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An Investigation of Issues Related to Raising the Rural Interstate Speed Limit in Virginia

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Abstract

In April of 1987, Congress passed the Surface Transportation and Uniform Relocation Assistance Act of 1987, which allows the states to raise, without penalty, the speed limit on interstate highways outside of urbanized areas with a population of 50,000 or more. This study estimated that an increase in the rural interstate speed limit in Virginia would have both positive and negative outcomes. The average speed traveled on the rural interstate highway system has already increased by 3.6 mph in Virginia; this is comparable to that experienced in states that have raised the speed limit. However, if the speed limit on the rural interstate highway system is raised from 55 mph to 65 mph, it is estimated that in the short run the average speed traveled on the rural interstate will increase by an additional 3 mph, from 60 mph to 63 mph. Increased speeds would be expected to result in increased stopping distances and an annual increase of between 6 and 18 fatalities and between 171 and 405 injuries. Further, injuries would likely be more severe as a result of the higher speeds traveled. If the average speed continues to increase in the long run, or if higher speeds spill over onto the urban interstate highway system or rural collector roads, then additional injuries and fatalities would be expected on those systems as well.

On the other hand, the primary quantifiable benefit of the higher limit would be a savings of 1.3 million hours in business and commercial travel time. This study has also found that almost 60% of the Virginians surveyed would prefer a 65 mph speed limit to a 55 mph limit on the rural interstate highway system. Finally, because of the current speeds, the geometric design, and the accident history of the rural interstates in general, it would be possible to raise the speed limit without violating traffic engineering tenets for setting speed limits. However, if the speed limit is raised, establishing a truck speed limit differential below the limit established for passenger cars would promote increased speed variance between cars and trucks, thereby creating a more dangerous environment than if the speed limit were raised to the same level for both cars and trucks.

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AN INVESTIGATION OF ISSUES RELATED TO RAISING THE RURAL INTERSTATE SPEED LIMIT IN VIRGINIA

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Virginia Transportation Research Council
(A Cooperative Organization Sponsored Jointly by the Virginia Department of Transportation and the University of Virginia)

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SAFETY RESEARCH ADVISORY COMMITTEE

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EXECUTIVE SUMMARY

AN INVESTIGATION OF ISSUES RELATED TO RAISING THE RURAL INTERSTATE SPEED LIMIT IN VIRGINIA

In January of 1973, Congress passed the 55 mph national maximum speed limit in response to the 1973-1974 energy crisis and all states immediately followed suit. Fatalities nationwide dropped 9,100 between 1973 and 1974, and the fatality rate declined by more than 15%. In Virginia, fatal accidents decreased by 132 between 1973 and 1974, and injury accidents decreased by 1,355. Fatalities on Virginia's rural interstate system dropped from 107 to 56. In April of 1987, however, Congress passed the Surface Transportation and Uniform Relocation Assistance Act of 1987, which allows the states to raise, without penalty, the speed limit on interstate highways outside of urbanized areas with a population of 50,000 or more. Although the reduced speed limit was responsible for some of the decrease in fatalities, it cannot be assumed that it was responsible for all the safety benefits, and because an increase in the speed limit in 1987 would not be associated with many of the factors that prevailed in the earlier period, it should not be expected that increases in fatalities and injuries would be as immediate, or as dramatic, as the decreases during the energy crisis.

The findings of this report are based upon the premise that average and 85th percentile speeds are better estimators of travel behavior than the posted speed limit since they reflect the real behavior of vehicle operators. The first job was to estimate how much average and 85th percentile speeds would increase if the current rural interstate speed limit were raised to 65 mph. Although intuition may suggest that a 10 mph increase in the speed limit would result in a 10 mph increase in the average speed, this has not been the case either currently in the states that have increased the speed limit or historically in Virginia.

Since the passage of the federal enabling legislation, average and 85th percentile speeds on Virginia's rural interstates have increased 3.6 mph and 3.0 mph to approximately 60 mph and 65 mph, respectively. In Pennsylvania and Georgia (which have made no decision on raising the rural interstate speed limit), average and 85th percentile speeds are up between 1.3 mph and 3.5 mph. In contrast to the states that have not raised the rural interestate speed limit, most of the states surveyed that have increased the speed limit to 65 mph currently have average and 85th percentile speeds that are between 1 mph and 5 mph higher than before the enactment of the new limit (only slightly higher than the increase already experienced in Virginia). Thus, the federal legislation may have been influential in raising rural interstate speeds in states that have not posted a higher limit.

The researchers also found that between 1966 and 1971, when Virginia had a 65 mph speed limit, the annual average rural interstate speed fluctuated between 60 mph and 65 mph, but was never 65 mph or higher. Thus, based on the short-term impact of the 65 mph speed limit in other states and on Virginia's historical experience with a 65 mph speed limit, it is estimated that if the speed limit is increased in Virginia, the average speed will increase in the short run by only as much as an additional 3 mph, thereby raising the current average rural interstate speed from 60 mph to 63 mph and bringing the total increase to 6 mph since the passage of the federal legislation. Neither Virginia's historical experience with the 65 mph rural interstate speed limit nor the short-term experience that other states have had with the 65 mph speed limit indicates that the average speed will increase much above the projected level of 63 mph; however, conditions are somewhat different in Virginia today, and speeds may continue to increase in the long run.

With increased speeds, more crashes and more severe crashes are likely. An increase in vehicle speed causes a disproportionately greater increase in stopping distance, thereby increasing the chance of collisions. Further, an increase in vehicle speed causes a disproportionately greater impact in a collision. As a result, if the speed limit is raised to 65 mph between 6 and 18 additional fatalities and between 171 and 405 additional injuries are projected annually on the rural interstate system in Virginia in the short run if all other factors remain the same. Further, some of the injuries will be more severe. These injuries and fatalities will be in addition to any increase that may occur from the increase in speed that followed the federal enabling legislation. Finally, if the higher speeds spill onto the urban interstate system and the rural collector roads, more injuries and fatalities can be expected on those roadways.

The severity of an accident is usually proportional to the average speed traveled, whereas the incidence of accidents is proportional to the variation in speed among the vehicles in the traffic flow. If vehicles travel at widely varying speeds, more interactions are going to occur than if they travel at about the same speed. Increases in these interactions increase the likelihood of a crash.

Little information exists on the impact on speed variance of increasing the speed limit to 65 mph. Data from Illinois and West Virginia indicate that the newly implemented 65 mph speed limit has not been associated with increased speed variance in the short run. However, experience indicates that higher speeds are associated with higher speed variance in the long run.

Another issue closely related to speed variance is the imposition of a differential speed limit. From the 1940s through 1973, Virginia had different speed limits for cars and for trucks weighing 7,500 pounds or more, as did many other states. Currently, 7 of the 38 states raising speed limits have established differential speed limits based on vehicle class or weight.

There are two arguments for establishing differential speed limits. One is based on the assumption that the unique characteristics of large trucks, especially their longer braking distances, indicate that they should travel slower to prevent accidents. However, the height of trucks improves sight distance. The other argument is based on the assumption that trucks currently travel faster than cars, and by imposing a slower speed limit for trucks, more uniform speeds will be achieved overall. However, data from Virginia and other states indicate that trucks do not travel faster than cars and may, in fact, travel slower. Data from Illinois, a state which has a 65 mph speed limit for cars and a 55 mph limit for trucks, indicate that the differential limit resulted in reduced speeds for trucks and increased speeds for cars, creating an overall increase in speed variance. Hence, differential speed limits are likely to increase interactions (and thus, accidents) between cars and trucks.

The researchers also examined whether changes in the size and weight of the vehicle fleet that have occurred since 1973 would influence safety and whether the expected consequences of the implementation of the new mandatory safety belt use law would be affected by higher speeds. Although the passenger vehicles of today are smaller than those of 1973 and trucks larger, today's vehicles have had the benefits of many safety improvements. Thus overall safety should be similar between 1973 and today. Further, the researchers found no evidence to indicate that safety belt systems are less effective in general at 63 mph as compared to 60 mph. Hence, the researchers concluded that neither issue is germane to the question of changing the rural interstate speed limit.

The researchers also reviewed the costs and benefits associated with either retaining or raising the rural interstate speed limit. One cost that weighed heavily in the decision-making process in many other states was the money the states would lose if rural interstate speeds were so out of compliance with the 55 mph speed limit that federal-aid highway funds would be impounded. Fortunately, Virginia's compliance is unlikely to be affected either way.

The cost of signing the Virginia rural interstate system could be as much as $10,000. An additional $1,300 would be needed for each change area to place "REDUCED SPEED AHEAD" signs in accordance with the Manual on Uniform Traffic Control Devices. If the speed limit remains at 55 mph, increased manpower from the Department of State Police will be needed to keep speeds down. If the speed limit is increased, enforcement will need to be increased on urban interstates, particularly near change areas, and on the rural collector roads to minimize spill-over of higher speeds.

Raising the speed limit by 10 mph, and consequently the average speed traveled on the rural interstate system from 60 to 63 mph, would save approximately 4.3 million hours annually in travel time, more than 1.3 million hours of which is estimated to be commercial and business travel. The economic value of the time saved is estimated to be between $10.8 million and $35.7 million. The increased vehicle operation costs associated with the higher speed limit are estimated to be almost $1.2 million, mostly from the consumption of as much as an additional 400 barrels of fuel per day. The annual economic cost of increased accidents, including the costs of injuries, property damage, and the actuarial value of the additional lives lost, is estimated to total almost $7.0 million, which will likely result in proportionately higher insurance premiums. These data, however, indicate that the economic benefits of raising the speed limit to 65 mph outweigh the costs by a minimum of $3.8 million.

Two groups of Virginians were polled to determine support for the speed limit alternatives. More than 1,380 Virginians were contacted by telephone and asked their speed limit preferences and their reasons for them. Additionally, 87 special interest groups with offices in Virginia were polled as to their organization's official and unofficial positions and whether they planned any lobbying efforts during the upcoming General Assembly session.

Of the persons polled, about 60% preferred raising the speed limit, while 37% preferred retaining the 55 mph speed limit (with a ±1.9% margin of error). The former believe interstate highways are designed for higher speeds and motorists are driving much faster regardless of the 55 mph speed limit. Reduced travel time and improved traffic flow were also mentioned. Among the latter, safety and comfort were among their main reasons, as well as the fear that drivers would travel much faster if the speed limit is increased.

Although convenience appears to be a significant factor in the public perception of the speed limit issue, it appears to be less of a factor with special interest groups: only one fourth held an official position, with the majority favoring the 55 mph speed limit. Only six organizations, three of which are local Transportation Safety Commissions, plan lobbying efforts. Organizations preferring the 55 mph speed limit, such as the American Trucking Association and its subgroups, generally listed safety and fuel economy as reasons for retaining the lower speed limit. In the organizations supporting the raised speed limit, reduced travel time was an issue, but rather than representing convenience, it represented a potential economic gain to these groups.

In addition to safety and economic factors, a number of traffic engineering issues have a bearing on the decision to raise or retain the current speed limit. The speed limit for any highway is normally set at or below the design speed, which is the maximum safe speed for a specific section of highway when conditions are so favorable that the design features of the highway govern. Other engineering factors considered in setting speed limits include: (1) prevailing vehicle speeds, (2) accident history, and (3) traffic characteristics.

The most common characteristic of prevailing speeds used to set speed limits is the 85th percentile speed, which is the speed at or below which 85 percent of drivers drive on a section of highway. This speed is selected for two reasons: First, drivers usually select a speed they judge to be safe for the geometric, traffic, and environmental conditions. Thus, selecting the 85th percentile speed as the speed limit will provide a maximum speed that will cover the desired speed of 85 percent of the drivers. Second, above the 85th percentile speed value, speeds become more dispersed, resulting in a higher probability of crashes.

The accident history of a particular section of highway may also be used to determine the appropriate speed limit. The average accident rate of the site and the critical accident rate in the state for the particular type of highway being considered are usually compared. The critical accident rate is that rate above which accident occurrence is higher than expected. When the accident rate is higher than the critical rate and it can be ascertained that speeding contributes to a high percentage of the accidents, a maximum speed limit is selected that will bring down the overall speed at the location to a satisfactory level.

Existing conditions on the rural sections of Virginia's interstate highways will not violate the engineering tenets if the speed limit is increased. Most rural sections were designed for 70 mph, and the current 85th percentile speed on these highways is 65 mph. For the few sections of the rural interstate system where accident rates are higher than the critical rate, speed limits may be lowered by the commissioner of the VDOT. Because of the rural nature of these highway sections, traffic characteristics have no significant effect on their speed limit.

The traffic engineering criteria for speed zoning have been interpreted somewhat differently by the various states. Through surveying other states, the researchers found that some states, in accordance with state legislation, raised the speed limit on all rural interstate highways to 65 mph. Other states determined where the higher limit would be inappropriate by considering certain traffic engineering factors, which included: (1) Institute of Transportation Engineers' guidelines, (2) accident history, (3) design speed, (4) 85th percentile speed,

(5) traffic volume, and (6) level of service. Each of these factors is in keeping with normal traffic engineering practice.

