,245	23%	836	710	-15%	16,847	16,857	0%
Applicable:									
No jackknife	89	70	-21%	15	35	133%	160	193	21%
Jackknife:									
First event	2	10	400%	3	0	-100%	12	8	-33%
Subsequent	4	12	200%	7	5	-29%	20	14	-30%
Total	1,111	1,337	20%	861	750	-13%	17,039	17,072	0%

Table IV-9: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Impact Type of the Vehicle in which the Fatality Occurred

	Rural Interstate			Urban Interstate			Non-Interstate		
Impact Type	1986	1987	Change	1986	1987	Change	1986	1987	Change
Noncollision	319	398	25%	132	114	-14%	2,353	2,528	7%
Striking	663	781	18%	562	488	-13%	11,489	11,228	-2%
Struck	103	121	17%	112	99	-12%	2,823	2,957	5%
Both	24	37	54%	52	48	-8%	367	342	-7%
Unknown	2	0		3	1		7	17	
Total	1,111	1,337	20%	861	750	-13%	17,039	17,072	0%

Police-reported travel speed is available on the FARS file for about half the vehicle occupant fatalities. The accuracy of these data is not known. However, they may be useful in pointing to changes in police perceptions of speed in these accidents. The largest increase in reported travel speed on rural Interstate roads was in the range 61 to 65 mph (Table IV-10). Reported fatalities in vehicles in this speed range increased from 84 in 1986 to 226 in 1987 -- an increase of 169 percent.

These speeds were legal for most of the 1987 rural Interstate fatalities in this table. The police may also have been more willing to report speeds in this range once they were legal. However, the police also reported more fatalities in vehicles traveling at these speeds on urban Interstate and non-Interstate roads, where these speeds were not, in general, legal.

Table IV-10: Fatalities After the Speed Limit Increase
from the Day of the Increase through December 31
-- Travel Speed of the Vehicle in which the Fatality Occurred

	Rural Interstate			Urban Interstate			Non-Interstate		
Travel Speed	1986	1987	Change	1986	1987	Change	1986	1987	Change
Stopped	16	10	-38%	27	13	-52%	95	114	20%
Up to 55 mph	279	136	-51%	172	146	-15%	4,443	4,677	5%
56 to 60 mph	71	121	70%	42	37	-12%	571	560	-2%
61 to 65 mph	84	226	169%	24	40	67%	447	527	18%
66 to 70 mph	57	97	70%	26	28	8%	536	447	-17%
Over 70 mph	105	127	21%	65	60	-8%	882	992	12%
Unknown	499	620		505	426		10,065	9,755	
Total	1,111	1,337	20%	861	750	-13%	17,039	17,072	0%

Fatality Factors:

Fatalities on rural Interstates increased among people of all ages after the speed limit increase, but the biggest increase was among very young children (Table IV-11). In 1986 there were 22 children under age five killed on rural Interstates during the days covered here, and 45 in 1987. These numbers are small, and hence subject to year-to-year variation. The number of young children killed on urban Interstates and non-Interstates decreased on these days.

Fatalities aged five through fourteen also increased more than older fatalities. There were 41 older child fatalities in 1986 and 58 in 1987 (a 41 percent increase). Fatalities in this age group decreased on urban Interstates and increased by 7 percent on non-Interstates. Again, these are small numbers, subject to random fluctuations. But taken together, fatalities of all children under fifteen years old increased from 63 to 103 (a 63 percent increase), and this increase should be analyzed more carefully. Since these are below driving age, however, any relationship to the increased speed limit is not obvious. Possible reasons for the 1987 increase are random fluctuations and increased young children occupancy.

Table IV-11: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Age of the Fatality

	Rural Interstate			Urban Interstate			Non-Interstate		
Age	1986	1987	Change	1986	1987	Change	1986	1987	Change
Under 5	22	45	105%	19	15	-21%	462	447	-3%
5 to 14	41	58	41%	24	14	-42%	992	1,064	7%
15 to 24	346	389	12%	315	280	-11%	6,756	6,302	-7%
25 to 44	463	568	23%	466	412	-12%	6,845	6,919	1%
45 to 64	214	277	29%	144	153	6%	2,653	2,840	7%
Over 64	150	164	9%	84	76	-10%	2,487	2,638	6%
Unknown	11	11		20	11		99	60	
Total	1,247	1,512	21%	1,072	961	-10%	20,294	20,270	-0%

Both male and female fatalities increased on rural Interstate roads after the speed limit change, but male fatalities increased slightly more (Table IV-12). In contrast, male non-Interstate fatalities decreased 2 percent while female non-Interstate fatalities increased 5 percent.

