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The Impact of the 65 mph Speed Limit on Virginia's Rural Interstate Highways Through 1990

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Abstract

In April of 1987, Congress passed the Surface Transportation and Uniform Relocation Assistance Act (STURAA), which permitted states to raise their maximum speed limit on rural interstate highways (rural interstates) to 65 mph. Virginia's 65 mph speed limit went into effect July 1, 1988, for passenger vehicles and on July 1, 1989, for commercial buses. This report is the fourth in a series of reports to examine the 65 mph speed limit in Virginia and summarizes 30 months of experience with the 65 mph speed limit.

Following the implementation of the 65 mph speed limit, average and 85th percentile speeds increased on Virginia's rural interstates, and fatal crashes and fatalities increased significantly. On Virginia's urban interstates, on which the speed limit remained at 55 mph, there was a smaller increase in average and 85th percentile speeds, but there was not a significant increase in fatal crashes or fatalities. National data show a substantial increase in rural interstate fatalities in states that increased the rural interstate speed limit to 65 mph and a decrease in states that maintained a 55 mph speed limit.

The data in this report clearly show that speeds, fatal crashes, and fatalities increased on Virginia's rural interstates after the implementation of the 65 mph speed limit. However, these data do not reflect causation. It is possible that factors other than the change in the speed limit—such as changes in traffic volumes, trip patterns, or trip purposes—are responsible for part or all of the increase in fatal crashes and fatalities. Causative issues will be addressed in the final report in this series, to be published in 1993.

THE IMPACT OF THE 65 MPH SPEED LIMIT ON VIRGINIA'S RURAL INTERSTATE HIGHWAYS THROUGH 1990

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(The opinions, findings, and conclusions expressed in this report are those of the authors and not necessarily those of the sponsoring agencies.)

Virginia Transportation Research Council
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Introduction

In April of 1987, Congress passed the Surface Transportation and Uniform Relocation Assistance Act (STURAA), which permitted states to raise their maximum speed limit on rural interstate highways (rural interstates) to 65 mph. Virginia's 65 mph speed limit went into effect on July 1, 1988, for passenger vehicles and on July 1, 1989, for commercial buses. This report is the fourth in a series of reports to examine the impact of the 65 mph speed limit in Virginia and summarizes 30 months of experience with the 65 mph speed limit.

Summary of Findings

Average and 85th Percentile Speeds

- Comparing the average speed on Virginia's rural interstates pre-65 with the average post-65, average speed increased 5.9 mph (from 58.6 mph to 64.5 mph). At the same time, the 85th percentile speed increased 6.9 mph (from 64.2 mph to 71.1 mph).
- Over the same time period, the average speed on Virginia's urban interstates increased 3.8 mph (from 54.3 mph to 58.1 mph), and the 85th percentile speed increased 4.2 mph (from 62.0 mph to 66.2 mph).

Fatal Crashes and Fatalities

- In states that retained a 55 mph speed limit for rural interstates (55 mph states), rural interstate fatalities decreased 12.1% between 1986 and 1989, compared to an increase of 33.0% for states that changed to a 65 mph speed limit for rural interstates (65 mph states). For the same time period, fatalities on Virginia's rural interstates increased by 42.2%.
- Fatalities on urban interstates in 55 mph states increased by 13.1%, substantially more than the 1.0% increase in 65 mph states. Virginia fell between these two national averages, with an increase of 8.9%.
- Fatal crashes on Virginia's rural interstates increased by 23.2 per year to 66.5 post-65, and fatalities increased by 26.8 per year to 76.5.
- Fatal crashes on Virginia's urban interstates increased by 1.8 per year to 39.5, and fatalities increased by 2.0 per year to 44.0.

Crash Characteristics and Configuration

- On Virginia's rural interstates, the mean speed for trucks increased by 2.1 mph between 1987 and 1990. During the same period, truck speed variance increased by 2.0. Truck collisions decreased by 25 between 1987 and 1990, and truck crashes were no more severe.
- For passenger vehicles on Virginia's rural interstates, the mean speed increased by 7.1 mph and speed variance decreased by 4.1. Collisions increased by 135 between 1987 and 1990, and crashes were no more severe.
- The mean speed for all vehicles on Virginia's rural interstates increased by 5.2 mph post-65, and overall speed variance increased by 9.4. Passenger vehicle/truck collisions decreased by 127 between 1987 and 1990, and crashes in general were no more severe.
- Single passenger vehicle crashes increased on Virginia's rural interstates by 345 between 1987 and 1990, but single truck crashes decreased by 77.
- On Virginia's rural interstates, there was an increase of 8.5 fatal crashes per year involving trucks post-65. Sideswipe, wrong-way, rear-end, alcohol-related, and speeding-related crashes also increased; however, pedestrian crashes decreased.
- On Virginia's urban interstates, truck crashes decreased as did pedestrian crashes. Sideswipe, wrong-way, rear-end, alcohol-related, and speeding-related crashes increased modestly.
- On Virginia's rural interstates, ROR-right fatal crashes increased by 4.3 per year and ROR-left fatal crashes increased by 19.2 per year. There was no corresponding increase in ROR fatal crashes on urban interstates.

Conclusions

The data in this report clearly show that speeds, fatal crashes, and fatalities increased on Virginia's rural interstates after the implementation of the 65 mph speed limit. However, these data do not reflect causation. It is possible that factors other than the change in the speed limit—such as changes in traffic volumes, trip patterns, or trip purposes—are responsible for part or all of the increase in fatal crashes and fatalities. Causative issues will be addressed in the final report in this series, to be published in 1993.

THE IMPACT OF THE 65 MPH SPEED LIMIT ON VIRGINIA'S RURAL INTERSTATE HIGHWAYS THROUGH 1990

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INTRODUCTION

In April 1987, Congress passed the Surface Transportation and Uniform Relocation Assistance Act (STURAA), which included a provision to allow states to increase the speed limit on rural interstate highways (rural interstates) to 65 mph. Although a higher speed limit had once been common for interstate and other highways, the OPEC oil embargo that began in 1973 prompted Congress to establish the 55 mph national maximum speed limit (NMSL) for all highways as a national energy conservation measure. After the establishment of the 55 mph NMSL, there was a substantial decrease in fatalities resulting from crashes on the nation's highways. Thus, even after an adequate energy supply had been reestablished, the 55 mph NMSL was maintained, at least in part, as a life-saving strategy.

In the 1980s, however, as oil supplies continued to grow and the price of fuel dropped, public pressure began to mount to abolish or raise the 55 mph NMSL. Further, a number of states were concerned that some of their highway funds were in jeopardy because the federal speed compliance monitoring program mandated that states maintain a minimum level of 50% compliance with the 55 mph NMSL or have up to 10% of their federal-aid highway funds impounded.