In summary, this study has estimated that an increase in the rural interstate speed limit would have both positive and negative outcomes. The average speed traveled on the rural interstate highway system has already increased by 3.6 mph in Virginia; this is comparable to that experienced in states that have raised the speed limit. However, if the speed limit on the rural interstate highway system is raised from 55 mph to 65 mph, it is estimated that in the short run the average speed traveled on the rural interstate will increase by an additional 3 mph, to 63 mph. Increased speeds would be expected to result in increased stopping distances and an annual increase of between 6 and 18 fatalities and between 171 and 405 injuries. Further, injuries would likely be more severe as a result of the higher speeds traveled. If the average speed continues to increase in the long run, or if higher speeds spill over onto the urban interstate highway system or rural collector roads, then additional injuries and fatalities would be expected on those systems as well.

On the other hand, the primary quantifiable benefit of the higher limit would be a savings of 1.3 million hours in business and commercial travel time. This study has also found that almost 60% of the Virginians surveyed would prefer a 65 mph speed limit to a 55 mph limit on the rural interstate highway system. Finally, because of the current speeds, the geometric design, and the accident history of the rural interstates in general, it would be possible to raise the speed limit without violating traffic engineering tenets for setting speed limits. However, if the speed limit is raised, establishing a truck speed limit differential below the limit established for passenger cars would promote increased speed variance between cars and trucks, thereby creating a more dangerous environment than if the speed limit were raised to the same level for both cars and trucks.

As is the case with most complex issues, there is no option that will provide only positive outcomes. The decision maker must weigh the facts and decide the course of action that Virginia should take. Regardless of the decision, there will be some loss and some gain, but hopefully an informed and carefully considered decision will provide for the best possible outcome.

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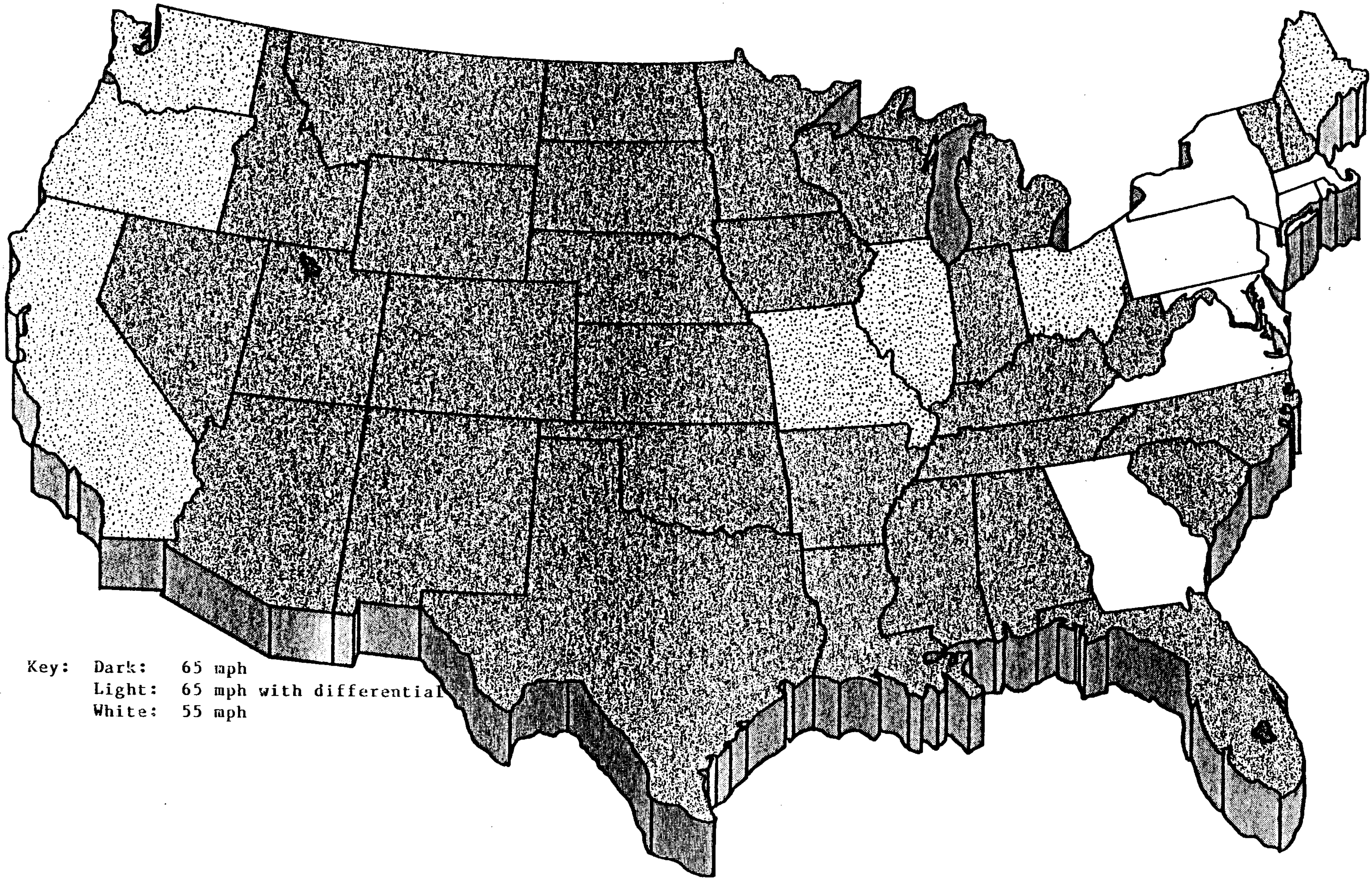
INTRODUCTION

In January of 1987, Congress passed the Surface Transportation and Uniform Relocation Assistance Act of 1987, amending the Emergency Highway Energy Conservation Act of 1974, which originally set the National Maximum Speed Limit (NMSL) at 55 mph. The new act, which allows states to raise speed limits on rural interstates to 60 mph or 65 mph, went into effect on April 2, 1987. As of this writing, 38 states have raised speed limits on all or some qualifying roads. These states are noted on the map in Figure 1. Some states have raised limits on all qualifying roads, but other states were more selective: they performed traffic engineering and safety studies to determine where the speed limit could be raised safely.

Congressional action to remove the speed limit ceiling came after years of debate on the subject and after extensive political opposition to the so called "double nickel," primarily from persons in the western United States where population density is low and where there are lengthy stretches of flat rural landscapes.

In Virginia, both the Governor and the Secretary of Transportation and Public Safety reacted cautiously to the opportunity to increase speed limits because of the persistent debates on the issue and the uncertainty concerning the likely effects in Virginia, an eastern seaboard state with significantly different geographic and population characteristics than those found in the west. This report examines a number of issues related to raising the rural interstate speed limit in Virginia.



Key: Dark: 65 mph
Light: 65 mph with differential
White: 55 mph

Figure 1. States Implementing Raised Speed Limits in 1987

PURPOSE AND SCOPE

Seldom has an issue been more extensively studied without reaching a definitive answer than the question of how the 55 mph NMSL is related to reducing traffic fatalities. Some believe that the 55 mph NMSL has had no impact on traffic safety and has cost the American public millions of hours each year in increased travel time. Others believe that it has been a vital component in reducing fatalities between 1973 and the present.

The purpose of this study was to examine the 55 mph and 65 mph speed limits as objectively as possible and to determine whether increasing the speed limit on Virginia's rural interstate system represents a viable and cost-beneficial option. The primary questions addressed through this investigation were:

1. What are the economic and safety outcomes likely to be for each of the possible speed-related options? These options include:

- Retaining the 55 mph speed limit on all Virginia roadways
- Raising the speed limit on the rural interstate system by 5 or 10 mph
- Raising the speed limit only on selected rural interstate segments based on appropriate studies

2. Under what specific conditions is it appropriate to raise speed limits?

To answer these questions, this study has gathered data in order to investigate fully and objectively a number of the issues related to the possible increase in the speed limit on the rural interstate system in Virginia.

- What impact would raising the speed limit have on average and 85th percentile speeds?
- What would be the economic costs and benefits of raising the speed limit?
- What would be the administrative costs of raising the speed limit?
- How would stopping distances, traffic fatalities, and crash severity be affected by increased speed limits?

- How would the vehicle fleet and vehicle mix of today be expected to impact on crash severity?
- What reasons were given for raising the speed limit in the states that have already enacted a change, and what guidelines do those states' laws provide?
- How would the effectiveness of Virginia's mandatory safety belt use law be affected by an increase in the rural interstate speed limit?
- Would a speed limit differential between cars and trucks benefit safety?
- How would either retaining or increasing the speed limit be related to Virginia's compliance with the federal 55 mph compliance monitoring program?

Obviously, because of the great uncertainty that surrounds many of these questions after years of careful research, their answers will in all likelihood remain elusive at the conclusion of this investigation. However, the operative premise here is that a convergence of evidence will lead to an informed decision.

METHODOLOGY

Obviously, all of the issues related to the debate over retaining or raising the speed limit on rural interstates could not be the subject of an original and in-depth analysis in this report. Yet, many of the major issues were discussed, evaluated, and applied to the prevailing circumstances in Virginia.

Where possible, the researchers used an original data analysis to supplement a review of the literature on a given issue. However, when an original data analysis was not possible, the literature was carefully reviewed and the findings of the most methodologically sound studies were used to estimate the anticipated outcome of a policy decision in Virginia.

On issues for which sound studies are in short supply or for which there is little or no convergence as to what outcome might be expected, the researchers developed and presented a number of scenarios and assessed which of those scenarios would most likely unfold should Virginia retain or raise the speed limit on the rural interstate system.

The remainder of this section of the report outlines the major issues of the study and how each issue was evaluated.

Average and 85th Percentile Speeds

Average and 85th percentile speeds are the key data elements on which this study was built. Raising the speed limit on the rural interstate system would have little or no impact on the economy, energy consumption, or traffic safety if average and 85th percentile speeds were not affected. However, if raising the speed limit drastically alters speeds, then a change in the speed limit would impact the economy, energy consumption, and traffic safety.

There is a wealth of information in the literature concerning how the enactment of the 55 mph NMSL affected average and 85th percentile speeds. Many studies have used this information to estimate the impact of raising the speed limit to 65 mph. However, most of these studies estimate the impact of raising the speed limit to 65 mph on all types of roadways, not just the rural interstate highways.

To supplement what was found in the literature, data on average and 85th percentile speeds were analyzed, and speed distributions for the rural and urban interstate systems and for the other 55 mph roads in Virginia and in other states were examined. These data were assessed to determine how Virginia's speed data compare to states that have already enacted an increased speed limit. Analyzing 1986 and current speed data permitted the study to control for differences that existed before the changes in other states' speed limits were enacted and to control for any changes in Virginia's speeds that have occurred since the enactment of the federal enabling legislation.

Combining the findings of the literature with this preliminary evaluation of the effects of the ongoing and natural experiment produced a reasonable estimate of what average and 85th percentile speeds should be expected on the rural interstate system. Further, this approach was used to estimate whether and how speeds on the urban interstate and other 55 mph roadway systems would be affected by raising the speed limit on the rural interstate. These estimates were then used throughout the study as a basis for evaluating the consequences of retaining or raising the speed limit.

Speed, Stopping Distance, and Crash Severity

There is a consensus in the literature that both stopping distances and crash severity are directly related to increased speeds. Hence, if increasing the speed limit results in increased speeds on the rural interstate, more crashes and more severe crashes can be expected.

The anticipated change in average speed, not the change in the speed limit, was used to calculate the expected change in stopping distance. Further, a multiple regression analysis was performed on Virginia's crash data compiled during the past 20 years to estimate the impact of average speeds on traffic injuries and fatalities on the rural interstate. This analysis isolated the effects of average speed from another relevant factor, vehicle miles of travel (VMT).

This analysis concentrated exclusively on the rural interstate because it is the only roadway that will officially be affected by an increased speed limit. There is a growing concern that the impact of a speed limit increase on the rural interstate system would also adversely affect the urban interstate system and the other 55 mph roadway systems through a "spillover" effect, but at this time there is no concensus on how to estimate the chance or magnitude of such an impact. Neither are there data available to examine the "spillover" that may occur at Virginia's borders because other states have enacted a 65 mph speed limit.

Economic Costs and Benefits

Many studies have been conducted to estimate the economic costs and benefits of changing the speed limit. This study looked only at the real impact that a speed limit change would have on the economy through actual changes in the average speed, rather than assuming that all traffic moves at the speed limit. Again, this approach is consistent with the assumption that a change in the speed limit, per se, will have no impact on the economy, energy consumption, or traffic safety if it has no impact on average and 85th percentile speeds.