Driver, passenger, and pedestrian fatalities increased on rural Interstates after the speed limit increase (Table IV-13). The passenger fatality increase was larger (27 percent) than the driver fatality increase (16 percent) on rural Interstates. In contrast, passenger fatalities decreased more than driver fatalities on urban Interstates, and neither changed on non-Interstates. This is consistent with the particularly large fatality increases among children under fifteen years old (who are usually passengers) shown in Table IV-11.

The number of other nonmotorist fatalities (nonmotorists other than pedestrians and bicyclists) increased from 3 to 23. Most of these (2 in 1986 and 22 in 1987) were occupants of motor vehicles not in transport. That is, after the speed limit increase there were many more fatalities in vehicles parked on the rural Interstate. Again, these are small numbers, subject to random year-to-year fluctuations.

Table IV-12: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Gender of the Fatality

	Rural Interstate			Urban Interstate			Non-Interstate		
Gender	1986	1987	Change	1986	1987	Change	1986	1987	Change
Male	864	1,059	23%	810	726	-10%	14,489	14,188	-2%
Female	379	452	19%	260	235	-10%	5,790	6,074	5%
Unknown	4	1		2	0		15	8	
Total	1,247	1,512	21%	1,072	961	-10%	20,294	20,270	-0%

Table IV-13: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Person Type of the Fatality

	Rural Interstate			Urban Interstate			Non-Interstate		
Person Type	1986	1987	Change	1986	1987	Change	1986	1987	Change
Motorist:									
Driver	694	802	16%	596	559	-6%	11,836	11,879	0%
Passenger	417	531	27%	257	190	-26%	5,154	5,140	-0%
Unknown	0	4		8	1		49	53	
Nonmotorist:									
Pedestrian	127	148	17%	199	204	3%	2,755	2,673	-3%
Cyclist	6	4	-33%	6	1	-83%	450	484	8%
Other	3	23	667%	6	6	0%	50	41	-18%
Total	1,247	1,512	21%	1,072	961	-10%	20,294	20,270	-0%

The number of ejected occupants (especially those partially ejected) increased more than did the number of nonejected occupant fatalities on rural Interstates (Table IV-14).

Table IV-14: Fatalities After the Speed Limit Increase from the Day of the Increase through December 31 -- Ejection Status of the Fatality

	Rural Interstate			Urban Interstate			Non-Interstate		
Ejection	1986	1987	Change	1986	1987	Change	1986	1987	Change
Nonmotorist	136	175	29%	211	211	0%	3,255	3,198	-2%
Not ejected	658	734	12%	628	496	-21%	12,634	12,527	-1%
Ejected:									
Totally	409	526	29%	194	219	13%	3,541	3,658	3%
Partially	36	66	83%	35	32	-9%	760	792	4%
Unknown	8	11		4	3		104	95	
Total	1,247	1,512	21%	1,072	961	-10%	20,294	20,270	-0%

External Comparisons

From June through December 1987 there were 948 rural Interstate fatalities on roads posted at 65 mph in the first twenty-eight states to raise the speed limit. Sixteen percent of rural Interstate fatalities in these states in 1987 were reported on roads with speed limits of 55 mph or less. The data are shown in Table IV-15.

Single-vehicle fatalities increased 22 percent in the first states to raise the speed limit, but were essentially unchanged in the other two groups of states (Table IV-16). Differences among the three groups of states may reflect differences in their economies, geography, or demographics. It is difficult to interpret observed differences in roadway alignment (Table IV-17), roadway grade (Table IV-18), or light condition (Table IV-19) because fatalities in these states do not track well with each other historically.