STURAA addressed the public's desire for a higher speed limit and returned some authority to the states for setting speed limits. In addition, STURAA allowed the removal of rural interstates, which had the lowest level of compliance with the 55 mph NMSL, from the federal speed compliance monitoring program if the speed limit was raised to 60 mph or 65 mph. Moreover, STURAA preserved much of the life-saving benefits of the 55 mph NMSL by limiting the higher speed limits to rural interstates, on which the accident, injury, and fatality rates had historically been among the lowest for all road types.

Many of the arguments put forth against the higher speed limit authorized in the STURAA are drawn from what is considered by the public to be "common knowledge." It is assumed that there will be fewer crashes if vehicles travel at slower speeds. In essence, common knowledge tells us that "speed kills." Many point to the establishment of the 55 mph NMSL in 1973 and conclude that crashes will decrease dramatically if travel speeds are reduced. Further, it seems intuitively correct that a speed limit differential in which a truck speed limit is lower than a passenger vehicle limit will also reduce crashes. The assumption is that trucks are inherently more hazardous than other vehicles and therefore require a lower speed limit to reduce the potential for crashes to occur.

The idea that trucks are less safe is, in part, based on a recognition of the obvious differences between the characteristics of trucks and smaller passenger vehicles. Due to the greater weight of trucks, the severity of their crashes tends to be greater than that of crashes involving passenger cars only. Trucks also have slower rates of acceleration and deceleration than smaller vehicles. In addition, it is generally assumed that trucks tend to exceed the maximum speed limit more often and by more than passenger vehicles, making them more in need of speed regulation. From a purely common knowledge point of view, these appear to be rational arguments in favor of differential speed limits for passenger cars and trucks.

However, arguments advocating that a reduction in travel speed will reduce crash potential are not substantiated by previous research or by crash statistics. The speed that a vehicle travels is not directly related to the likelihood that it will be involved in a crash with another vehicle, but rather speed is related to the severity of the consequences of crashes that occur. As the speed a vehicle travels increases, the severity of any crash involving that vehicle will increase (Solomon, 1968). The higher the speed traveled, the higher the energy that must be absorbed by the occupants and the vehicle in a collision. In fact, a 20% increase in speed from 50 mph to 60 mph produces a 44% increase in the kinetic energy, which must be absorbed by the vehicle and its occupants, thereby increasing the severity of the consequences of the crash (Kelley, 1973). However, the likelihood of a collision occurring is not directly affected.

A factor that does seem to affect the probability of a crash occurring is the speed of the vehicle in relation to the speeds of all the other vehicles on the road (Research Triangle Institute, 1976). The more the speed of a vehicle differs from the average speed of the vehicles on the section of road the vehicle is traveling, the more likely it is to be involved in a crash (Michaels & Schneider, 1976). For example, vehicles that travel the same speed in the same direction do not pass or interact with each other; thus they can never collide. However, when vehicles travel at widely varying speeds, the number of interactions, such as overtaking and passing, are maximized (Hauer, 1971). Further, the closer a vehicle travels to the median speed, the fewer the number of interactions and, therefore, the fewer the opportunities for a collision to occur. Thus, crash involvement rates have been shown to be directly related to speed variance, a measure of how vehicles' speeds differ from the average.

Moreover, the fatality rate tends to be highest at speeds that are either much higher or much lower than the average speed (Solomon, 1968). Figure 1 shows that crash involvement rates are lowest when a vehicle's speed approaches the median speed for all traffic. The impact of these relationships was very clearly demonstrated during the 1973 energy shortage. After the 55 mph NMSL was established and the differential speed limit between cars and trucks abolished, speed variance was significantly reduced and collisions and fatalities decreased dramatically.

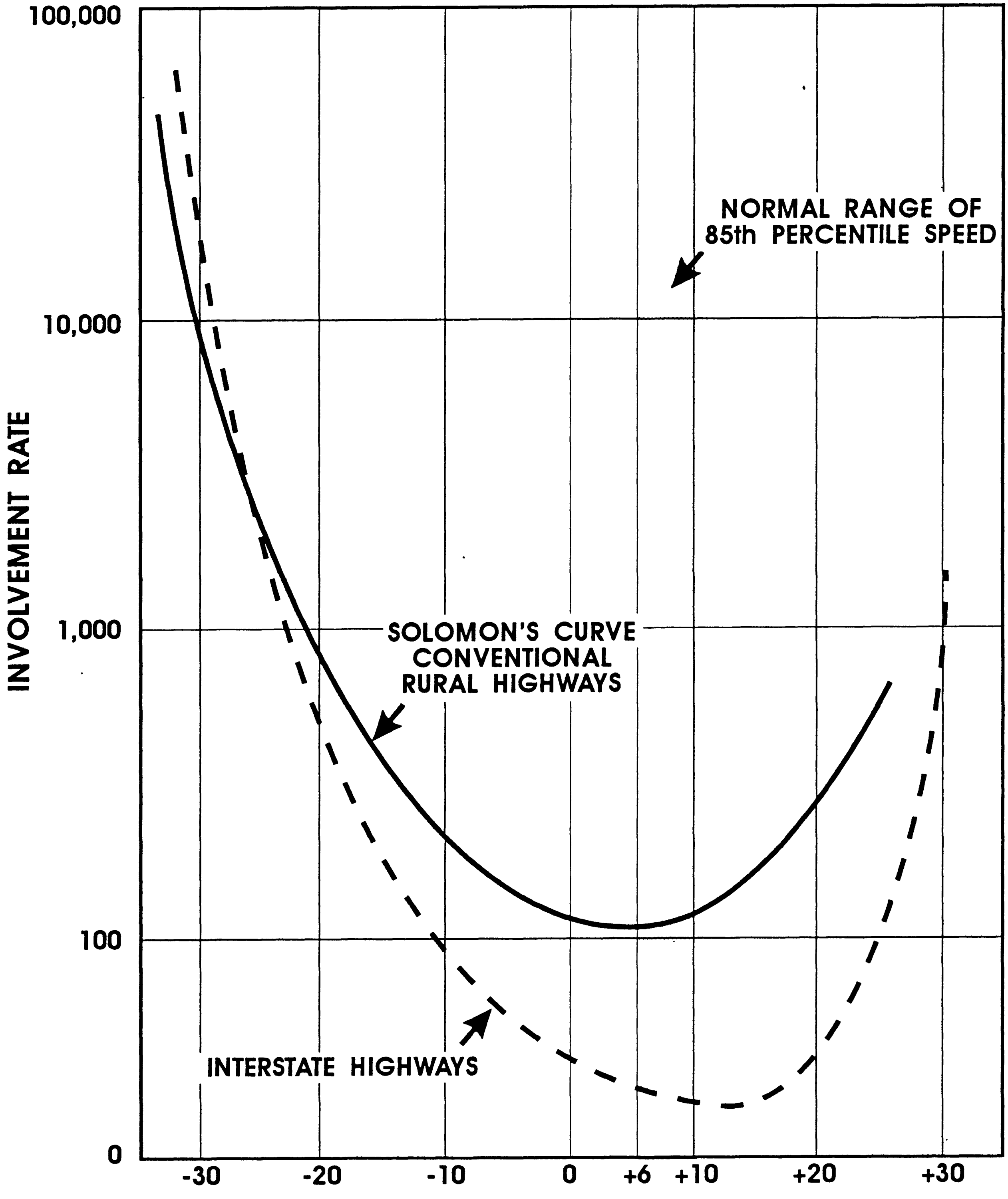

Figure 1. Relationship Between Variation From Mean Speed and Crash Involvement Rates.