Opinion Research

A series of surveys were conducted to provide information on how individuals and groups perceive the speed limit issue. The general public was polled concerning their views on retaining or raising speed limits (see Appendix A). Officers of special interest groups were also contacted to determine if their organizations have an official position concerning the issue (see Appendix B). Additionally, the legislative history of the speed limit statutes was researched, and any available speed data were obtained by contacting the appropriate state agencies in other states (see Appendix C and Appendix D).

The public opinion poll was conducted by telephone during a two-week period in September of 1987. Questions concerning the ideal maximum speed limit for Virginia and the person's preference between retaining the 55 mph speed limit and raising the speed limit to 65 mph on rural interstates were asked along with several demographic questions. The survey hours were from 5:00 P.M. to 9:00 P.M. Monday through Friday, 12:00 noon to 5:00 P.M. on Saturday, and 1:00 P.M. to 8:00 P.M. on Sunday. The survey began on September 11th and ran through September 28th. Telephone numbers for the survey were generated by randomly selecting a valid telephone area code and prefix for Virginia and attaching a randomly generated four-digit number.

During the survey period, a total of 1380 households were contacted, yielding a statistical precision of ±1.9 percentage points (see Appendix E). During that same time period, 84 special interest groups were contacted concerning their official and unofficial positions on the speed limit issue. Finally, other states were contacted to determine the mechanics with which their speed limits were raised and to obtain any available data on the consequences of that increase.

Federal Compliance Monitoring Program

One of the major issues that led to the call for the federal government to release to the states the ability to raise the speed limit was the lack of compliance with the 55 mph NMSL, particularly on the rural interstates. Unfortunately, leaving the compliance monitoring program intact may force the states to raise the rural interstate speed limit in order to avoid a federal non-compliance penalty. However, if raising the rural interstate speed limit results in higher speeds on the urban interstate system and on the other 55 mph roadways, then Virginia and the other states may be forced out of compliance. Anticipated changes in average and 85th percentile speeds were used to determine whether raising the rural interstate speed limit would affect Virginia's compliance with the monitoring program. Further, a review of the current Virginia speed data enabled an evaluation of how retaining the 55 mph speed limit might affect Virginia's compliance with regard to the monitoring program.

Vehicle Fleet and Vehicle Mix

There has been some concern that smaller cars, larger trucks, and higher speeds are trends that will combine to increase crash severity. Through a review of the literature, the researchers investigated whether and how the characteristics of the vehicle fleet and the vehicle mix might interact with any changes in average and 85th percentile speeds to produce a change in crash severity.

Administrative Costs and Benefits

How much will it cost the Commonwealth to retain or raise the rural interstate speed limit? An increase in the speed limit would at least involve the costs of signing the interstate for the increased limits. The VDOT maintains records on the per-unit costs of installing signs, so estimating this cost was determined relatively easily.

However, one issue that cannot be estimated easily is that of the impact that either retaining or raising the rural interstate speed limit would have on enforcement. If there would be greater compliance with an increased speed limit than there is with the 55 mph speed limit, then the enforcement burden on rural interstates would be less than retaining the 55 mph limit. On the other hand, if the speed limit is raised and if speeds increase on the urban interstate system and on the other 55 mph roadways through a "spillover" effect, then the burden on the Department of State Police could be even greater than it is today. Hence, anticipated compliance on the rural and urban interstate systems and on the other 55 mph roadways is critical in estimating the administrative costs and benefits to the Department of State Police for retaining or raising the speed limit.

Mandatory Safety Belt Use Law

There has been some concern that increasing the speed limit might negate much of the impact that Virginia's mandatory safety belt use law

(MUL) will have on traffic safety. A range of estimates have already been made concerning how many lives the MUL might save, and this report has attempted to provide a range of estimates for lives that might be lost under a new speed limit policy. The researchers caution, however, that these two policies are not necessarily related. To determine if a relationship exists between these two policies, the literature was reviewed to determine how a change in average speed on the rural interstate might be related to the effectiveness of safety belts in preventing deaths and injuries.

Speed Differential

Virginia has a long history of imposing differential speed limits for cars and for trucks in excess of 7,500 pounds, which ended in 1973 with the enactment of the 55 mph speed limit for all vehicles. To date, at least seven of the thirty-eight states that have enacted a 65 mph speed limit have imposed a differential limit based on vehicle characteristics. Although there is much disagreement in the literature as to whether having a speed differential is safer than not, the researchers presented and weighed the positive and negative aspects of a differential and attempted to determine the safer option. To aid in making this decision, the researchers relied heavily on the literature and the current laws and policies of other states.

SHOULD VIRGINIA RETAIN OR RAISE RURAL INTERSTATE SPEED LIMITS?

Theory of Speed Zoning

The establishment of appropriate maximum speed limits for different sections of highways is usually referred to as speed zoning. The primary objective in speed zoning is to inform the motorists of the maximum safe speed at which vehicles can be driven when conditions are such that the geometric characteristics of the highway section govern. In addition, speed zoning can be used to facilitate the flow of traffic and to assist motorists in selecting appropriate speeds for specific environmental conditions. Speed control can be classified as advisory or regulatory.

Advisory Controls

These controls advise motorists of the maximum safe speed at a specific site during specific environmental or traffic conditions. These maximum speeds are usually not enforceable; but in some court jurisdictions, the court may consider a driver to be driving recklessly when driving above the posted advisory speed.

Regulatory Controls

Regulatory controls specify speed limits that are enforceable. They can be divided into the following two subcategories: (1) those that are established by legislation and applicable nationwide, statewide, or countywide, and (2) those that are established by administrative action based on engineering studies. For example, the 55 mph NMSL on the interstate system was established by federal legislation and was applicable throughout the nation, but posting a maximum of 50 mph at a specific section of an interstate highway in Virginia would be the result of an engineering judgment followed by an administrative action.

In addition, numerical maximum speed limits can also be classified into two types: (1) the absolute limit, above which it is illegal for any driver to drive, regardless of the traffic, highway, and environmental conditions, and (2) the prima facie limit, above which a driver is considered to be speeding. If charged with a violation of the prima facie limit, a driver has the right to produce evidence to show that the speed at which he or she was driving was safe for the conditions that existed at that time, and was, therefore, not guilty of speeding. It is, therefore, more difficult to enforce prima facie speed limits because it is more difficult to prove guilt in a court of law.

Enforcement officers therefore prefer absolute speed limits, and this type is commonly used in regulatory speed control.

It is essential that speed limits be based on sound engineering judgment, coupled with a detailed analysis of the data on traffic and geometric characteristics. The factors normally taken into consideration by traffic engineers in setting speed limits can be divided into the following four general categories:

1. Prevailing vehicle speeds
2. Physical features
3. Accident history
4. Traffic characteristics

A number of speed characteristics are usually considered in determining prevailing vehicle speeds. These include the 85th percentile speed, the mean speed, the 10 mph pace, and the speed distribution. Each of these terms is defined below.

85th Percentile Speed

This is the speed at or below which 85 percent of the drivers drive on a specific section of highway. This speed has been selected by traffic engineers as the maximum speed limit for two reasons. First, it is postulated that most drivers are reasonable and do not want to be involved in an accident and will therefore usually select a speed that in their judgment is safe for the prevailing geometric, traffic, and environmental conditions. Selection of the 85th percentile speed as the maximum speed limit will, therefore, cover the usual speed of 85 percent of the drivers. Second, an examination of a typical cumulative speed distribution curve, as shown in Figure 2, will indicate that above the 85th percentile speed value, speeds usually become more dispersed and the curve flattens out significantly. The selection of the 85th percentile speed will, therefore, aid in controlling the dispersion of speeds.

The suitability of the 85th percentile speed as the maximum safe speed has also been supported by studies carried out by several researchers, including Cirillo (1) and Soloman (2). These researchers have shown that accident involvement rates are lowest at the 85th percentile speed, whereas accident risk increases significantly at speeds higher or lower than the 85th percentile value.

The selection of the 85th percentile speed as the maximum speed limit on specific sections of highways therefore seems reasonable both in terms of safety and driver's desire, and it has therefore become a major criterion used for setting maximum speed limits.

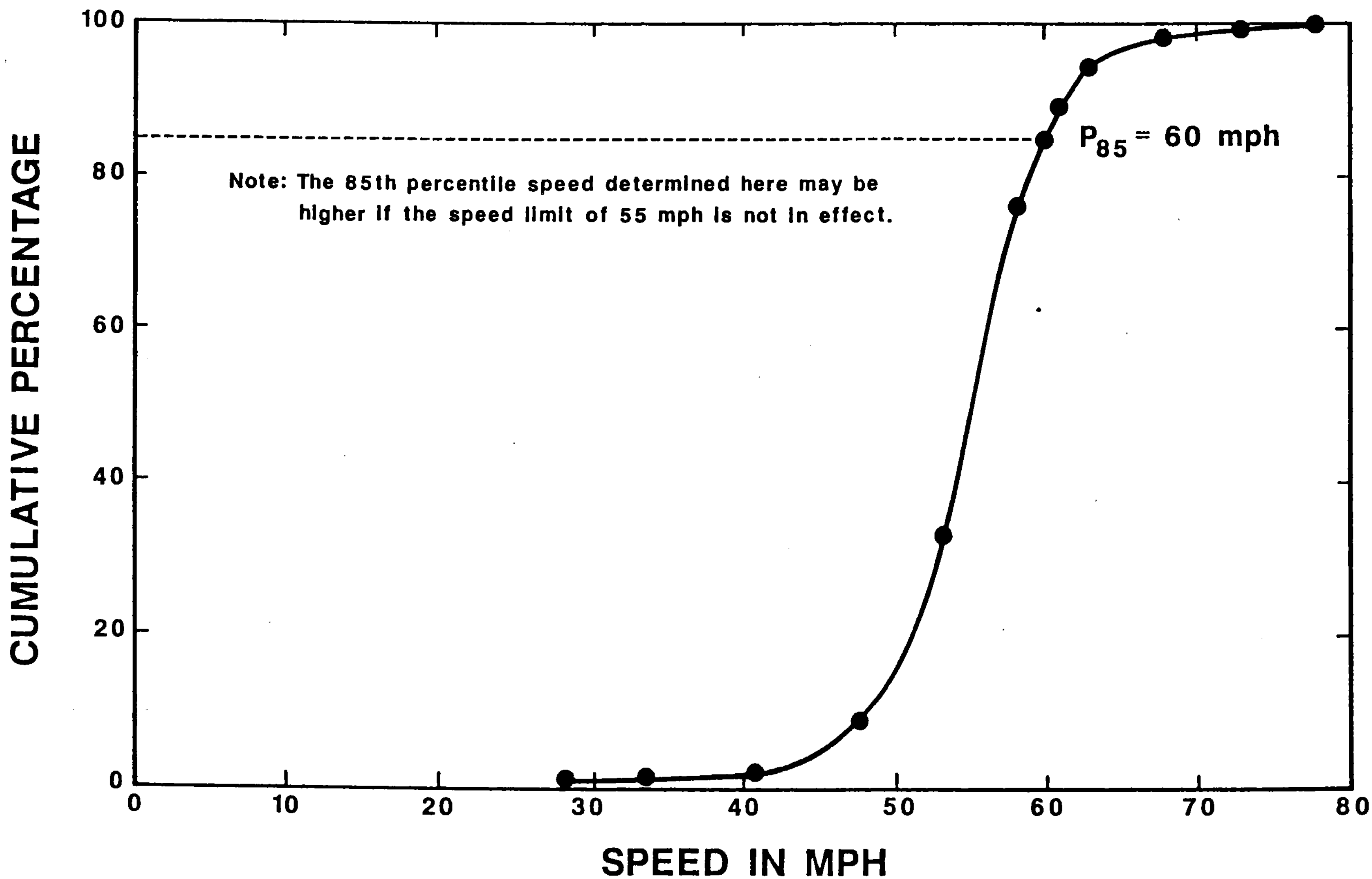


FIGURE 2. Cumulative Speed Distribution for a Rural Interstate Section

Mean Speed

In traffic engineering, two types of mean speeds are usually of importance; time mean speed and space mean speed. The time mean speed is the arithmetic mean (average) of the speeds of vehicles passing a point on a highway during an interval of time, while the space mean speed is the harmonic mean of the speeds of vehicles passing a point on a highway during an interval of time. Space mean speed is mainly used in determining traffic flow characteristics, while time mean speed is normally used as one of the significant variables describing the speed characteristics on the highway. The time mean speed is therefore considered more often in this report. Although the time mean speed at a particular section of highway is normally not selected as the maximum speed limit, it can play an important role in determining an appropriate speed limit. Studies conducted by the Federal Highway Administration have shown that the accident involvement rate is significantly influenced by the variation of speeds from the mean speed. Figure 3 shows that accident involvement rate is lowest at a speed that is about 10 mph higher than the mean speed. Also, data collected on most highways indicate that the 85th percentile speed is usually between 6 mph and 10 mph above the mean speed. The selection of a speed limit of about 6 mph to 10 mph above the mean speed will, therefore, stipulate a speed limit that is approximately equal to the 85th percentile speed.