Table IV-15: Rural Interstate Fatalities, June through December -- Speed Limit of the Road on which the Fatality Occurred

	By June 1, 1987			Later in 1987			Not in 1987		
Speed Limit	1986	1987	Change	1986	1987	Change	1986	1987	Change
Under 55	29	29	0%	2	4	100%	6	11	83%
55 mph	950	154	-84%	205	91	-56%	190	197	4%
60 mph	0	7		0	6		0	0	
65 mph	0	948		0	162		0	0	
Unknown	7	18		3	0		1	3	
Total	986	1,156	17%	210	263	25%	197	211	7%

Table IV-16: Rural Interstate Fatalities, June through December -- Vehicles Involved in the Accident

	By June 1, 1987			Later in 1987			Not in 1987		
Vehicles Involved	1986	1987	Change	1986	1987	Change	1986	1987	Change
One	630	770	22%	142	144	1%	129	127	-2%
Two	284	309	9%	55	91	65%	56	69	23%
More	72	77	7%	13	28	115%	12	15	25%
Total	986	1,156	17%	210	263	25%	197	211	7%

Table IV-17: Rural Interstate Fatalities, June through December
-- Alignment of the Road on which the Fatality Occurred

Roadway Alignment	By June 1, 1987			Later in 1987			Not in 1987		
	1986	1987	Change	1986	1987	Change	1986	1987	Change
Straight	843	980	16%	179	223	25%	152	176	16%
Curved	143	174	22%	31	40	29%	43	35	-19%
Unknown	0	2		0	0		2	0	
Total	986	1,156	17%	210	263	25%	197	211	7%

Table IV-18: Rural Interstate Fatalities, June through December
-- Grade of the Road on which the Fatality Occurred

Roadway Grade	By June 1, 1987			Later in 1987			Not in 1987		
	1986	1987	Change	1986	1987	Change	1986	1987	Change
Level	693	863	25%	150	173	15%	110	125	14%
Grade	266	277	4%	56	83	48%	83	82	-1%
Crest	13	7	-46%	3	5	67%	2	3	50%
Sag	3	1		0	1		0	0	
Unknown	11	8		1	1		2	1	
Total	986	1,156	17%	210	263	25%	197	211	7%

Table IV-19: Rural Interstate Fatalities, June through December
-- Light Condition under which the Fatality Occurred

Light Condition	By June 1, 1987			Later in 1987			Not in 1987		
	1986	1987	Change	1986	1987	Change	1986	1987	Change
Daylight	458	539	18%	111	127	14%	92	108	17%
Dark	414	514	24%	86	114	33%	95	85	-11%
Lighted	55	44	-20%	3	10	233%	4	7	75%
Dawn	41	36	-12%	7	9	29%	5	7	40%
Dusk	16	20	25%	3	3	0%	0	2	
Unknown	2	3		0	0		1	2	
Total	986	1,156	17%	210	263	25%	197	211	7%

Vehicle Factors:

Car occupant fatalities on rural Interstates increased by comparable amounts in all three groups of states (between 15 and 18 percent). Pickup, van, and utility vehicle occupant fatalities increased by more in states that implemented speed limit increases later; but the small numbers preclude firm conclusions on the data. In the first twenty-eight states that raised the speed limit, only heavy truck fatalities decreased. The data are shown in Table IV-20.

Rollover fatalities during June through December increased more than did nonrollover fatalities for the first twenty-eight states to raise the speed limit (Table IV-21). This was not the case for the other two groups of states.

Table IV-20: Rural Interstate Fatalities, June through December -- Body Type of the Vehicle in which the Fatality Occurred

	By June 1, 1987			Later in 1987			Not in 1987		
Body Type	1986	1987	Change	1986	1987	Change	1986	1987	Change
Car	495	585	18%	116	136	17%	105	121	15%
Motorcycle	25	31	24%	8	8	0%	3	5	67%
Van	55	72	31%	11	20	82%	12	9	-25%
Utility	45	54	20%	2	6	200%	3	9	200%
Pickup	160	195	22%	17	31	82%	27	13	-52%
Heavy truck	91	81	-11%	25	23	-8%	22	34	55%
Other	1	4		0	1		0	0	
Unknown	0	3		3	2		0	0	
Total	872	1,025	18%	182	227	25%	172	191	11%

Table IV-21: Rural Interstate Fatalities, June through December -- Rollover Occurrence of the Vehicle in which the Fatality Occurred