When the prospect of raising the speed limit on rural interstates to 65 mph became a reality, it was predicted, based on speed theory, that the increased speed would increase the severity of crashes that occurred (Jernigan, Lynn, & Garber, 1988). That is, since the 1973 decrease in the NMSL resulted in decreased speed variance, the researchers hypothesized that an increase in the speed limit might produce a general increase in speed variance. It was also hypothesized that if a speed differential between passenger vehicles and trucks were to be instituted, passenger vehicle/truck speed variance would increase and more collisions would occur. On the interstate system, this would theoretically increase the number of rear-end and lane-change interactions between passenger vehicles and trucks, increasing the potential for rear-end and sideswipe crashes. It is also likely that these resulting passenger vehicle/truck crashes would be more serious than those between passenger vehicles only since the disparity in size between two vehicles in a crash is related to the severity of the injuries to the occupants of the smaller vehicle (Lohman & Waller, 1975). In a preliminary way, this study examines these hypotheses concerning the speed differential.

PURPOSE AND SCOPE

Before the end of 1987, 38 states had increased the speed limit on at least a portion of their rural interstates. Currently, 41 states have a speed limit of 65 mph on portions of their rural interstates. In 1988, during the first session of Virginia's General Assembly subsequent to the passage of the STURAA, Virginia became the 40th state to raise the maximum speed limit on rural interstates to 65 mph. Virginia's higher speed limit went into effect on July 1, 1988, and contained the provision that trucks and nonschool buses be limited to 55 mph (school buses are limited to 45 mph). On July 1, 1989, the speed limit for nonschool buses was raised to 65 mph. The statute also contained a sunset provision mandating that the higher speed limit was to last for a period of 5 years, during which time accident figures would be compiled by the Virginia Department of State Police (VSP) and made available to the Virginia Department of Transportation (VDOT) for analysis and evaluation.

Prior to the 1988 Session of the General Assembly, the Secretary of Transportation and Public Safety created the Joint Secretarial Task Force on Interstate Highway Speed Limits, which was chaired by a representative of the Office of the Secretary and included a representative of the VSP, VDOT, and Virginia Department of Motor Vehicles (DMV). The Virginia Transportation Research Council (VTRC) served as the staff for the task force. Prior to the change in the speed limit, the task force submitted a report to the Secretary and subsequently to the Governor and General Assembly on estimates of the positive and negative effects of raising the speed limit for Virginia's rural interstates (Jernigan et al., 1988). With the fiscal support of the DMV and VDOT, the task force and the VTRC have worked in cooperation with the represented agencies to monitor the impact of the 65 mph speed limit since its implementation (see Jernigan & Lynn, 1989; Jernigan & Lynn, 1990).

This report is the fourth in a series of reports on the estimated impact of the change to the 65 mph speed limit. The final report of the task force is scheduled to be completed in January 1993, 6 months prior to the end of the 5-year period for which the 65 mph maximum speed limit was authorized in Virginia.

This document was prepared as an update to previous reports and presents data gathered during the first 30 months that followed the implementation of the higher speed limit. The data presented in this report are provided for information purposes only and are not intended to provide conclusions that link the changes in speeds, fatal crashes, and fatalities to the speed limit alone. Further, this updated report contains no recommendations; they are reserved for the task force's final report, in which data will be evaluated fully.

METHODOLOGY

This report concentrates on the changes in travel speeds, fatal crashes, fatalities, and truck crashes that occurred on Virginia's rural interstates after the implementation of the 65 mph speed limit and through December 31, 1990. Data for urban interstates, noninterstates, and all systems are compared to data for rural interstates in an attempt to determine whether similar patterns emerged for rural interstates as for other highways that were not subject to the 65 mph speed limit. This was done to isolate the effect of the increase in the speed limit from other possible changes.

In Virginia, speed data are collected at some of the permanent speed monitoring sites established for the federal speed compliance monitoring program, for which quarterly and annual reports are made to the Federal Highway Administration (FHWA). However, these data are compiled based on the federal fiscal year, not the calendar year. Because this report concentrates on changes between calendar years, quarterly reports of average and 85th percentile speeds were averaged to provide an estimate of travel speeds for the calendar year.

The federal speed compliance monitoring program does not require that speeds be monitored on interstate highways posted at 65 mph, so Virginia, like many other states, no longer routinely collects speed data at these stations. Special provisions were made to conduct 24-hour rural interstate speed surveys for several days during the spring of 1990. However, the reliability of rural interstate speed data for 1990 is not as good as for previous years. Fortunately, speed data for the urban interstates remain as reliable as they have been in the past because the data collection methods have remained constant in urban areas.

In addition to speed data collected for all vehicle types at the speed monitoring stations, daytime radar speed surveys were conducted on the rural and urban interstates before the speed limit increased to 65 mph and in each autumn subsequent to the increase in the speed limit. Every attempt was made to conceal the research vehicle so that its presence would not affect the speeds of passing vehicles.

However, due to the widespread use of radar detectors, especially among truck drivers, the method of collection may have affected speed data. The radar speed survey allowed the study team to distinguish between the speeds of cars and trucks, which are subject to different speed limits on Virginia's rural interstates.

The VDOT has made a special effort to track fatalities and fatal crashes on Virginia's interstate highways and was, therefore, able to provide the study team with up-to-date information for interstate crashes. However, the latest crash data available for other states are for the year 1989.

Because Virginia increased its rural interstate speed limit in July 1988, that year is considered to be a year of transition. Thus, the 3-year period 1985–1987 is considered the "before" period (before the change to 65 mph, i.e., pre-65) in the analysis of Virginia data. The 2-year period 1989–1990 is considered the "after" period (after the change to 65 mph, i.e., post-65). The use of data from multiple years reduces the probability that single-year figures, either before or after the speed limit change, would be unusually high or low due to random and nonrandom fluctuations.

In the analysis of speed and crash data, the pre-65 average was compared to the post-65 average. Further, because crash data were available by month, differences in Virginia fatal crash and fatality data pre-65 and post-65 were tested for statistical significance using analysis of variance (ANOVA) to compare monthly totals.