10 mph Pace

Pace is that range of speeds that includes the largest percentage of vehicle speeds. In traffic engineering a 10 mph speed range is usually considered. For example, if a set of speed data includes speeds between 30 mph and 60 mph, the speed intervals could be 30 mph to 40 mph, 40 mph to 50 mph, and 50 mph to 60 mph. The pace will be 40 to 50 mph if the highest percentage of drivers drive within this speed range. Studies have shown that when speeds are normally distributed, about 70 percent of the vehicle speeds will be within the pace, about 15 percent below, and about 15 percent above.

The pace is commonly used to determine the value above which the maximum speed limit should be selected, in that maximum posted speed limits are usually selected higher than the lower limit of the pace. Although a few researchers have proposed other relationships between the maximum speed limit and the pace, these relationships have not been commonly used by traffic engineers.

Speed Distribution

The distribution of spot speeds on a section of highway can also play a significant role in the selection of maximum safe speeds. The

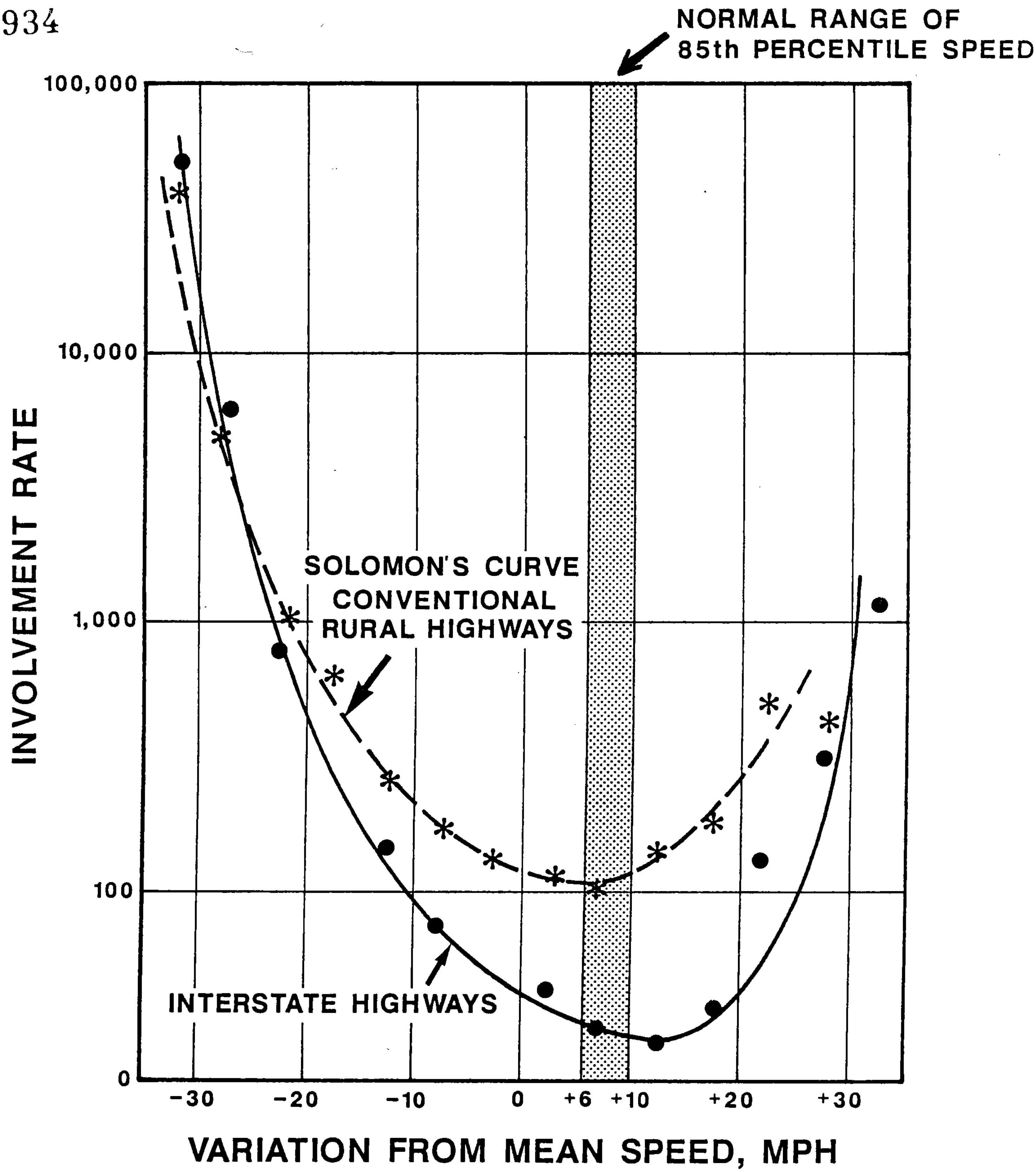


FIGURE 3. Accident Involvement vs. Variation from Mean Speed

main characteristics of the speed distribution that may be considered in setting speed limits are the variation in speeds and the skewness of the speeds. These can be most easily depicted by mapping the percentage of motorists traveling at each speed (see Figure 4). The variance of the distribution determines how similar the speeds of all motorists are. For instance, in graph A, most of the motorists are traveling at approximately the same speed, right at 60 mph. This graph depicts low variation, a condition in which accidents are less likely to occur. In graph B, motorists' speeds are not so consistent and vary considerably, a more dangerous condition.

The skew is a measure of the symmetry and normality of a curve. A symmetric distribution will have a skew of zero, while a nonsymmetric distribution will have a positive or negative skew depending on the location of the tail of the distribution curve. The symmetry of a speed distribution indicates whether equal numbers of drivers are driving faster or slower than the most common speed. Graph C illustrates a symmetrical distribution in which equal numbers of drivers are driving faster than 60 mph than are driving slower than 60 mph. In graph D, however, more drivers are driving faster than 60 mph than are driving slower, indicating less symmetry. Roadways on which speed distributions are symmetrical tend to be safer than those that have skewed distribution. It will be shown later in the crash severity section of this report that the more skewed a speed distribution is, the higher the accident rate. This theory was postulated by Taylor (3) from the results of a study in which he found out that accident rates were higher in areas in which speed distributions were not symmetrical:

1. There is a strong relationship between the rate of occurrence of accidents and the speed distribution on rural state highways. The accident rate is significantly higher where the speed distribution is non-normal, and the accident rate is reduced when the distribution is changed to a normal one.

2. The best parameter to use in determining non-normality is the skewness of the distribution.

3. Changing the speed distribution from non-normal to normal results in an accident rate reduction that is about twice that found under any other set of before-and-after conditions.

4. Warrants for speed zoning should be established that include the speed distribution as a factor.

5. The "before" speed distribution alone is not adequate as a warrant for speed zoning.

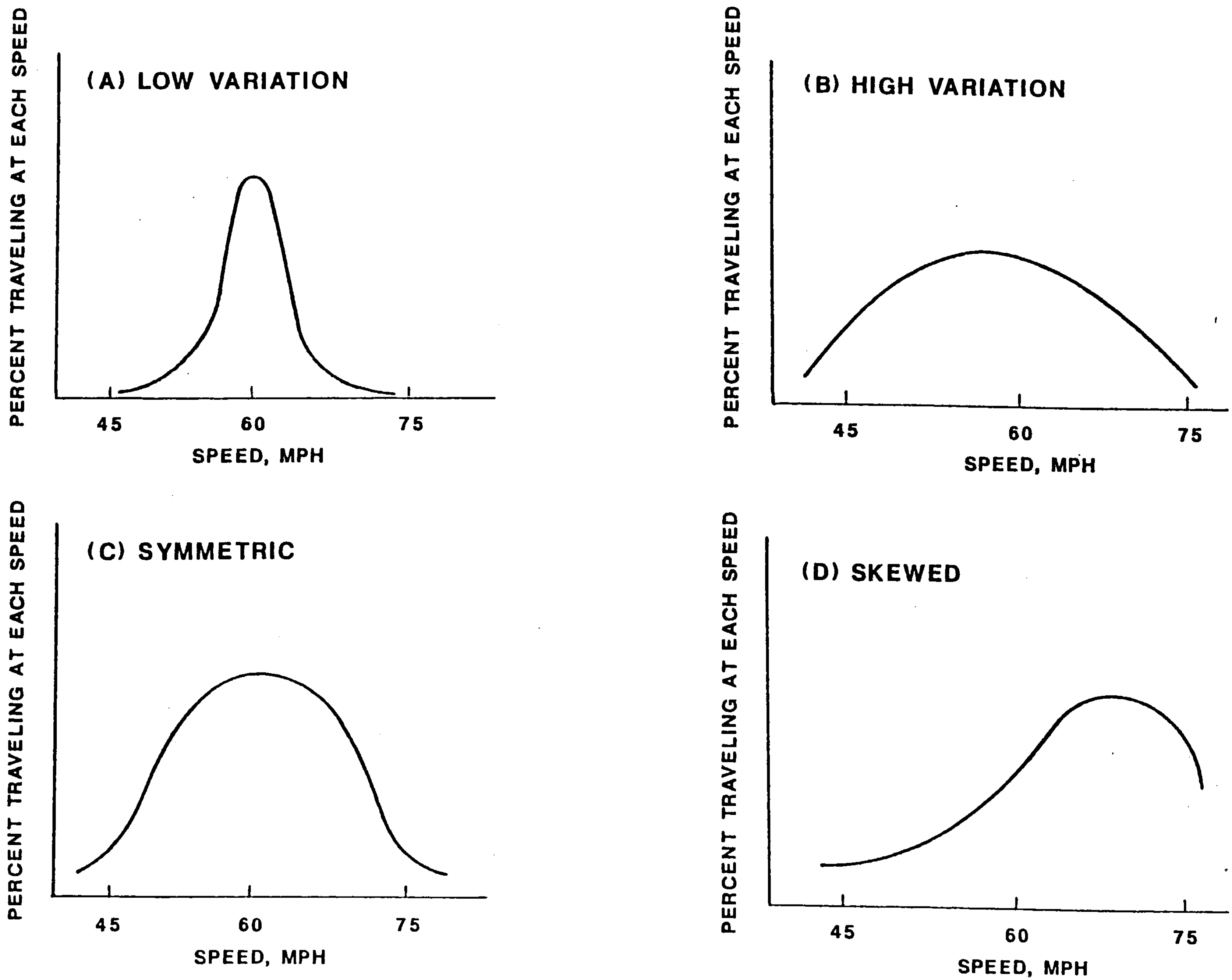


FIGURE 4. Possible Speed Distributions

The objective in using the speed distribution to determine a maximum speed limit is to obtain a symmetrical speed distribution curve and a low variance of the speeds of the individual drivers.

Physical Features

The decision whether or not a speed zone should be established and what should be the value of the maximum speed limit usually involves the evaluation of the physical features of the section of the road being considered. The main features considered for rural highways are the vertical and horizontal alignments. For example, the maximum speed stipulated for a section of highway is usually selected such that the available sight distance at that section is at least equal to the stopping distance for that speed, which is defined as total distance traveled by the vehicle from the time the driver observes an object on the road to the time the vehicle comes to a rest. This speed is usually referred to as the design speed, and it is defined as "the maximum safe speed that can be maintained over a specified section of highway, when conditions are so favorable, that the design features of the highway govern" (4).

When the design speed of the highway section is used as the maximum speed limit, other geometric features, such as minimum radius of horizontal curves and minimum length of vertical curves, will be satisfied for the selected speed limit.

It is therefore customary for posted speed limits not to be higher than the design speeds. It is, however, impractical to change posted speed limits within distances of less than 1000 ft. The permitted minimum length of a speed zone is therefore 0.2 miles, although much longer lengths are used in practice. When a very short section with restrictive geometric characteristics such as a sharp horizontal curve exists on a stretch of highway, an advisory sign indicating the maximum safe speed may be posted instead of posting a lower speed limit.

Accident History

In setting maximum speed limits, it is necessary to review the accident experience at the highway section being considered in terms of frequency, severity, type, and cause. A comparison is usually made between the average accident rate at the site and the critical accident rate in the area for the type of highway being considered. The critical accident rate is that rate above which accident occurrence is higher than the expected. Critical accident rates are computed from mathematical formulae that are different from one state to another. When the accident rate is higher than the critical rate, and it can be ascertained that speeding is a contributing factor to a high percentage of the accidents, a maximum speed limit is selected that will bring overall speed at the highway location to appropriate levels. It should be noted that in some cases this may require raising existing restrictive speed limits, which may result in reduced collision frequency and accident rates.