	By June 1, 1987			Later in 1987			Not in 1987		
Rollover	1986	1987	Change	1986	1987	Change	1986	1987	Change
No rollover	431	486	13%	104	141	36%	98	114	16%
Rollover:									
First event	261	313	20%	37	39	5%	23	24	4%
Subsequent	180	226	26%	41	47	15%	51	53	4%
Total	872	1,025	18%	182	227	25%	172	191	11%

There was an increase in fatalities among occupants of trucks that jackknifed, despite a decrease in heavy truck occupant fatalities (Table IV-22). This increase was limited to the group of states that first implemented the higher speed limit, and the numbers are small.

The number of vehicles reported to have both been a striking vehicle and to have been struck by another vehicle increased more than did either noncollision, striking only, or struck only involvements (Table IV-23).

Table IV-22: Rural Interstate Fatalities, June through December -- Jackknife Occurrence of the Vehicle in which the Fatality Occurred

	By June 1, 1987			Later in 1987			Not in 1987		
Jackknife	1986	1987	Change	1986	1987	Change	1986	1987	Change
Not applicable	798	955	20%	160	210	31%	154	160	4%
Applicable:									
No jackknife	70	53	-24%	19	13	-32%	16	30	88%
Jackknife:									
First event	1	8		1	1		0	0	
Subsequent	3	9		2	3		2	1	
Total	872	1,025	18%	182	227	25%	172	191	11%

Table IV-23: Rural Interstate Fatalities, June through December -- Impact Type of the Vehicle in which the Fatality Occurred

	By June 1, 1987			Later in 1987			Not in 1987		
Impact Type	1986	1987	Change	1986	1987	Change	1986	1987	Change
Noncollision	256	311	21%	50	54	8%	24	25	4%
Striking	512	592	16%	114	143	25%	124	144	16%
Struck	85	88	4%	15	28	87%	20	14	-30%
Both	18	34	89%	2	2	0%	4	8	100%
Unknown	1	0		1	0		0	0	
Total	872	1,025	18%	182	227	25%	172	191	11%

There were large increases in occupant fatalities in vehicles reported to have been traveling over 55 mph on rural Interstates in states that raised the speed limit in 1987 (Table IV-24).

In states that raised the speed limit during 1987, fatalities in vehicles reported to have been traveling less than the speed limit greatly increased (Table IV-25). Fatalities in vehicles reported to have been traveling more than 15 mph over the limit decreased in these states.

Table IV-24: Rural Interstate Fatalities, June through December -- Travel Speed of the Vehicle in which the Fatality Occurred

	By June 1, 1987			Later in 1987			Not in 1987		
Travel Speed	1986	1987	Change	1986	1987	Change	1986	1987	Change
Stopped	10	7		6	3		2	3	
Up to 55 mph	200	95	-53%	60	47	-22%	53	63	19%
56 to 60 mph	53	92	74%	9	26	189%	9	10	11%
61 to 65 mph	72	155	115%	10	47	370%	19	8	-58%
66 to 70 mph	42	70	67%	9	14	56%	8	7	-13%
Over 70 mph	81	91	12%	17	23	35%	14	17	21%
Unknown	414	515	24%	71	67	-6%	67	83	24%
Total	872	1,025	18%	182	227	25%	172	191	11%

Table IV-25: Rural Interstate Fatalities, June through December -- Speeding of the Vehicle in which the Fatality Occurred

	By June 1, 1987			Later in 1987			Not in 1987		
Speeding	1986	1987	Change	1986	1987	Change	1986	1987	Change
Less than limit	70	170	143%	19	58	205%	11	20	82%
At limit	136	146	7%	47	52	11%	42	42	0%
Over limit:									
1 to 4 mph	10	16	60%	2	3	50%	2	3	50%
5 to 14 mph	122	90	-26%	17	27	59%	26	18	-31%
By more	120	80	-33%	26	20	-23%	24	25	4%
Unknown	414	523		41	67		67	83	
Total	872	1,025	18%	182	227	25%	172	191	11%

Fatality Factors:

While fatalities in all age groups increased in states with the earliest speed limit increase, the changes in states with a later speed limit increase (or that did not increase the speed limit) were mixed (Table IV-26). This may have been an effect of the smaller numbers involved.