Not all 41 states that elected to raise their rural interstate speed limit did so on the same date: 38 states did so in 1987, Virginia and Georgia did so in 1988, and Massachusetts did so in 1990. When comparing Virginia to other states, the year 1986 was selected as the "before" period and 1989 was considered the "after" period. Hence, Massachusetts is treated as a state in which the speed limit on rural interstates was 55 mph.

Finally, the types of vehicles involved in crashes and the configuration of those crashes were considered in relation to speed data. In addition to speed data, accident data were arrayed by the types of vehicles involved, specifically (1) single passenger vehicle crashes, (2) single truck crashes, (3) passenger vehicle collisions (where passenger vehicles struck passenger vehicles), (4) truck collisions (where two trucks collided), and (5) passenger vehicle/truck collisions. Other aspects of urban and rural interstate crashes, such as crash configuration, were also examined in an attempt to identify some of the changes in crash patterns following the speed limit change.

FINDINGS

Table 1 shows that the average annual speed of vehicles on Virginia's rural interstates was 58.6 mph pre-65 and increased by 5.9 mph to 64.5 mph post-65.

Table 1
AVERAGE AND 85TH PERCENTILE SPEEDS ON VIRGINIA'S INTERSTATES
Pre (1985-1987) vs. Post (1989-1990)

Speeds (mph)	1985	1986	1987	1988	1989	1990	Pre-65	Post-65	Pre-Post Difference
Rural interstates									
Average	59.2	58.4	58.2	60.2	63.4	65.5	58.6	64.5	+5.9
85th Percentile	64.8	63.8	64.0	67.0	70.0	72.2	64.2	71.1	+6.9
Urban interstates									
Average	54.2	54.0	54.6	59.9	57.8	58.3	54.3	58.1	+3.8
85th Percentile	61.8	60.8	63.5	68.5	66.0	66.3	62.0	66.2	+4.2

Likewise, the 85th percentile speed (the speed at or below which 85% of the vehicles were traveling) increased by 6.9 mph. Speeds on Virginia's urban interstates also increased, but by a lesser amount than on rural interstates. The average speed on Virginia's urban interstates was 54.3 mph pre-65 and increased by 3.8 mph post-65. Similarly, the 85th percentile speed on urban interstates increased 4.2 mph post-65. Thus, the difference between the average and 85th percentile speeds on urban and rural interstates had also increased post-65.

As can be seen in Table 2, fatalities also increased on Virginia's rural interstates. Pre-65, there was an average of 49.7 fatalities per year. Post-65, rural interstate fatalities increased by 26.8, to an average of 76.5 fatalities per year. Using ANOVA to compare the monthly number of fatalities pre-65 and post-65, we find that the increase in fatalities post-65 is statistically significant at $p < .05$.

Table 2 also shows that fatalities on urban interstates also increased, but to a much lesser extent than on rural interstates. Pre-65, there was an average of 42.0 fatalities per year on Virginia's urban interstates, which increased by 2.0 to 44.0 fatalities per year post-65. However, this increase was not statistically significant.

Table 2 also displays annual fatality figures for noninterstate highways and total fatalities in Virginia. Noninterstate fatalities decreased by 33.8, and total fatalities decreased by 5.0 post-65. However, neither decrease was statistically significant.

The pattern of changes in fatal crashes was similar to the pattern for fatalities. Table 3 shows that fatal crashes increased by 23.2 on Virginia's rural interstates, and this increase was statistically significant at $p < .05$. Urban interstate fatal crashes increased by 1.8, but this increase was not statistically significant. Noninterstate fatal crashes decreased by 27.5, and total fatal crashes decreased by 2.5, but neither decrease was statistically significant.

Nationally, the cumulative experience of the states that have a 65 mph speed limit on their rural interstates is similar to Virginia's experience. Table 4 was compiled from data presented by the National Highway Traffic Safety Administration (NHTSA) (NHTSA, 1990) and shows a percentage change in fatalities between 1986 and 1989 for the states with a 55 mph rural interstate speed limit (called "55 mph states") and those with a 65 mph rural interstate speed limit (called "65 mph states"). The percentage changes for Virginia are included in the data for the 65 mph states but are also displayed separately so that comparisons can be made.

Table 4 shows that the 65 mph states experienced a 33.0% increase in fatalities as compared with Virginia's 42.2% increase. However, rural interstate fatalities in the 55 mph states had decreased by 12.1% in 1989 since 1986. Urban interstate fatalities increased in both the 55 mph states and the 65 mph states, with the 55 mph states experiencing a 13.1% increase, which was greater than either Virginia's 4.4% increase or the 1.0% increase experienced in the 65 mph states in general. Noninterstate and total fatalities decreased for the 55 mph states, the 65 mph states, and Virginia.

Table 2
FATALITIES IN VIRGINIA
Pre (1985-1987) vs. Post (1989-1990)

Highway Type	1985	1986	1987	1988	1989	1990	Pre-65	Post-65	Pre-Post Difference
Rural interstate	60	45	44	78	64	89	49.7	76.5	+26.8
Urban interstate	34	45	47	58	47	41	42.0	44.0	+2.0
Noninterstate	886	1028	931	993	888	941	948.3	914.5	–33.8
Total	980	1118	1022	1069	999	1071	1040.0	1035.0	–5.0

Table 3
FATAL CRASHES IN VIRGINIA
Pre (1985-1987) vs. Post (1989-1990)

Highway Type	1985	1986	1987	1988	1989	1990	Pre-65	Post-65	Pre-Post Difference
Rural interstate	50	40	40	65	60	73	43.3	66.5	+23.2
Urban interstate	32	40	41	52	41	38	37.7	39.5	+1.8
Noninterstate	814	917	825	852	812	837	852.0	824.5	–27.5
Total	896	997	906	969	913	948	933.0	930.5	–2.5

Table 4
FATALITIES IN THE UNITED STATES

Highway Type	55 mph States (86-89 % Change)	65 mph States* (86-89 % Change)	Virginia (86-89 % Change)
Rural interstate	−12.1	+33.0	+42.2
Urban interstate	+13.1	+1.0	+4.4
Noninterstate	−3.1	−2.9	−13.6
Total	−2.5	−0.9	−10.6

*Includes Virginia.

The national data are not presented in terms of monthly totals, and they compare only one pre-65 year to one post-65 year; thus, these data were not analyzed for statistical significance. However, it is interesting that the data for the 65 mph states are similar to Virginia's and that the 65 mph states experienced a rather large percentage increase in rural interstate fatalities. The 55 mph states did not follow this pattern. In fact, they experienced a slight decrease in rural interstate fatalities. Further, the direction of change for urban interstates, noninterstates, and total fatalities were the same for the 55 mph states, the 65 mph states, and Virginia.

Table 5 lists monthly fatal crash and fatality data for Virginia's rural interstates. Fatal crashes between pre-65 and post-65 increased by 23.2 per year.