Traffic Characteristics

Traffic characteristics and control are usually considered when maximum speed limits are being determined. Factors usually considered are peak and off-peak traffic volumes, proportion of commercial vehicles in the traffic streams, parking, traffic signals, and other traffic control devices. The objective is to determine a maximum speed limit that will enhance the efficient flow of traffic. Since most of these factors are considered in the determination of the level of service on any section of highway, the consideration of traffic characteristics on the selection of speed limits usually implies the selection of the speed limit that will maintain at least a required level of service. A minimum level of service C is usually adopted for rural highways.

ITE Recommended Guidelines

The Institute of Transportation Engineers developed a check sheet (see Table 1) for speed zones based on some of the factors discussed earlier. This check sheet is frequently used to aid traffic engineers in selecting appropriate maximum speed limits. The Institute of Transportation Engineers also developed the following guidelines for determining where the 55 mph speed limit could be raised:

1. Freeway segments only, with full control of access and complying with freeway design standards.

2. Level of service C or higher with a traffic density less than 30 passenger car equivalents per mile per lane in the peak hour.

3. A minimum segment length of 10 miles.

4. Engineering and traffic study that should include:

    a. Analysis of compliance with freeway design standards for appropriate design speed.

    b. Accident analysis and comparison with statewide average rates.

    c. Capacity and level-of-service calculations.

TABLE 1

ITE Check Sheet for Speed Zones

Part 1

HIGHWAY CONDITIONS (THREE OR MORE MUST BE SATISFIED)				
Design Speed (mph)	Minimum Length of Zone Equals or Exceeds (miles)	Average Distance Between Intersections Equals or Exceeds (feet)	Number of Roadside Businesses does not Exceed Per Mile	Preliminary Estimate of Maximum Speed (mph)
20	0.2	no min.	no max.	20
30	0.2	no min.	no max.	30
40	0.3	125	8	4
50	0.5	250	6	50
60	0.5	500	4	60
70	---	1000	1	70

Part 2

SPEED CHARACTERISTICS (TWO OR MORE MUST BE SATISFIED)			
85th Percentile Speed Between (mph)	Limits of 10-mph Pace Between (mph)	Average Test Run Speed Equals or Exceeds (mph)	Maximum Proposed Speed Limit (mph)
under 22.5	under 25	17.5	20
22.5-27.5	11-29	22.5	25
27.5-32.5	16-34	27.5	30
32.5-37.5	21-39	32.5	35
37.5-42.5	26-44	37.5	40
42.5-47.5	31-49	42.5	45
47.5-52.5	36-54	47.5	50
52.5-57.5	41-59	52.5	55
57.5-62.5	46.64	57.5	60
62.5-67.5	51-66	62.5	65
67.5 or over	over 55	67.5	70

d. Roadway features, such as length proposed, interchange locations, terrain considerations.

e. Speed characteristics, traffic volumes, vehicle types, and freeway flow considerations.

f. Special features or considerations relating to roadway segment.

g. Current status and quantity of existing enforcement.

h. Need to exclude specific vehicles from higher speed zoning.

i. Concurrence of responsible engineering and enforcement authorities.

5. Monitoring study and analysis.

Virginia Rural Interstate Characteristics and Engineering Tenets

The physical features of the rural sections of Virginia interstate highways and the existing traffic characteristics indicate that the factors discussed above will not be violated if Virginia increases the speed limit. For example, the current 85th percentile speed is 65 mph on the rural interstate highways, and setting the speed limit at 65 mph will therefore not violate the 85th percentile concept. Also, the design speed for most sections of these rural interstate highways is 70 mph, which in general satisfies the design speed criteria. Since the commissioner of the VDOT has the authority to lower the speed limit on specific sections of highways within the state, those short sections with design speeds of less than 65 mph can be identified and current procedures used to identify appropriate speed limits for them.

Average and 85th Percentile Speeds

As part of its detailed consideration of the engineering aspects of a possible change in the 55 mph speed limit, the traffic engineering division of the VDOT analyzed speed data from the rural interstate system in Virginia (5). The results of their analysis confirm speed trends nationally and in other states. As shown in Figure 5, speeds on the rural interstate system were increasing during the nine years prior to adoption of the 55 mph NMSL from an average of 60.3 mph in 1966 to 66.2 mph in 1973 (the speed limit for passenger cars in the state was increased to 70 mph in 1972). In 1974, coincident with the lowering of the speed limit, average speed dropped to 58.7 mph. From that time through 1986, annual average speeds oscillated between 57.1 and 60.4

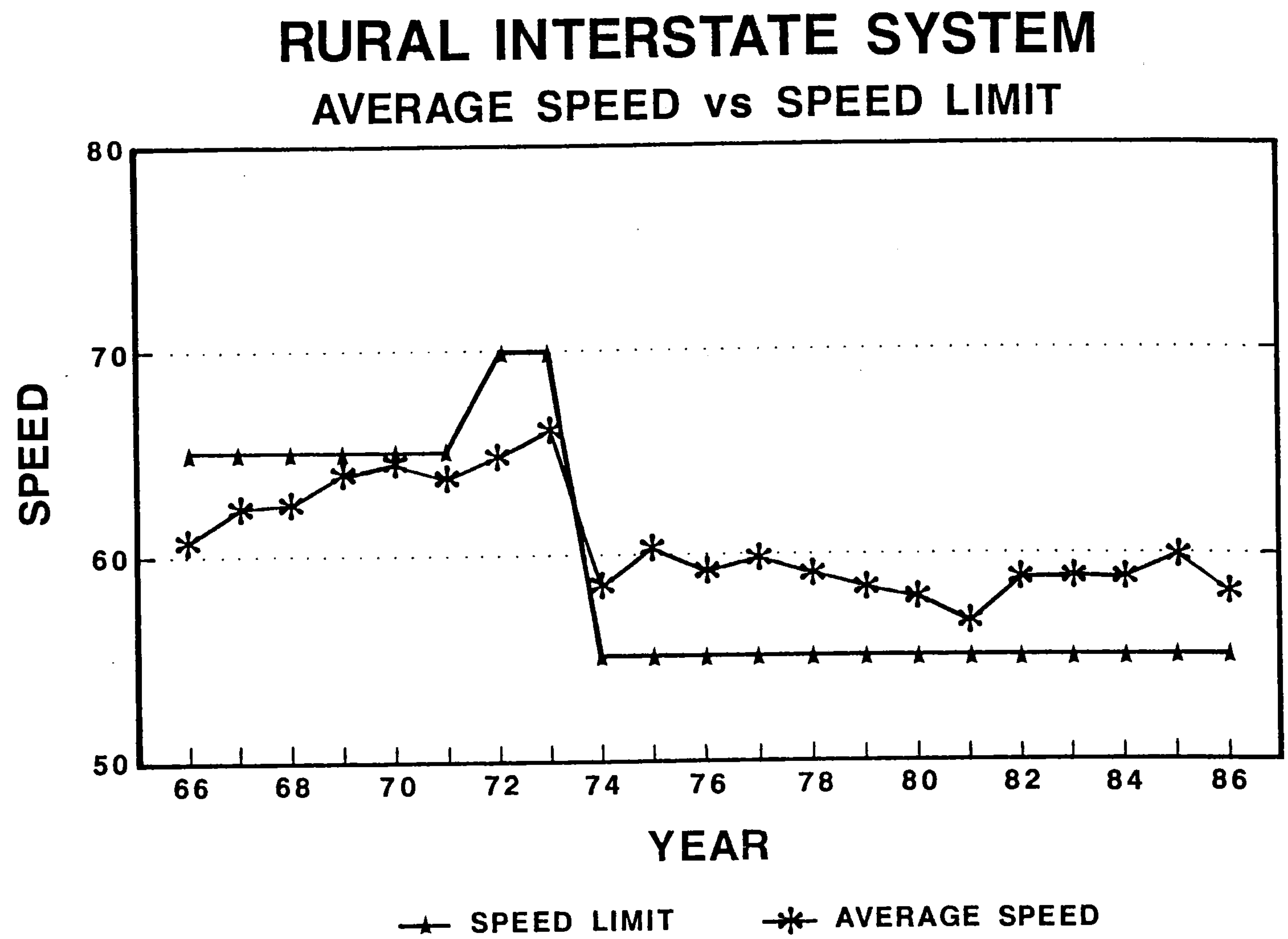


FIGURE 5. Rural Interstate Average Speed vs. Speed Limit in Virginia, 1966-1986.

mph. A similar trend exists for the 85th percentile speed (see Figure 6). In 1971 and 1973, 85th percentile speeds were 70.6 and 73.6 mph, respectively. This figure dropped to 66 mph in 1974 and in early 1987 stood at 68 mph. It is interesting to note that prior to the institution of the 55 mph speed limit, 85th percentile speeds fell within 3 to 5 mph of the speed limit of the time. After establishment of the 55 mph limit, 85th percentile speeds were between 9 and 13 mph higher than the speed limit.

Since the imposition of the 55 mph speed limit in late 1973, annual average speeds on Virginia rural interstates have exceeded 60 mph only once, in 1975. However, before the speed limit change, average speeds had been at least 62 mph on the rural interstate since 1967. Hence, the 55 mph speed limit can be credited with slowing the average speeds on the rural interstate.

Between 1986 and 1987, however, both average and 85th percentile speeds increased in Virginia. In the third quarter of the federal fiscal year 1986, the average speed on the rural interstates was 56.3 mph. In the same quarter in 1987, after the much-publicized passage of the federal enabling legislation, the average speed increased by 3.6 mph and rose to 59.9 mph. Median speeds have also risen from 57.0 mph in 1986 to 60.0 mph in 1987. Likewise, in 1986 the 85th percentile speed on Virginia's rural interstate was 62 mph, but in 1987 the 85th percentile speed rose to 65 mph. Thus, it is likely that the federal enabling legislation has had an impact on average, median, and 85th percentile speeds traveled on Virginia's rural interstates, even though the Commonwealth has yet to act on the issue.

As is shown in Table 2, states that have raised the rural interstate speed limit to 65 mph have also experienced an increase in average and 85th percentile speeds. Obviously, these data only indicate the short-term effect of the new speed limit on average and 85th percentile speeds, because when the data were collected the change had been in effect for fewer than four months in all cases. However, the experience of other states provides the only contemporary empirical data of the impact on average and 85th percentile speeds of raising the speed limit to 65 mph on the rural interstates.

In Arizona, the average speed increased by 2.6 mph and the 85th percentile speed by 2.8 mph on rural interstates monitored in June of 1987 over the speeds monitored the previous year. Likewise, in June of 1987, the average and 85th percentile rural interstate speeds in Arkansas were each 4.0 mph higher than speeds monitored in March of 1987.

In California, the average speed on the rural interstate system had increased by 4.7 mph in September of 1987 and the 85th percentile speed

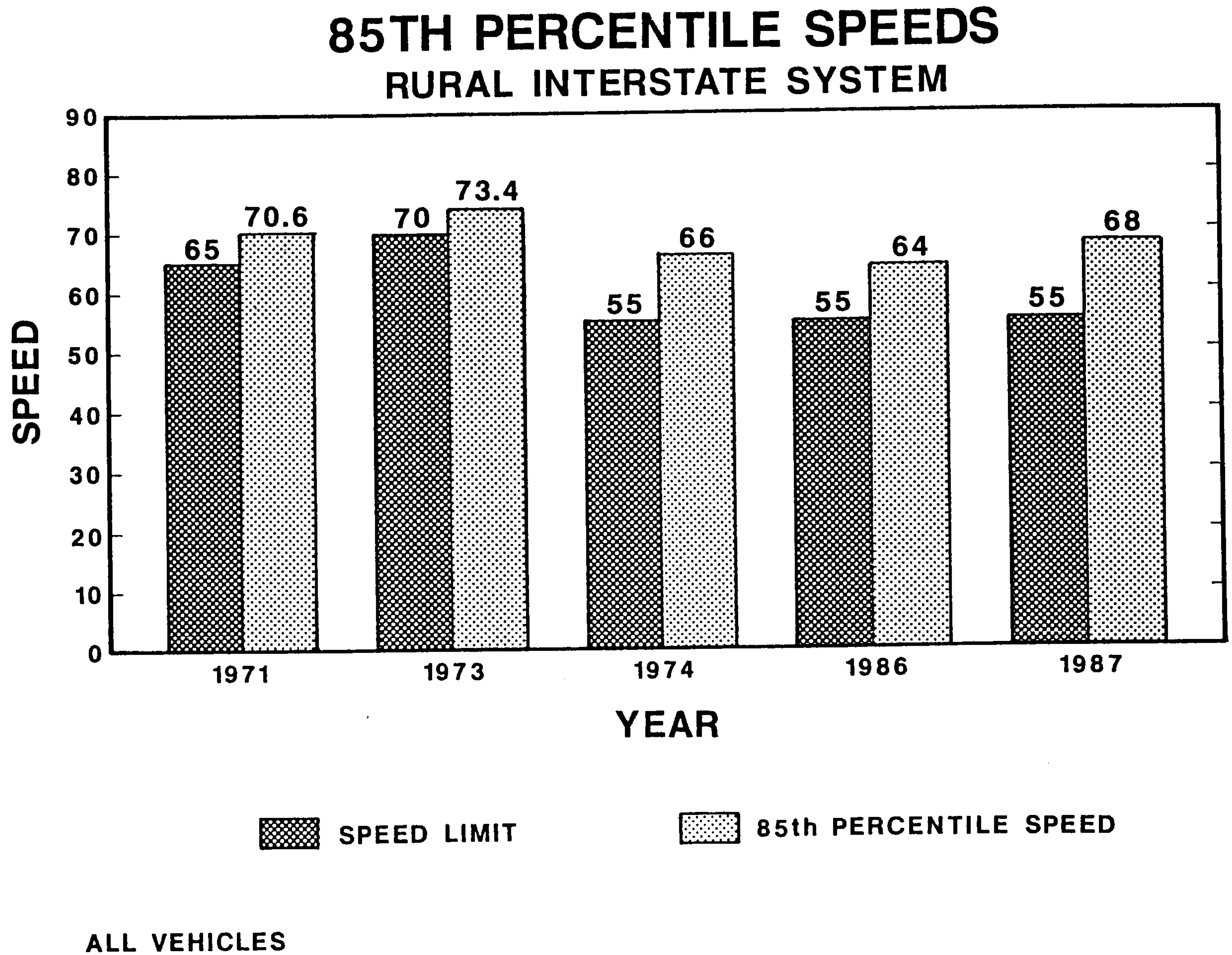


FIGURE 6. Rural Interstate 85th Percentile Speed vs. Speed Limit in Virginia

TABLE 2

Rural Interstate Speed Date for Selected States*

States With 65 mph Speed Limit

Arizona (enacted 4/15/87)