During the seven months of this comparison, male fatalities increased more than did female fatalities in states that raised the speed limit, but not in other states (Table IV-27).

Table IV-26: Rural Interstate Fatalities, June through December -- Age of the Fatality

	By June 1, 1987			Later in 1987			Not in 1987		
Age	1986	1987	Change	1986	1987	Change	1986	1987	Change
Under 5	19	42	121%	4	2	-50%	5	6	20%
5 to 14	37	43	16%	6	10	67%	6	4	-33%
15 to 24	273	303	11%	56	50	-11%	43	50	16%
25 to 44	360	440	22%	83	99	19%	70	86	23%
45 to 64	174	202	16%	33	62	88%	46	34	-26%
Over 64	112	118	5%	28	37	32%	26	28	8%
Unknown	11	8		0	3		1	3	
Total	986	1,156	17%	210	263	25%	197	211	7%

Table IV-27: Rural Interstate Fatalities, June through December -- Gender of the Fatality

	By June 1, 1987			Later in 1987			Not in 1987		
Gender	1986	1987	Change	1986	1987	Change	1986	1987	Change
Male	681	823	21%	141	182	29%	137	143	4%
Female	301	333	11%	69	80	16%	60	68	13%
Unknown	4	0		0	1		0	0	
Total	986	1,156	17%	210	263	25%	197	211	7%

Passenger fatalities increased more than did driver fatalities in states that raised the speed limit, but not in states that retained the 55 mph speed limit (Table IV-28).

The large increase in partially and totally ejected occupants in states that increased the speed limit by June 1, 1987 was not matched by similar increases in other states (Table IV-29).

Table IV-28: Rural Interstate Fatalities, June through December -- Person Type of the Fatality

	By June 1, 1987			Later in 1987			Not in 1987		
Person Type	1986	1987	Change	1986	1987	Change	1986	1987	Change
Motorist:									
Driver	536	615	15%	125	145	16%	103	124	20%
Passenger	336	406	21%	57	82	44%	67	67	0%
Unknown	0	4		0	0		2	0	
Nonmotorist:									
Pedestrian	106	106	0%	21	33	57%	23	19	-17%
Cyclist	5	4		1	0		0	0	
Other	3	21		6	3		2	1	
Total	986	1,156	17%	210	263	25%	197	211	7%

Table IV-29: Rural Interstate Fatalities, June through December -- Ejection Status of the Fatality

	By June 1, 1987			Later in 1987			Not in 1987		
Ejection	1986	1987	Change	1986	1987	Change	1986	1987	Change
Nonmotorist	114	131	15%	28	36	29%	25	20	-20%
Not ejected	510	548	7%	120	161	34%	108	125	16%
Ejected:									
Totally	330	420	27%	53	56	6%	59	62	5%
Partially	24	52	117%	8	9	13%	3	3	0%
Unknown	8	5		1	1		2	1	
Total	986	1,156	17%	210	263	25%	197	211	7%

Complicating Changes

The effects of several complicating factors that reflect how people use the roads can be explored through the fatal accident data. A review of the data does not reveal any factor that can explain the rural Interstate fatality increase.

Changes in road construction and maintenance patterns do not appear to explain the fatality increase on rural Interstate roads. There were 70 fatalities in work zones after the speed limit increase in 1987, as compared to 63 fatalities on the same days of the previous year (Table IV-30). This increase (11 percent) is about half the increase (22 percent) experienced outside work zones. In each year, about 95 percent of rural Interstate fatalities occurred outside work zones.

The police reported the same alcohol involvement in 1986 (32.8 percent) as in 1987 (32.1 percent), Table IV-31.