Table 5
AVERAGE NUMBER OF FATAL CRASHES AND FATALITIES
ON VIRGINIA'S RURAL INTERSTATES BY MONTH
Pre (1985-1987) vs. Post (1989-1990)

	Pre-65		Post-65		Pre-Post Difference	
Month	# Crashes	# Killed	# Crashes	# Killed	# Crashes	# Killed
Jan	2.7	3.0	3.5	4.0	+0.8	+1.0
Feb	2.0	2.7	4.0	5.0	+2.0	+2.3
Mar	3.7	4.0	5.0	6.0	+1.3	+2.0
Apr	2.0	2.7	3.5	4.0	+1.5	+1.3
May	3.0	3.7	7.0	8.0	+4.0	+4.3
June	3.3	4.0	7.5	9.0	+4.2	+5.0
July	4.0	5.0	6.0	7.5	+2.0	+2.5
Aug	6.0	6.7	5.5	5.5	−0.5	−1.2
Sept	5.3	5.7	7.5	7.5	+2.2	+1.8
Oct	5.0	5.7	7.5	8.5	+2.5	+2.8
Nov	4.3	4.7	5.0	6.0	+0.7	+1.3
Dec	2.0	2.0	4.5	5.5	+2.5	+3.5
Total	43.3	49.7	66.5	76.5	+23.2	+26.8

Fatalities increased by 26.8 per year. These differences were statistically significant at $p < .05$. However, even though the increase in fatalities was greater than the increase in fatal crashes, both increased by similar proportions. Thus, there are no data to indicate that there was an increase or a decrease in the number of multiple-fatality crashes.

Table 6 shows the average monthly distribution of fatal crashes and fatalities on Virginia's urban interstates. Unlike the rural interstates on which the average number of fatal crashes and fatalities increased in 11 of the 12 months, fatal crashes on the urban interstates increased in only 7 of the 12 months and fatalities increased in only 6 of the 12 months. Further, the overall increase of 1.8 fatal crashes and 2.0 fatalities was not statistically significant.

Table 7 shows the distribution of rural interstate fatal crashes by route. More than 40% of the increase in fatal crashes between pre-65 and post-65 on rural interstates occurred on I-95, and approximately an additional 30% of the increase occurred on I-81. This is not surprising since I-95 and I-81 are the most heavily traveled interstate routes in Virginia. On the urban interstates, fatal crashes increased on I-95 by 6.2 per year post-65, even through the overall increase on all urban interstates was 1.8 per year. However, fatal crashes on I-81 decreased post-65. Fatal crashes also decreased on I-64 but increased slightly on I-66.

Table 6
AVERAGE NUMBER OF FATAL CRASHES AND FATALITIES
ON VIRGINIA'S URBAN INTERSTATES BY MONTH
Pre (1985-1987) vs. Post (1989-1990)

	Pre-65		Post-65		Pre-Post Difference	
Month	# Crashes	# Killed	# Crashes	# Killed	# Crashes	# Killed
Jan	1.0	1.0	3.5	3.5	+2.5	+2.5
Feb	3.3	3.3	1.0	1.0	–2.3	–2.3
Mar	1.3	1.3	3.0	3.0	+1.7	+1.7
Apr	4.3	5.0	3.5	3.5	–0.8	–1.5
May	2.0	2.0	1.5	2.0	–0.5	0
June	6.3	6.7	3.5	4.0	–2.8	–2.7
July	4.7	5.0	5.5	6.5	+0.8	+1.5
Aug	3.7	4.0	6.0	6.0	+2.3	+2.0
Sept	3.0	3.0	3.5	3.5	+0.5	+0.5
Oct	3.0	5.3	4.0	5.0	+1.0	–0.3
Nov	3.3	3.7	2.0	2.5	–1.3	–1.2
Dec	1.7	1.7	2.5	3.5	+0.8	+1.8
Total	37.7	42.0	39.5	44.0	+1.8	+2.0

Table 7
AVERAGE NUMBER OF FATAL CRASHES ON VIRGINIA'S INTERSTATES BY ROUTE
Pre (1985-1987) vs. Post (1989-1990)

Route	Pre-65	Post-65	Pre-Post Difference
Rural			
64	6.3	8.0	+1.7
66	2.0	1.5	–0.5
77	2.7	4.0	+1.3
81	15.7	22.5	+6.8
85	1.7	5.5	+3.8
95	14.3	24.5	+10.2
295	0.7	0.5	–0.2
Total	43.3	66.5	+23.2
Urban			
64	14.0	11.5	–2.5
264	2.7	4.0	+1.3
464	0.3	0.0	–0.3
564	0.7	1.0	+0.3
664	0.3	1.0	+0.7
66	2.7	4.0	+1.3
81	4.3	0.5	–3.8
581	1.3	1.0	–0.3
85	0.3	0.5	+0.2
95	6.3	12.5	+6.2
195	0.0	0.5	+0.5
295	0.7	0.5	–0.2
395	1.3	2.0	+0.7
495	2.7	0.5	–2.2
Total	37.7	39.5	+1.8

Speed Variance and Crash Types

As mentioned previously, it was expected that instituting a speed differential would result in increased speed variance and, thus, in more crashes on the rural interstates. In addition, since passenger vehicles would be traveling faster than before, it was expected that the severity of passenger vehicle crashes would also increase. What actually occurred was quite different from predictions. As noted in Table 8, crashes on rural interstates did increase, but the major increase was not in collisions between passenger vehicles and trucks, but rather in collisions involving only passenger vehicles and in single passenger vehicle crashes.

Table 8 shows that, based on the radar survey of speeds on rural interstates, the mean speed for passenger vehicles increased from 62.0 mph in the spring of 1988, which was before the speed limit change, to 69.1 mph in 1990. Between the 1988 and 1990 samples, speed variance decreased slightly, from 19.3 to 15.2. The mean speed for trucks also increased slightly, from 59.4 mph to 61.5 mph. The speed variance also increased somewhat, from 13.5 to 15.5. When the speeds for

Table 8
SPEED CHARACTERISTICS AND CRASHES ON VIRGINIA'S INTERSTATE
BY TYPE OF ACCIDENT (1987-1990)

Crash Type	Mean (88 Pre vs 90)	Variance (88 Pre vs 90)	Difference in Total Crashes (87 vs 90)
Rural			
Single truck	+2.1 mph	—	–77
Single passenger vehicle	+7.1 mph	—	+345
Passenger vehicle/passenger vehicle	+7.1 mph	–4.1	+135
Truck/truck	+2.1 mph	+2.0	–25
Passenger vehicle/truck	+5.2 mph	+9.4	–127
Urban			
Single truck	+1.1 mph	—	– 13
Single passenger vehicle	+1.4 mph	—	+182
Passenger vehicle/passenger vehicle	+1.4 mph	+11.9	+523
Truck/truck	+1.1 mph	+1.5	–18
Passenger vehicle/truck	+1.6 mph	+9.2	–95

both types of vehicles were combined, speed variance increased from 19.0 prior to raising the speed limit to 28.4 in 1990.