	Before (June 86)	After (June 87)
Average Speed	58.8 mph	61.4 mph
85th Percentile Speed	65.1 mph	67.9 mph
Percent of Vehicles Traveling Faster than the Speed Limit	76.1%	26.2%

Arkansas (enacted 4/20/87)

	Before (March 87)	After (June 87)
Average Speed	59.0 mph	63.0 mph
85th Percentile Speed	64.6 mph	68.6 mph
Percent of Vehicles Traveling Faster than the Speed Limit	74.2%	31.7%

California (enacted 5/14/87)

	Before (Sept. 86)	After (Sept. 87)
Average Speed	61.0 mph	65.7 mph
85th Percentile Speed	68.0 mph	73.7 mph
Percent of Vehicles Traveling Faster than the Speed Limit	83.0%	51.0%

Colorado (enacted 4/6/87)

	Before (June 86)	After (June 87)
Average Speed	58.8 mph	60.2 mph
85th Percentile Speed	64.9 mph	66.1 mph
Percent of Vehicles Traveling Faster than the Speed Limit	x	x

* NOTE: The speeds and percents listed are averages of the stations surveyed through the quarter including the date listed.

Florida (enacted 4/27/87)

	Before (Dec. 86)	After (Sept. 87)
Average Speed	62.1 mph	66.7 mph
85th Percentile Speed	67.9 mph	73.2 mph
Percent of Vehicles Traveling Faster than the Speed Limit	89.1%	61.6%

Idaho (enacted 5/5/87)

	Before (June 86)	After (June 1987)
Average Speed	58.1 mph	61.6 mph
85th Percentile Speed	65.2 mph	68.3 mph
Percent of Vehicles Traveling Faster than the Speed Limit	71.3%	27.3%

Illinois (enacted 4/28/87)

	Before (July 86)	After (July 87)
Average Speed	x	x
85th Percentile Speed	67 mph	68 mph
Percent of Vehicles Traveling Faster than the Speed Limit	x	26.7%

Indiana (enacted 6/1/87)

	Before (June 86)	After (June 87)
Average Speed	60.4 mph	62.6 mph
85th Percentile Speed	65.5 mph	67.5 mph
Percent of Vehicles Traveling Faster than the Speed Limit	81.7%	23.6%

Iowa (enacted 5/12/87)

	Before (Sept. 86)	After (Sept. 87)
Average Speed	58.9 mph	60.8 mph
85th Percentile Speed	63.8 mph	65.6 mph
Percent of Vehicles Traveling Faster than the Speed Limit	84.2%	16.9%

<u>Kansas</u> (enacted 5/14/87)

	Before (Sept. 86)	After (Sept. 87)
Average Speed	61.6 mph	64.9 mph
85th Percentile Speed	67.8 mph	71.1 mph
Percent of Vehicles Traveling Faster than the Speed Limit	85.4%	48.1%

<u>Mississippi</u> (enacted 4/14/87)

	Before (March 87)	After (June 87)
Average Speed	60.7 mph	64.7 mph
85th Percentile Speed	68.0 mph	68.8 mph
Percent of Vehicles Traveling Faster than the Speed Limit	82.5%	64.3%

<u>Missouri</u> (enacted 4/30/87)

	Before (April 87)	After (August 87)
Average Speed	60.6 mph	62.5 mph
85th Percentile Speed	x	x
Percent of Vehicles Traveling Faster than the Speed Limit	x	29.8%

<u>Montana</u> (enacted 4/16/87)

	Before (FY 86)	After (Sept. 87)
Average Speed	60.4 mph	63.0 mph
85th Percentile Speed	68.4 mph	69.7 mph
Percent of Vehicles Traveling Faster than the Speed Limit	70.4%	30.5%

<u>Nebraska</u> (enacted 4/28/87)

	Before (FY 86)	After (Sept. 87)
Average Speed	61.7 mph	64.6 mph
85th Percentile Speed	66.8 mph	69.2 mph
Percent of Vehicles Traveling Faster than the Speed Limit	90.1%	41.8%

Nevada (enacted 4/6/87)	Before (FY 86)	After (Sept. 87)
Average Speed	59.4 mph	62.8 mph
85th Percentile Speed	67.5 mph	70.3 mph
Percent of Vehicles Traveling Faster than the Speed Limit	77.1%	34.6%

New Hampshire (enacted 4/15/187)	Before (June 86)	After (June 87)
Average Speed	61.2 mph	61.6 mph
85th Percentile Speed	68.9 mph	68.6 mph
Percent of Vehicles Traveling Faster than the Speed Limit	88.6%	24.5%

North Dakota (enacted 4/8/87)	Before (Oct. 86 - Mar. 87)	After (Apr. - Sept. 87)
Average Speed	58.2 mph	64.5 mph
85th Percentile Speed	64.4 mph	70.4 mph
Percent of Vehicles Traveling Faster than the Speed Limit	82.0%	46.9%

Oklahoma (enacted 4/15/87)	Before (Sept. 86)	After (Sept. 87)
Average Speed	61.7 mph	63.7 mph
85th Percentile Speed	67.0 mph	69.0 mph
Percent of Vehicles Traveling Faster than the Speed Limit	87.0%	33.0%

South Dakota (enacted 4/15/87)	Before (Apr. - Sept. 86)	After (Apr. - Sept. 87)
Average Speed	59.2 mph	64.2 mph
85th Percentile Speed	62.6 mph	67.6 mph
Percent of Vehicles Traveling Faster than the Speed Limit	60.8%	32.2%

<u>Utah</u> (enacted 5/22/87)

	Before (June 86)	After (June 87)
Average Speed	60.0 mph	61.7 mph
85th Percentile Speed	65.0 mph	66.0 mph
Percent of Vehicles Traveling Faster than the Speed Limit	79.0%	49.0%

<u>Washington</u> (enacted 4/22/87)

	Before (June 86)	After (Aug. 87)
Average Speed	58.3 mph	62.4 mph
85th Percentile Speed	63.0 mph	69.2 mph
Percent of Vehicles Traveling Faster than the Speed Limit	71.2%	29.4%

<u>West Virginia</u> (enacted 5/9/87)

	Before (June 86- May 87)	After (Sept. 87)
Average Speed	60.7 mph	63.7 mph
85th Percentile Speed	x	x
Percent of Vehicles Traveling Faster than the Speed Limit	x	x

<u>Wisconsin</u> (enacted 6/17/87)

	Before (July 86)	After (July 87)
Average Speed	59.7 mph	62.5 mph
85th Percentile Speed	x	x
Percent of Vehicles Traveling Faster than the Speed Limit	75.8%	31.4%

States with 55 mph Speed Limit

Georgia (no decision)

	Before (June 86)	After (June 87)
Average Speed	61.4 mph	62.7 mph
85th Percentile Speed	65.7 mph	69.2 mph
Percent of Vehicles Traveling Faster than the Speed Limit	84.9%	89.5%

Pennsylvania (no decision)

	Before (Sept. 86)	After (Sept. 87)
Average Speed	59.7 mph	62.0 mph
85th Percentile Speed	67.5 mph	70.1 mph
Percent of Vehicles Traveling Faster than the Speed Limit	76.6%	81.4%

Virginia (no decision)

	Before (June 86)	After (June 87)
Average Speed	56.3 mph	59.9 mph
85th Percentile Speed	62.0 mph	65.0 mph
Percent of Vehicles Traveling Faster than the Speed Limit	60.5%	82.3%

by 5.7 mph over speeds of the previous September. In Colorado, the average speed in June of 1987 was up by 1.4 mph over the speed monitored for that time the previous year. The 85th percentile speed on Colorado's rural interstates had also increased by 1.2 mph. Rural interstate speeds have increased in Idaho as well, with the average speed up by 3.5 mph and the 85th percentile speed up by 3.1 mph. In Florida, the average speed was up by 4.6 mph in September of 1987, and the 85th percentile speed by 5.3 mph, over speeds monitored in December of 1986.

Although the researchers were not able to obtain data on the average speed in Illinois, data on that state's 85th percentile speed on the rural interstate system showed a 1 mph increase in June of 1987 over speeds monitored in June of 1986. Comparable data on Indiana's rural interstate system indicate that the average speed increased by 2.2 mph and the 85th percentile speed increased by 2.0 mph over the speeds surveyed for the same period in 1986. Likewise, in Iowa the average speed traveled on the rural interstate system was up by 1.9 mph in September of 1987 and the 85th percentile speed was up by 1.8 mph over the speeds traveled in the same period in 1986.

In Kansas, both the rural interstate average and 85th percentile speeds were 3.3 mph higher in September of 1987 than those monitored for the previous year. The average rural interstate speed in Mississippi was up by 4.0 mph in June of 1987 over the speed monitored in March of 1987. Mississippi's 85th percentile speed on the rural interstate system was up by 0.8 mph over the same period. Speed data for the state of Missouri indicate that the average speed increased by 1.9 mph in the first four months of the implementation of the 65 mph speed limit.

By September of 1987, the average speed on the rural interstate system in Montana had increased by 2.6 mph over that monitored for the federal fiscal year of 1986. Montana's 85th percentile speed had increased by 1.3 mph. In Nebraska, the average speed on the rural interstates was up by 2.9 mph in September of 1987 and the 85th percentile speed had increased by 2.2 mph over speeds recorded for the previous federal fiscal year.

By September of 1987, the average speed on Nevada's rural interstate system was 3.4 mph higher and the 85th percentile speed 2.8 mph higher than speeds recorded in the federal fiscal year of 1986. In New Hampshire, however, the average speed for the rural interstate system was only 0.4 mph higher in June of 1987 than speeds surveyed in the previous June. The 85th percentile speed was down by 0.3 mph. However, in North Dakota the average speed was up by 6.3 mph and the 85th percentile speed by 6.0 mph since the implementation of the new speed limit over speeds monitored in the first half of the federal fiscal year of 1987.

Both average and 85th percentile speeds on the rural interstate system in Oklahoma were up by 2.0 mph in September of 1987 as compared to those in the previous September. Likewise, both average and 85th percentile speeds were up by 5.0 mph between April and September of 1987 over speeds surveyed over the same time period in 1986.

In Utah, the average speed traveled on the rural interstate system was 1.7 mph higher in June of 1987 and the 85th percentile speed 1.0 mph higher than speeds recorded in the previous June. The average speed traveled on the rural interstate system in the state of Washington was 4.1 mph higher for speeds surveyed between June and August of 1987 over the speeds monitored for June of 1986. Washington's 85th percentile speed on the rural interstate system was up by 6.2 mph. The average speed traveled on West Virginia's rural interstate was 3.0 mph higher in the first three months of the new limit's implementation over speeds surveyed the prior year. In Wisconsin, however, little more than one month after the new limit's implementation, the average speed was recorded as being 2.8 mph higher than that recorded a year earlier.

Finally, Table 2 exhibits speed data for Georgia and Pennsylvania, two states that, like Virginia, have made no decision regarding retaining or raising the rural interstate speed limit. In Georgia, the average speed on the rural interstate system had increased by 1.3 mph and the 85th percentile speed by 3.5 mph in June of 1987 over speeds surveyed the previous year. In Pennsylvania, the average speed was up by 2.3 mph in September of 1987 and the 85th percentile speed by 2.6 mph over speeds monitored in the previous September.