Table IV-30: Rural Interstate Fatalities after the Speed Limit Increase by Whether in a Construction or Maintenance Zone

Work Zone	1986		1987	
No	1,184	(94.9%)	1,442	(95.4%)
Yes:				
Construction	53	(4.3%)	60	(4.0%)
Maintenance	6	(0.5%)	4	(0.3%)
Utility	0	(0.0%)	1	(0.1%)
Unknown Which	4	(0.3%)	5	(0.3%)
Total	1,247	(100.0%)	1,512	(100.0%)

Table IV-31: Rural Interstate Fatalities after the Speed Limit Increase by Police-Reported Alcohol Involvement

Number of Drinking Drivers in Accident	1986		1987	
None reported	838	(67.2%)	1,026	(67.9%)
Some reported:				
One driver	390	(31.3%)	465	(30.8%)
Two drivers	14	(1.1%)	21	(1.4%)
Three drivers	5	(0.4%)	0	(0.0%)
Total	1,247	(100.0%)	1,512	(100.0%)

There was little change in the relative frequency of fatalities in good or bad weather (Table IV-32), in accidents with hit-and-involvement (Table IV-33), or in vehicles carrying hazardous cargo (Table IV-34).

Table IV-32: Rural Interstate Fatalities after the Speed Limit Increase by Weather

Weather	1986		1987	
Normal	1,123	(90.1%)	1,355	(89.6%)
Rain	82	(6.6%)	98	(6.5%)
Sleet	3	(0.2%)	1	(0.1%)
Snow	9	(0.7%)	22	(1.5%)
Fog	21	(1.7%)	22	(1.5%)
Rain/fog	2	(0.2%)	2	(0.1%)
Other	5	(0.4%)	9	(0.6%)
Unknown	2	(0.2%)	3	(0.2%)
Total	1,247	(100.0%)	1,512	(100.0%)

Table IV-33: Rural Interstate Fatalities after the Speed Limit Increase by Hit-and-Run Involvement

Hit-and-Run in Accident	1986		1987	
No	1,210	(97.0%)	1,486	(98.3%)
Yes:				
Vehicle in transport	15	(1.2%)	5	(0.3%)
Pedestrian/nonmotorist	20	(1.6%)	20	(1.3%)
Parked vehicle/object	2	(0.2%)	1	(0.1%)
Total	1,247	(100.0%)	1,512	(100.0%)

Table IV-34: Rural Interstate Fatalities after the Speed Limit Increase by Hazardous Cargo, for Occupant Fatalities

Hazardous Cargo	1986		1987	
No	1,097	(99.5%)	1,322	(99.5%)
Yes	6	(0.5%)	7	(0.5%)
Unknown	8		8	
Total	1,111	(100.0%)	1,337	(100.0%)

Table IV-35 shows small changes in fatalities by day of week -- there were relatively more weekday fatalities after the speed limit increase. There were also only small changes by month (Table IV-36). There were more fatalities in later months (in each year). Some of the monthly differences are caused by factors such as the number of weekend days in a month or weather.

Table IV-35: Rural Interstate Fatalities after the Speed Limit Increase by Day of Week

Day of Week	1986		1987	
Sunday	216	(17.3%)	250	(16.5%)
Monday	159	(12.8%)	179	(11.8%)
Tuesday	144	(11.5%)	196	(13.0%)
Wednesday	157	(12.6%)	189	(12.5%)
Thursday	132	(10.6%)	182	(12.0%)
Friday	196	(15.7%)	225	(14.9%)
Saturday	243	(19.5%)	291	(19.2%)
Total	1,247	(100.0%)	1,512	(100.0%)

Table IV-36: Rural Interstate Fatalities after the Speed Limit Increase by Month

Month	1986		1987	
April	28	(2.2%)	25	(1.7%)
May	104	(8.3%)	135	(8.9%)
June	128	(10.3%)	184	(12.2%)
July	184	(14.8%)	216	(14.3%)
August	206	(16.5%)	223	(14.7%)
September	142	(11.4%)	202	(13.4%)
October	145	(11.6%)	184	(12.2%)
November	147	(11.8%)	183	(12.1%)
December	163	(13.1%)	160	(10.6%)
Total	1,247	(100.0%)	1,512	(100.0%)

Table IV-37 allows more detailed comparisons of occupant fatality changes by victim age and vehicle body type. The large increase among young children (under five years old) occurred evenly across each of the vehicle body types presented here -- young child fatalities doubled in cars, vans, utility vehicles, and pickup trucks.