Passenger vehicle collisions increased from 690 in 1987, prior to raising the speed limit, to 825 in 1990. However, passenger vehicle collisions were no more severe after the speed limit change (see the Appendix). Crashes in which trucks collided with other trucks decreased from 63 in 1987 to 38 in 1990.

Crashes in which a passenger vehicle and a truck collided were expected to increase dramatically. This was an especially gloomy prediction, considering that collisions between a truck and a smaller passenger vehicle tend to be more serious than other types of crashes. This prediction was not substantiated by the data, since passenger vehicle/truck collisions decreased from 556 in 1987 to 429 in 1990.

Finally, single passenger vehicle crashes increased by 345 but were no more severe. Single truck crashes declined by 77 and were no more severe.

On urban interstates, speeds for all vehicle types increased less than 2 mph, indicating that urban interstate crashes should be only slightly more severe after the speed limit change, if at all. However, whereas passenger vehicle variance decreased on rural interstates, it increased dramatically on urban interstates, corresponding with an increase in passenger vehicle collisions of 523. Truck and total variance results for urban interstates were similar to those for rural interstates.

Configuration of Crashes on Urban and Rural Interstates

Tables 9 through 12 show configuration data for fatal crashes on Virginia's rural interstates pre-65 and post-65. Table 9 shows that fatal truck crashes

Table 9
FATAL CRASH CHARACTERISTICS ON VIRGINIA'S INTERSTATES
Pre (1985-1987) vs. Post (1989-1990)

Crash Type	Average Number of Crashes: Pre-65	Average Number of Crashes: Post-65	Pre-Post Difference
Rural			
Sideswipe	2.7	6.5	+3.8
Truck	11.0	19.5	+8.5
Pedestrian	5.7	3.5	–2.2
Wrong way	1.7	2.5	+0.8
Phantom	1.7	3.5	+1.8
Total	43.3	66.5	+23.2
Urban			
Sideswipe	2.7	4.5	+1.8
Truck	12.7	10.0	–2.7
Pedestrian	7.0	5.5	–1.5
Wrong way	0.7	1.5	+0.8
Phantom	2.3	3.0	+0.7
Total	37.7	39.5	+1.8

Table 10
AVERAGE NUMBER OF REAR-END CRASHES ON VIRGINIA'S INTERSTATES
Pre (1985-1987) vs. Post (1989-1990)

Crash Type	Pre-65		Post-65		Pre-Post Difference	
Rural						
Rear end		7.7		11.0		+3.3
Truck into truck	1.7		1.0		–0.7	
Truck into nontruck	1.7		1.5		–0.2	
Nontruck into nontruck	2.3		3.0		+0.7	
Nontruck into truck	2.0		5.5		+3.5	
Non–rear end		35.7		55.5		+19.8
Total		43.3		66.5		+23.2
Urban						
Rear end		8.7		10.0		+1.3
Truck into truck	1.0		0.5		–0.5	
Truck into nontruck	1.0		1.0		0.0	
Nontruck into nontruck	3.3		5.5		+2.2	
Nontruck into truck	3.3		3.0		–0.3	
Non–rear end		29.0		29.5		+0.5
Total		37.7		39.5		+1.8

Table 11
AVERAGE NUMBER OF ALCOHOL-RELATED CRASHES ON VIRGINIA'S INTERSTATES
Pre (1985-1987) vs. Post (1989-1990)

Crash Type	Pre-65	Post-65	Pre-Post Difference
Rural			
Alcohol related	13.3	13.5	+0.2
Non–alcohol related	19.0	36.0	+17.0
Alcohol unknown	11.0	17.0	+6.0
Total	43.3	66.5	+23.2
Urban			
Alcohol related	12.7	13.5	+0.8
Non–alcohol related	14.3	15.5	+1.2
Alcohol unknown	10.7	10.5	–0.2
Total	37.7	39.5	+1.8

Table 12
AVERAGE NUMBER OF CRASHES INVOLVING SPEEDING ON VIRGINIA'S INTERSTATES
Pre (1985-1987) vs. Post (1989-1990)

Crash Type	Pre-65		Post-65		Pre-Post Difference	
Rural						
All speeding crashes		18.7		20.0		+1.3
Single nontruck	10.7		9.5		–1.2	
Single truck	0.7		0.5		–0.2	
Nontruck in collision	4.7		7.0		+2.3	
Truck in collision	1.3		3.0		+1.7	
Other	1.3		0.0		–1.3	
Nonspeeding		22.0		38.5		+16.5
Speeding unknown		2.7		8.0		+5.3
Total		43.3		66.5		+23.2
Urban						
All speeding crashes		16.7		17.0		+0.3
Single nontruck	9.3		7.0		–2.3	
Single truck	0.3		0.0		–0.3	
Nontruck collision	5.3		9.5		+4.2	
Truck in collision	1.0		0.0		–1.0	
Other	0.7		0.5		–0.2	
Nonspeeding		17.7		14.0		–3.7
Speeding unknown		3.3		8.5		+5.2
Total		37.7		39.5		+1.8

increased by 8.5 per year post-65. Table 9 also shows that sideswipe and wrong way fatal crashes also increased. However, fatal pedestrian crashes decreased by 2.2 per year.

Table 9 also shows that, on urban interstates, pedestrian fatal crashes decreased post-65 and sideswipe, wrong way, and phantom crashes increased only slightly. Fatal truck crashes decreased by 2.7 per year.

One argument often posed with regard to truck crashes is that, under a system of differential speed limits, slower moving trucks may cause accidents in which they are not actually a striking or struck vehicle. Because faster moving passenger vehicles must maneuver around slower moving trucks, some of these passing maneuvers could result in collisions or run-off-road (ROR) crashes. In this case, the truck would be called a "phantom" vehicle. As seen in Table 9, fatal phantom-vehicle crashes, that is, crashes in which a vehicle not involved in the crash contributed to the crash, increased slightly post-65 on both rural and urban interstates.

Table 10 shows that most of the increase in rural interstate fatal crashes was attributable to non–rear-end crashes. Virtually all of the increase in rear-end fatal crashes on rural interstates was in the number of nontrucks colliding with the rear of trucks.

Table 10 also shows that most of the slight increase in fatal crashes on urban interstates resulted from an increase in rear-end fatal crashes. Moreover, most of the increase in rear-end fatal crashes did not involve a truck. Thus, the crash experiences were quite different from those on rural interstates.

Table 11 shows that most of the increase in rural interstate fatal crashes was not because of an increase in alcohol-related crashes. In fact, there was an increase of only 0.2 fatal crashes per year that were reported by the investigating officer as being alcohol related. However, there was an increase of 6.0 fatal crashes per year in which an officer reported that he or she did not know whether a pedestrian or driver had been drinking. These radical changes in the "unknown" category undermine the usefulness of the "had been drinking" scale used on accident report forms.