These data consistently show that, with few exceptions, regardless of whether the speed limit was increased, both average and 85th percentile speeds on the rural interstate systems rose between 1 mph and 5 mph in the first several months after the passage of the federal enabling legislation. From the data listed in Appendix F, it is evident that when the speed limit was 65 mph on the rural interstates (the last full year of the 65 mph speed limit was 1971) average speeds ranged between 60.3 mph and 64.5 mph. If Virginia raises its rural interstate speed limit to 65 mph and if average speeds increase by between an additional 1 mph and 5 mph as has been the case in the other states, then average speeds in Virginia would again fall within this range. Hence, the researchers estimate that, based on Virginia's past experience with a 65 mph speed limit and based on the short-term experience of other states with the newly increased speed limit, average and 85th percentile speeds would increase in the short run by between an additional 1 mph and 5 mph, with a 3 mph estimated additional increase being most likely, should Virginia raise the rural interstate speed limit to 65 mph.

In summary, it is the opinion of the researchers that a policy decision to raise the statutory speed limit by 10 mph will not increase traveled speeds from 55 mph to 65 mph. Instead, were this policy decision to be made, the average speed would likely increase, in the short run, by another 3 mph from the current average of 60 mph to an estimated 63 mph. Further, the short-run increase in the 85th percentile speeds would be from 65 mph to an estimated 68 mph.

Obviously, because no states have had more than a few months experience with the new limit, there are no data with which to estimate confidently the long-term impact of a 65 mph speed limit on rural interstate speeds. Virginia's historical experience with the 65 mph rural interstate speed limit, however, indicates that the annual average speed traveled on the rural interstate system never exceeded 65 mph. Thus, although it is possible that average speeds will continue to increase, average speeds may also stabilize in the 60 mph to 65 mph range and follow the historical pattern.

Crash Severity

The Relationship Between Speed and Accidents

From an intuitive point of view, it is clear to most people that increased speed will have some effect upon the probability of being involved in a crash. However, the relationship between crashes and speed is somewhat more complex than it seems at first glance. Based on the work of Solomon and others, the following is known about that relationship:

1. As the speed at which an accident occurs increases, accident severity increases, especially at speeds above 60 mph (6). This has to do with the concept of dissipation of energy. Vehicles traveling at a given rate of speed build up kinetic energy. When a fixed object or moving vehicle is struck, that kinetic energy is released and the impact of the crash is absorbed by the struck object, the vehicle, and its occupants. The relationship between kinetic energy and speed can be summarized by the equation

$$\text{kinetic energy} = 1/2 \text{ mass x velocity}^2.$$

   From this equation, it is clear that any increase in velocity increases kinetic energy proportionate to the square of the velocity (7). A 20% increase in speed from 50 to 60 mph results in a 44% increase in kinetic energy, which must be absorbed either by the struck object or vehicle, the striking vehicle, or the occupant, thus increasing the likely severity of the crash (8,9,10,11)". It has also been noted that a driver crashing with a velocity of 50 mph (i.e., as if a vehicle traveling 50 mph were to hit a stationary object) is twice as likely to be killed as a driver crashing at 40 mph (12). Additionally, higher speeds contribute to increased severity of the wreckage and heighten the possibility that fire will result from the crash (13). Higher speeds also increase the difficulty, time, and hazard involved in extricating the injured occupants. The creation of forgiving roadsides and the improvement of the level of protection offered by vehicles may help mitigate some of the effects of increased dissipation of energy, but they cannot entirely overcome the increase in kinetic energy caused by higher speeds (14).

2. The probability of being involved in a crash has been shown to be related to speed distribution rather than to average speed. The theoretical relationships have been proven by a number of accident analyses. The greater the variation in speed of any vehicle from the average speed of all traffic, the greater its chances of being involved in an accident (14,15). Thus, the more uniform the speeds, the safer the driving conditions. Accident involvement rates as well as injury and fatality rates have been shown to vary directly with the standard deviation of traveled speeds (16). One explanation for this is that the accident involvement rate is also correlated with the number of overtaking maneuvers (17). The number of overtakings is minimized when vehicles travel at the median speed. The more the vehicle's speed differs from the median either way, the more the number of overtakings increase. Additionally, fewer accidents occur on roadways on which the distribution of speeds is symmetrical, rather than skewed in one direction or the other (3,18).

3. The interaction of speed variation and absolute traveled speed is shown by the fact that the fatality rate tends to be highest at very high speeds and lowest at about the average speed (2).

4. As average speed decreases, there is a corresponding decrease in the standard deviation of speed (19). The only data available since the implementation of a higher speed limit on the rural interstates, however, indicate that the short-term increase in speeds has not increased speed variance. In fact, there may be some short-term decreases in speed variance. But in the long-run, higher speeds should be expected to be associated with an increase in speed variance.

In summary, the speed at which a vehicle travels determines the amount of energy that must be absorbed in the event of a crash, either by the vehicle itself or its occupants. Thus, the traveled speed is related to the severity of any crash once it has occurred. Since the variation in speed traveled by vehicles on a given roadway determines the opportunity they have for interaction, speed variation is related to the probability that accidents will occur. Lower speed variation reduces the number of opportunities for a crash to occur, and higher variation increases these opportunities. How these speed factors affect accidents was well illustrated during the energy crisis of 1973 and 1974.

The Impact of Changing the Speed Limit During the 1974 Energy Crisis

One of the most difficult safety research problems of the last 20 years has been the interpretation of the events that occurred in 1973 and 1974 with the onset of the Arab oil embargo. Clearly, an immediate and conspicuous change in the traffic safety environment occurred at that time, coincident with reduced levels of travel, changes in patterns and locations of travel, as well as passage and subsequent enforcement of the 55 mph NMSL. The energy crisis of 1973 and 1974 created one of the most interesting natural experiments in recent history. It is one that should be able to provide considerable information and define the limits of effects of changing the speed limit. However, like all natural experiments, the events that took place during the energy crisis occurred spontaneously and were not under experimental control. This has made the interpretation of the facts and, in particular, attempts to isolate the effects of any one change very difficult. While much speculation has been made concerning the impact of the individual and discrete changes that occurred between 1973 and 1974, only a few studies have attempted to assess quantitatively the impact of each intervention. However, due to gaps in available data and difficulties in separating effects, these studies have had limited usefulness, particularly on the state level. Additionally, since both the transportation and vehicle systems have changed significantly since the early 1970s, findings from this earlier period may not be applicable to situations occurring in the 1980s. The decision makers in Virginia need to make an informed policy decision relating to future speed limits, and the energy crisis experience, although difficult to interpret, provides one of the best indicators of the effects that changing the speed limit might have.

The Energy Crisis Experience

The most serious problems with using the energy crisis experience to predict the outcome of changing speed limits is that so many events, not all of which were speed related, occurred at once. The following events occurred during the energy crisis period.

1. The average speed on rural interstate roads nationwide was 65 mph in 1973. By 1974, that figure had decreased to 57 mph and remained

at 59 mph through 1983. At the same time, there was a sharp decline in speed variance, which continues in part to the present. There was a sharp decline in traveled speed in 1974 on the nation's urban interstates, but speeds returned to pre-energy crisis levels in the 1980s. However, the speed variance on these urban interstates was reduced in 1974 and remains lower at present (20). There were also significant reductions in speed on roads that were posted at or below 55 mph prior to the energy crisis and thus were not subject to a speed limit change (21,22). Whether this was due to a change in perceptions concerning safe speeds or to a perceived need to conserve fuel is unknown. Additionally, a reduction in speed variation on all highway systems, even those not affected directly by the limit change, was noted in 1974 (19). Based on the physical relationships between speed and accidents discussed in the previous section, these changes would be expected to produce safety benefits on all roadways.

These findings also held true in Virginia. Prior to the energy crisis, average speeds in the winter months on interstates had increased gradually to 69.3 mph. In 1974, when the speed limit was decreased by 15 mph, the average speed on these roads fell to 57.1 mph. On primary roadways, where the speed limit was changed from 60 mph to 55 mph in 1974, average speeds dropped from 60.7 mph to 53.5 mph. Roadways already posted at 55 mph or below experienced a decrease in average speed from 57.7 mph to 53.0 mph in 1974 (23). This is consistent with findings nationally and in other states. Additionally, speed variances were significantly reduced in 1974 and the speed distribution became more symmetric, especially on roadways with a reduced speed limit, indicating safer driving conditions.

2. VMT nationwide was reduced by 1.45% overall and reductions were noted on all types of highways. Average daily traffic (ADT) was reduced by 2.87% nationwide, and between 4% and 8% in the first four months of 1974 and less thereafter. ADT declined 4% to 5% on interstates and non-federal-aid highways. Toll road travel (an actual count of vehicles) was reduced 7.5%. In Virginia, VMT was reduced by about 6% overall (20).

3. The distribution within types of travel was also changed significantly. Because of fuel shortages and the closing of gasoline stations on weekends, fewer pleasure and recreational trips were made. These trips are thought to be more dangerous since they involve long-distance driving on unfamiliar roadways often under conditions of fatigue. Additionally, it is speculated that fewer miles were traveled by teenage drivers, whose travel is more likely to fall into the nonessential category. All of these trip types

are considered to be inherently less safe than work and other essential types of trips.

4. Fuel prices increased significantly and fuel consumption was reduced. As mentioned above, the desire to conserve gasoline may have affected driving patterns as well as the amount of travel.

5. National legislation concerning daylight savings time (DST) was amended to continue DST during the winter months of 1974. This factor may have affected the incidence of pedestrian accidents.

As a result of this combination of factors, the highway safety environment in the United States improved significantly during the energy crisis. The number of fatalities declined 9,100 between 1973 and 1974. Based on previous trends, the fatality rate would have been expected to fall from 4.24 per hundred million VMT in 1973 to 4.11 in 1974, a 3% drop. The actual reduction in fatality rate was 15.33%, the largest decline since World War II (20). Interestingly, pedestrian deaths declined 17% during 1974, in contrast to a constant trend exhibited during the previous six years.

In Virginia, fatalities decreased about 14% from 1,220 in 1973 to 1,050 in 1974. Numbers of fatal accidents decreased by 132 in 1974 and injury accidents decreased by 1,355. Injury and property damage accident rates decreased on the interstate, primary, and secondary systems, while the death rate declined only on the interstate and secondary systems. Both nationally and in Virginia, reductions in fatalities were significantly higher than would have been expected based on previous trends, indicating that the improved condition was due to something that occurred in 1974, concurrent with the energy crisis (23,24,25).

The Impact of Speed Limit Changes During the Energy Crisis

There were a number of direct and indirect indications that a significant part of the reduction in fatalities experienced during the energy crisis was due to the reduction in the speed limit. The fatality rate dropped 32% on the interstate system, 38% on toll roads, 17% on the primary system, and 13% on secondary roads. There was no drop in fatality rates on local roads (20). Nationally, fatality rate reductions were most pronounced on roadways affected by the change in the NMSL. This was also true in individual states. For instance, in Arizona, 92% of the reduction of fatalities occurred on high-speed roads (26). On the other hand, in Michigan and North Carolina, fatalities were reduced equally on interstates and on roads previously posted at 55 mph or lower (21,22). In addition, the fatality rate currently remains lower than would be expected, long after the non-speed-related energy crisis effects have "worn off" (20,27).

A number of attempts have been made to isolate the effect of the 55 mph NMSL from the other energy-related factors in order to estimate the impact of a speed limit change. Cerilli (1977) evaluated the impact of previous trends, reduced travel, and reduced speed limit on fatalities. He estimated that two thirds of the reduction in fatalities (or about 6,000 lives saved) could be attributed to the new speed limit (24). In all likelihood, this estimate is too high, considering that Cerilli attributed all of the savings other than that for reduced travel to the speed factor. In studies done for the American Association of State Highway and Transportation Officials (AASHTO), 50% and later 35% of the reduction in fatalities were attributed to slower and more uniform speeds (28,29). In the latter study, where most of the fuel shortage factors were included, a savings of 3,200 lives was attributed to the 55 mph NMSL. Johnson et al. used intervention analysis to evaluate the role of VMT, the environment, and the 55 mph speed limit in saving lives. This study attributed an annual savings of 6,400 lives to the speed factor (14). Finally, in two separate analyses, the Transportation Research Board estimated that of the 6,300 fewer fatalities occurring on the interstate system, the rural primaries, and the rural secondaries, 28% could be attributed to reduced travel and previous historical trends, leaving 72% (or 4,500 lives saved) attributable to the NMSL. Using a more complicated model involving economic indicators as well as variables representing the 55 mph NMSL and the other energy crisis related factors, lives saved as a result of the NMSL have been estimated at between 3,700 and 5,900 annually (20).