Table IV-37: Rural Interstate Fatalities after the Speed Limit Increase by Victim Age and Body Type, for Vehicle Occupants

1986 Occupants	Under 5	5-14	15-24	25-44	45-64	Over 64	Unknown	Total
Car	12	23	193	203	104	106	1	642
Motorcycle	0	1	10	19	3	2	0	35
Van	2	3	15	23	18	7	0	68
Utility	3	3	12	20	8	2	0	48
Pickup	4	7	61	77	30	16	4	199
Heavy truck	0	2	14	64	30	4	1	115
Other	0	0	0	0	1	0	0	1
Unknown	0	0	0	2	0	1	0	3
Total Occupants	21	39	305	408	194	138	6	1,111

1987 Occupants	Under 5	5-14	15-24	25-44	45-64	Over 64	Unknown	Total
Car	22	32	227	252	124	100	4	761
Motorcycle	0	0	15	22	5	1	0	43
Van	5	6	8	35	26	23	1	104
Utility	6	5	18	37	6	0	0	72
Pickup	8	7	68	87	41	23	2	236
Heavy truck	1	0	15	59	34	1	0	110
Other	0	0	0	1	2	3	0	6
Unknown	1	1	1	1	1	0	0	5
Total Occupants	43	51	352	494	239	151	7	1,337

1986 to 1987 Fatality Change	Under 5	5-14	15-24	25-44	45-64	Over 64	Unknown	Total
Car	10	9	34	49	20	-6	3	119
Motorcycle	0	-1	5	3	2	-1	0	8
Van	3	3	-7	12	8	16	1	36
Utility	3	2	6	17	-2	-2	0	24
Pickup	4	0	7	10	11	7	-2	37
Heavy truck	1	-2	1	-5	4	-3	-1	-5
Other	0	0	0	1	1	3	0	5
Unknown	1	1	1	-1	1	-1	0	2
Total Occupants	22	12	47	86	45	13	1	226

Table IV-38 shows restraint use by age of the occupant fatality. Among young children (under five years old) unrestrained fatalities increased from 14 to 33; fatalities in child seats increased from 4 to 7. In each case, fatalities approximately doubled. Increases in the number of older fatalities reported to have been belted reflect both increased belt use (with wider public acceptance of seat belts) and more-complete restraint use reporting by the police.

Table IV-38: Rural Interstate Fatalities after the Speed Limit Increase by Victim Age and Restraint Use, for Vehicle Occupants

1986 Occupants	Under 5	5-14	15-24	25-44	45-64	Over 64	Unknown	Total
Unrestrained	14	30	240	290	131	79	5	789
Shoulder belt	0	0	0	0	0	1	0	1
Lap belt	0	1	3	10	6	6	0	26
Lap and shoulder belt	2	2	26	33	18	25	0	106
Child safety seat	4	0	0	0	0	0	0	4
Motorcycle helmet	0	0	6	9	1	1	0	17
Unknown type	1	1	4	7	8	8	0	29
Unknown if restrained	0	5	26	59	30	18	1	139
Total Occupants	21	39	305	408	194	138	6	1,111

1987 Occupants	Under 5	5-14	15-24	25-44	45-64	Over 64	Unknown	Total
Unrestrained	33	32	264	380	168	97	6	980
Shoulder belt	0	0	0	1	0	0	0	1
Lap belt	0	9	7	13	8	7	0	44
Lap and shoulder belt	1	3	43	37	30	31	0	145
Child safety seat	7	0	0	0	0	0	0	7
Motorcycle helmet	0	0	6	7	5	1	0	19
Unknown type	1	1	10	15	9	4	0	40
Unknown if restrained	1	6	22	41	19	11	1	101
Total Occupants	43	51	352	494	239	151	7	1,337

1986 to 1987 Fatality Change	Under 5	5-14	15-24	25-44	45-64	Over 64	Unknown	Total
Unrestrained	19	2	24	90	37	18	1	191
Shoulder belt	0	0	0	1	0	-1	0	0
Lap belt	0	8	4	3	2	1	0	18
Lap and shoulder belt	-1	1	17	4	12	6	0	39
Child safety seat	3	0	0	0	0	0	0	3
Motorcycle helmet	0	0	0	-2	4	0	0	2
Unknown type	0	0	6	8	1	-4	0	11
Unknown if restrained	1	1	-4	-18	-11	-7	0	-38
Total Occupants	22	12	47	86	45	13	1	226

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