With regard to urban interstates, both alcohol-related and non–alcohol-related crashes increased slightly post-65. However, unlike for rural interstates, there was almost no change in fatal crashes post-65 in which the investigating officer reported that he or she did not know whether a pedestrian or driver had been drinking.

Table 12 shows an increase of 5.3 fatal crashes per year on rural interstates in which an officer reported that he or she did not know the speed of a vehicle prior to its involvement in a fatal crash. Again, extensive use of the "unknown" category reduces the validity of speeds reported by the investigating officer. Most of the rest of the increase in fatal crashes involved an increase in fatal crashes in which no vehicle was reported as exceeding the posted speed limit.

On urban interstates, the increase in fatal crashes was greatest among fatal crashes involving a speeding nontruck in a collision. Further, crashes in which the speed of a vehicle prior to a fatal crash was unknown increased by 5.2 fatal crashes per year post-65.

ROR fatal crashes on rural and urban interstates are examined in Tables 13 and 14, respectively. Overall, ROR fatal crashes increased by an average of 23.5 per year on rural interstates but decreased by 1.8 per year on urban interstates. In general, ROR-right fatal crashes increased for all vehicle types on rural interstates but decreased for all vehicle types on urban interstates. ROR-left fatal crashes in which a vehicle left the roadway but did not enter the opposing lanes of traffic increased for rural interstates by 13.3 per year; however, the corresponding increase on the urban interstates was only 1.4 per year. ROR-left fatal crashes in which the vehicle entered the opposing traffic lanes and collided with another vehicle increased by 4.7 per year on rural interstates and by only 0.7 per year on urban interstates. ROR-left fatal crashes in which the vehicle entered the opposing lanes but did not strike another vehicle increased by 1.2 per year on rural interstates compared to a decrease of 0.7 per year on urban interstates. Finally, nontruck ROR crashes increased more than did truck ROR crashes, and the increase in ROR-left crashes in which the vehicle did not cross over into the opposing lanes of traffic was particularly pronounced.

Table 13
RUN-OFF-ROAD (ROR) FATAL CRASHES ON VIRGINIA'S RURAL INTERSTATES
BY DIRECTION AND INCURSION
Pre (1985-1987) vs. Post (1989-1990)

ROR Direction	Pre-65	Post-65	Pre-Post Difference
Right			
Truck	1.7	2.0	+0.3
Nontruck	12.0	16.0	+4.0
Left not into other lane			
Truck	1.0	3.0	+2.0
Nontruck	11.7	23.0	+11.3
Left into other lane (collision)			
Truck	0.0	1.0	+1.0
Nontruck	0.3	4.0	+3.7
Left into other lane (no collision)			
Truck	0.0	0.0	0.0
Nontruck	1.3	2.5	+1.2
Total ROR	28.0	51.5	+23.5
Total non-ROR	15.3	15.0	–0.3
Total	43.3	66.5	+23.8

Table 14
RUN-OFF-ROAD (ROR) FATAL CRASHES ON VIRGINIA'S URBAN INTERSTATES
BY DIRECTION AND INCURSION
Pre (1985-1987) vs. Post (1989-1990)

ROR Direction	Pre-65	Post-65	Pre-Post Difference
Right			
Truck	1.3	0.5	–0.8
Nontruck	10.3	8.0	–2.3
Left not into other lane			
Truck	2.3	1.0	–1.3
Nontruck	6.3	9.0	+2.7
Left into other lane (collision)			
Truck	0.0	0.0	0.0
Nontruck	2.3	3.0	+0.7
Left into other lane (no collision)			
Truck	0.0	0.0	0.0
Nontruck	0.7	0.0	–0.7
Total ROR	23.3	21.5	–1.8
Total non-ROR	14.3	18.0	+3.7
Total	37.7	39.5	+1.8

DISCUSSION

This examination of Virginia and national data indicates that changes have occurred in the Commonwealth in terms of speed and crashes. Post-65, average speeds increased on rural and urban interstates by 5.9 mph and 3.8 mph, respectively. Corresponding 85th percentile speeds also increased, by 6.9 mph and 4.2 mph, respectively. Nationally, fatalities on rural interstates increased between 1986 and 1989 by about 33.0% in 65 mph states. Rural interstate fatalities increased in Virginia by 42.2%, which was more than the national average. Conversely, urban interstate crashes increased more in 55 mph states than in 65 mph states. Virginia's increase fell between the two national averages.

In some cases, these figures are somewhat difficult to interpret. Average speeds increased by almost 6 mph on rural interstates and 4 mph on urban interstates; however, this constitutes only a 2 mph difference between increases on the two systems, although there is now an overall difference of more than 6 mph. Rural interstates experienced a dramatic increase in fatal crashes and fatalities and urban interstates did not. Clearly, a small difference in the increase in speeds coincides with very different crash experiences on the two systems.

Likewise, the crash configuration data, which showed a large increase in ROR fatal crashes on rural interstates, should also be viewed with caution. From an intuitive point of view, the increase in all types of ROR crashes appears to be responsible for a majority of the increase, especially since ROR fatal crashes did not increase on urban interstates. It is possible that a vehicle's speed could increase the likelihood of any given action resulting in a ROR situation since the amount of time an individual could safely react to emergency conditions or could safely take complete attention away from the driving task would be decreased at higher speeds. For instance, in cases where a driver drifted off the road onto the shoulder or swerved to avoid another vehicle, the time available to recover would be reduced at higher speeds. Although these explanations appear to make intuitive sense, there are many factors that could account for the increase in fatal crashes. Thus, it cannot yet be concluded that ROR situations are the major cause of the post-65 increase in fatal crashes on rural interstates.

There are factors that are not accounted for in this evaluation—traffic volumes, trip patterns, and trip purposes may have changed concurrent with the speed limit increase. These and other potential causative factors will be addressed in the last in this series of reports, scheduled to be released in 1993.

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Appendix

CRASH SEVERITY BY VEHICLE TYPE AND ROADWAY SYSTEM

Table A-1
CRASH SEVERITY—TOTAL INTERSTATE SYSTEM

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	80	0.01	81	0.01	103	0.01	111	0.01	80.5	107.0	0.33
Injury crashes	3315	0.38	3878	0.36	4402	0.37	2701	0.36	3596.5	3551.5	–0.01
PDO crashes	5305	0.61	6759	0.63	7533	0.63	4750	0.63	6032.0	6141.5	0.01
Total	8700		10718		12038		7562		9709	9800	0.02

$X^2 = 4.58$, N.S.; PDO = property damage only.

Table A-2
CRASH SEVERITY—URBAN INTERSTATE SYSTEM

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	40	0.01	41	0.01	44	0.01	45	0.01	40.5	44.5	0.10
Injury crashes	2099	0.37	2446	0.35	2696	0.36	2701	0.36	2272.5	2698.5	0.19
PDO crashes	3505	0.62	4496	0.64	4839	0.64	4814	0.64	4000.5	4826.5	0.21
Total	5644		6983		7579		7560		6313.5	7569.5	0.20

$X^2 = .36$, N.S.; PDO = property damage only.

Table A-3
CRASH SEVERITY—RURAL INTERSTATE SYSTEM

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	40	0.01	40	0.01	59	0.01	66	0.02	40.0	62.5	0.56
Injury crashes	1216	0.40	1197	0.38	1535	0.38	1322	0.39	1206.5	1428.5	0.18
PDO crashes	1800	0.59	1875	0.60	2394	0.60	1975	0.59	1837.5	2184.5	0.19
Total	3056		3112		3988		3363		3084.0	3675.5	0.19

X^2 = 1.83, N.S.; PDO = property damage only.

Table A-4
CRASH SEVERITY—RURAL INTERSTATE SYSTEM
SINGLE PASSENGER VEHICLE CRASHES

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	27	0.02	21	0.01	36	0.02	33	0.02	24	34.5	0.44
Injury crashes	660	0.43	630	0.40	857	0.39	749	0.39	645	803.0	0.24
PDO crashes	865	0.56	913	0.58	1301	0.59	1127	0.59	889	1214.0	0.36
Total	1552		1564		2194		1909		1558	2051.5	0.32

X^2 = 1.92, N.S.; PDO = property damage only.

Table A-5
CRASH SEVERITY—RURAL INTERSTATE SYSTEM
SINGLE TRUCK CRASHES

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	2	0.01	2	0.01	2	0.01	3	0.02	2.0	2.5	0.25
Injury crashes	95	0.40	92	0.38	90	0.40	70	0.43	93.5	80.0	–0.14
PDO crashes	141	0.59	145	0.61	132	0.59	89	0.55	143.0	110.5	–0.23
Total	238		239		224		162		238.5	193	–0.19

$X^2 = .32$, N.S.; PDO = property damage only.

Table A-6
CRASH SEVERITY—RURAL INTERSTATE SYSTEM
PASSENGER VEHICLE/PASSENGER VEHICLE COLLISIONS

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	5	0.01	5	0.01	11	0.01	13	0.02	5.0	12.0	1.40
Injury crashes	231	0.33	242	0.35	371	0.39	330	0.40	236.5	350.5	0.48
PDO crashes	459	0.66	443	0.64	581	0.60	482	0.58	451.0	531.5	0.18
Total	695		690		963		825		692.5	894.0	0.29

$X^2 = 6.12$, $p < .05$; PDO = property damage only.

Table A-7
CRASH SEVERITY—RURAL INTERSTATE SYSTEM
PASSENGER VEHICLE/TRUCK COLLISIONS

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	5	0.01	8	0.01	8	0.01	15	0.03	6.5	11.5	0.77
Injury crashes	202	0.39	217	0.39	201	0.37	157	0.37	209.5	179.0	–0.15
PDO crashes	312	0.60	331	0.60	340	0.62	257	0.60	321.5	298.5	–0.07
Total	519		556		549		429		537.5	489.0	–0.090

X^2 = 2.35, N.S.; PDO = property damage only.

Table A-8
CRASH SEVERITY—RURAL INTERSTATE SYSTEM
TRUCK/TRUCK COLLISIONS

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	1	0.02	4	0.06	2	0.03	2	0.05	2.5	2	–0.20
Injury crashes	28	0.54	16	0.25	16	0.28	16	0.42	22.0	16	–0.27
PDO crashes	23	0.44	43	0.68	40	0.69	20	0.53	33.0	30	–0.09
Total	52		63		58		38		57.5	48	–0.16

X^2 = .28, N.S.; PDO = property damage only.

Table A-9
CRASH SEVERITY—URBAN INTERSTATE SYSTEM
SINGLE PASSENGER VEHICLE CRASHES

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	21	0.02	21	0.01	21	0.01	19	0.01	21	20.0	–0.05
Injury crashes	629	0.46	615	0.40	715	0.41	745	0.43	622	730.0	0.17
PDO crashes	717	0.52	897	0.59	1014	0.58	951	0.55	807	982.5	0.22
Total	1367		1533		1750		1715		1450	1732.5	0.195

$X^2 = .79$, N.S.; PDO = property damage only.

Table A-10
CRASH SEVERITY—URBAN INTERSTATE SYSTEM
SINGLE TRUCK CRASHES

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	5	0.04	1	0.01	1	0.01	5	0.04	3.0	3.0	0.00
Injury crashes	51	0.38	58	0.42	52	0.41	51	0.41	54.5	51.5	–0.05
PDO crashes	78	0.58	78	0.57	74	0.58	68	0.55	78.0	71.0	–0.09
Total	134		137		127		124		135.5	125.5	–0.07

$X^2 = .001$, N.S.; PDO = property damage only.

Table A-11
CRASH SEVERITY—URBAN INTERSTATE SYSTEM
PASSENGER VEHICLE/PASSENGER VEHICLE COLLISIONS

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	6	0.00	10	0.00	11	0.00	15	0.00	8.0	13	0.62
Injury crashes	1141	0.36	1389	0.34	1549	0.34	1579	0.34	1265.0	1564	0.24
PDO crashes	2046	0.64	2719	0.66	2997	0.66	3047	0.66	2382.5	3022	0.27
Total	3193		4118		4557		4641		3655.5	4599	0.26

$X^2 = .63$, N.S.; PDO = property damage only.

Table A-12
CRASH SEVERITY—URBAN INTERSTATE SYSTEM
PASSENGER VEHICLE/TRUCK COLLISIONS

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	10	0.01	8	0.01	11	0.01	5	0.00	9	8.0	–0.11
Injury crashes	267	0.30	363	0.32	364	0.33	317	0.31	315	340.5	0.08
PDO crashes	628	0.69	762	0.67	714	0.66	714	0.69	695	714.0	0.03
Total	905		1133		1089		1036		1019	1062.5	0.04

$X^2 = .40$, N.S.; PDO = property damage only.

Table A-13
CRASH SEVERITY—URBAN INTERSTATE SYSTEM
TRUCK/TRUCK COLLISIONS

	1986	%	1987	%	1989	%	1990	%	1986-1987 Average	1989-1990 Average	% Diff.
Fatal crashes	2	0.04	1	0.02	0	0.00	1	0.02	1.5	0.5	–0.67
Injury crashes	11	0.24	21	0.34	16	0.29	9	0.20	16.0	12.5	–0.22
PDO crashes	32	0.71	40	0.65	40	0.71	34	0.77	36.0	37.0	0.03
Total	45		62		56		44		53.5	50.0	0.065

X^2 = .56, N.S.; PDO = property damage only.