In the aggregate, these studies indicate that between 20% and 72% of the reduction in fatalities nationally were due to the institution of the 55 mph NMSL. This would amount to a savings of between 3,200 and 5,900 lives. The discrepancies between the figures noted in each of these studies is somewhat disconcerting. Part of the lack of agreement stems from a lack of consistently collected nationwide data. For instance, at the time of the initial energy crisis, each state collected speed data in a different manner; consequently, very few sources of consistent historical data on speeds exist prior to the institution of the federal compliance monitoring program. Thus, to a certain extent, each of these studies of national trends suffers from problems within the data. Also, since the studies use different methods for arriving at a reduction figure, each of which makes different assumptions, it is not surprising that there is some disagreement among them.

A number of individual states have also attempted to separate out the effects of the 55 mph speed limit. Two studies done in California evaluated the impact of previous trends, reduced travel, reduced speed, and safety belt use. These studies initially attributed 46% of the decline in fatalities to reduced speeds (30,31). A later estimate was lowered to 39%. Since California accounts for about 10% of travel nationwide, speed-related savings would on a national level be between

3,500 and 4,200 lives. Studies done in Maryland using only data for roadways where speed limits were changed attributed 20% to 24% of the reductions in fatalities to reduced speeds (32). This reduction would translate into 1,800 to 2,200 lives saved annually on a national level. Studies done in Texas and Illinois attribute close to 57% of the decline in fatalities to the institution of the 55 mph NMSL (33,34). Thus, on a state-by-state basis, studies indicate that reduced and more uniform speeds account for between 20% and 57% of the reduction in fatalities. Because they use statewide data, more aggregated historical information is available and somewhat more consistency is achieved. However, most of these studies suffer from statistical and sample-size problems, due to smaller numbers of fatalities per state per time period.

Problems in these studies limit their usefulness in predicting the effect of raising the speed limit. An additional factor that makes generalization of the energy crisis findings dangerous is the change in the driving environment in the United States since 1974. Although the same physical relationships govern reaction time, steering control, braking distance, and vehicle deceleration during impact, the effect of speed may nevertheless have been reduced by other improvements to highway safety during the last decade. Today's vehicles can more successfully withstand high speed crashes, and they offer their occupants considerably more protection. Safety belts, head restraints, side door beams, energy-absorbing steering columns, and energy-absorbing bumpers are available in more of the vehicle fleet than in 1974 (35). Additionally, roadside design has been improved with the advent of breakway signing and the acknowledgment of the danger offered by roadside obstacles. Also, more roadways are separated by medians, reducing the chances of vehicle interaction. In addition, with the establishment of sophisticated emergency medical systems and the increased use of trauma centers, more persons are surviving serious injury (36).

The characteristics of the driver and vehicle populations have also changed significantly since the early 1970s. Drivers are older on the average, since the baby boomers are now out of the high risk 16 to 24 year age category. The vehicle mix has also substantially changed, with more small passenger cars present and larger and heavier commercial vehicles in service. In 1974, 30% of the vehicle fleet were small cars; by 1984, this figure had risen to 45%. Indications are that there are as many small cars in the vehicle mix now as there are large ones (37). By 1990, the FHWA projects that truck travel will increase 68% while car travel will decrease 30% (38).

Finally, the economic situation is also significantly different from that of 1973 and 1974. It has been shown that motor vehicle fatalities increase during good economic times and decrease during bad (39). A number of economic indicators correlate with fatalities, such as industrial production and retail sales. In 1973 and 1974, the country was in the middle of a recession, a very different scenario from the present day. All of these factors came together to create the safety outcome of the 1974 fuel shortage. A different set of factors may interact to create a different set of results from an increase in the speed limit on rural interstates.

In summary, it is clear that the imposition of the 55 mph NMSL in 1974 was responsible for saving lives and very likely responsible for reducing the severity of traffic crashes. The exact number of lives saved or crashes avoided is a matter of some disagreement. There are indications that some of these savings persist to one degree or another at the present time. It is probable that since absolute speeds are likely to increase on qualifying rural interstates, the crashes that occur on these roadways will increase in severity. Additionally, if speed variances rebound to pre-1974 levels, the number of accidents on these roads will increase as well. However, since conditions today differ significantly from those of a decade age, increases in crashes and severity may not be as dramatic as those decreases experienced during the energy shortage. It is these factors that prompted the Transportation Research Board to conclude that (20):

> Increases in the speed limit today would probably have less of an impact on safety than they would have a decade ago. Nonetheless, the 55 mph speed limit still appears to have a substantial impact on safety.

The Impact of Speed Limit Changes Today

The short-term impact of the 65 mph speed limit is beginning to be reported in the media. The associated press reported that on affected rural interstates in New Mexico, traffic-related fatalities have more than doubled since the speed limit was increased as compared to the same time period last year. Between April 2 and August 15, 1986, 25 deaths were recorded on New Mexico's rural interstates, but that increased to 56 in 1987.

Because of the relatively small number of traffic-related fatalities that occur in a given year and the relatively large variance associated with those fatalities, a policy decision should not be based solely on what has happened in New Mexico. For instance, in Virginia, where average and 85th percentile speeds have increased, rural interstate fatalities remained the same between April and June of 1987 as compared to that period in the previous year, but there were 43 more injuries in the 1987 period. In Illinois and Wyoming, 1987 traffic deaths were down on affected roadways compared to 1986, and in Indiana, traffic fatalities were up only slightly on affected rural interstates.

Further, in New Mexico, many of the fatal crashes were alcohol-related and occurred on two sections of highway. It is possible that those interstate segments were not engineered to handle a 65 mph speed limit. In addition, because many alcohol-related fatalities are also associated with excessive speed, it is possible that at least some of the drivers would have been driving without regard for either a 55 mph or 65 mph speed limit.

Another way to indicate how crash severity may be affected by increased speed limits is to examine how rural interstate injuries and fatalities have been related to average speeds on Virginia's rural interstates in the past. In a multiple regression analysis of rural interstate fatalities in Virginia between 1966 and 1986, it was found that after controlling for VMT, there is a significant positive correlation between average speed and rural interstate fatalities. Likewise, after controlling for VMT, there is a significant relationship between rural interstate injuries and average speed.*

Table 3 and Table 4 indicate that a 1 mph increase in average speed corresponds with an estimated increase of approximately 4 deaths and 96 injuries on the rural interstates for each year. The 95% confidence range indicates that a 1 mph increase in average speed has resulted in an estimated loss of between 2 and 6 additional lives in traffic crashes and between 57 and 135 additional traffic-related injuries. Likewise, Table 5 and Table 6 indicate that traffic deaths and injuries per hundred million VMT are significantly related to average speeds. A one mph increase in average speed corresponds with an increase of between 0.13 and 0.33 per hundred million VMT in the death rate and an increase of between 2.54 and 5.34 per hundred million VMT in the injury rate. These estimates should be treated cautiously, however, because many factors other than VMT and average speed affect the total number of injuries and fatalities, but are beyond the scope of the model.

These figures illustrate the relationship between average speeds, not the legal speed limit, and traffic fatalities and injuries. As was shown in the previous section, average speeds and the speed limit on the rural interstate are not the same. Given the estimates that increasing the rural interstate speed limit to 65 would result in increasing average speeds approximately 3 mph from 60 mph to 63 mph, then, all things being equal, rural interstate traffic fatalities would increase by between 6 and 18 per year. Additionally, increasing the rural interstate speed limit to 65 mph would correlate with between 171 and

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* VMT has increased relatively steadily and is therefore closely associated with the variable time. Thus, increases in injuries and fatalities that might be expected with increased VMT are somewhat offset or overshadowed by annual improvements in highway and vehicle safety.

TABLE 3

Regression Analysis of VMT and Average Speed on Traffic Fatalities

Dependent Variable: Annual Rural Interstate Traffic Fatalities

Multiple R	0.847	F	22.767
R Square	0.717	Sig	0.000
Adjusted R Square	0.685		
Standard Error	9.863		

Variable	b	Standard Error	Sig
Average Speed	3.971	1.025	0.001
VMT (Millions)	-0.006	0.003	0.061
(Constant)	-148.896	70.518	0.049

TABLE 4

Regression Analysis of VMT and Average Speed on Traffic Injuries

Dependent Variable: Annual Rural Interstate Traffic Injuries

Multiple R	0.762	F	12.475
R Square	0.581	Sig	0.000
Adjusted R Square	0.534		
Standard Error	185.942		

Variable	b	Standard Error	Sig
Average Speed	96.354	19.332	0.000
VMT (millions)	0.202	0.061	0.004
(Constant)	-4928.279	1329.383	0.002

TABLE 5

Regression Analysis of Average Speed on Traffic Death Rate

Dependent Variable: Annual Rural Interstate Traffic Fatalities Per Hundred Million VMT

Multiple R	0.71	F	20.352
R Square	0.517	Sig	0.000
Adjusted R Square	0.492		
Standard Error	0.630		

Variable	b	Standard Error	Sig
Average Speed	0.234	0.052	0.000
(Constant)	-12.269	3.141	0.001

TABLE 6

Regression Analysis of Average Speed on Traffic Injury Rate

Dependent Variable: Annual Rural Interstate Traffic Injuries Per Hundred Million VMT

Multiple R	0.719	F	31.275
R Square	0.622	Sig	0.000
Adjusted R Square	0.602		
Standard Error	8.562		

Variable	b	Standard Error	Sig
Average Speed	3.937	0.704	0.000
(Constant)	-192.507	42.686	0.000

405 additional rural interstate injuries, a 0.39 to 0.99 per hundred million VMT increase in the rural interstate death rate, and a 7.62 to 16.02 per hundred million VMT increase in the injury rate on rural interstates, assuming that all other factors remain constant. Further, it is estimated that increased speeds would result in some injuries being made more severe. The researchers note, however, that these injuries and fatalities will be in addition to any increase that may occur from the increase in speed that followed the federal enabling legislation.

If a speed limit increase on the rural interstate also results in increased average speeds on the urban interstates and on the other 55 mph roads, then more additional deaths and injuries likely can be expected. Though there are little data available, it appears that some states may be experiencing this spillover effect, with average speeds increasing on roadways that remain posted at 55 mph once that state increases its speed limit to 65 mph. The extent of the spillover of higher speeds and the impact that those speeds may have on traffic injuries and fatalities, however, are impossible to determine given the short-term experience that the other states have had with the new speed limit. Because rural collector roads generally have higher accident, injury, and death rates, and the urban interstates higher accident and injury rates than the rural interstates, it is likely that any spillover of increased speeds onto these systems would result in a proportionately greater impact on these systems than on the rural interstates.

Economic Costs and Benefits

There are several methods of cost-benefit analysis that can be applied to evaluate speed-zoning policy. This section considers the results of two types of analysis. The first part of this section determines that a strict comparison of the dollar costs versus the dollar benefits of a 65 mph speed limit versus a 55 mph speed limit on rural interstate highways in Virginia yields a net benefit to the Commonwealth. The second part of this section determines that the optimum vehicle speed on Virginia's rural interstate highways is approximately 60 mph and the optimum speed limit on Virginia's rural interstate, based on traditional engineering methods, is estimated to be 65 mph.

Public Choice and Optimal Policies

A tenet of conventional welfare economics is that there is such a thing as "social optimality" that has technical properties and parameters that can be measured and identified (40). The object of cost-benefit analysis in public policymaking is to determine the socially optimal level of public activity (40):

> ... if the benefits expected from a proposed program, measured by the prices that the beneficiaries would be willing to pay for them, exceed the cost, measured by the value to those who forego them of the goods and services foregone because of the resources diverted to the program, the program should be undertaken. The corollary is that an excess of costs over benefits is sufficient for rejection of the program.

One method of comparing costs and benefits of different speed limits would be to designate certain consequences of speed zoning as costs and certain consequences of speed zoning as benefits and compare the sums of those costs and benefits. For instance, it is estimated that at 55 mph, it would take approximately 100 million hours to drive the 5.5 billion vehicle miles driven on Virginia's rural interstates in 1986, but it would take 93 million hours to drive those miles at 60 mph, and 86 million hours to drive them at 65 mph. If an hour of time is valued at $8.30, the average wage paid in Virginia, the time-saving benefit of traveling at 60 mph instead of 55 mph is $58.1 million, and the time savings benefit of traveling at 65 mph instead of 55 mph is $116.2 million. It is projected by this study that the actual average vehicle speed on Virginia's rural interstates would increase from the current speed of 60 mph to an estimated 63 mph if the speed limit were changed from 55 mph to 65 mph; such a change would result in a time-savings benefit to Virginia of approximately 4.3 million hours, or $35.7 million each year. It is often argued that since pleasure travel and commuting time do not directly contribute to state income accounting, they should not be included in the "benefit" analysis but should be considered as a transfer. If commuting time and pleasure travel (41) are deducted from this analysis, the total time-saving benefit to Virginia business would be approximately 1.3 million hours, or $10.8 million.

The time-saving benefit would be counterweighed by consequences of the higher speed limit that could be characterized as costs. Operation costs (fuel costs and vehicle maintenance costs) of the vehicles traveling on the highway would be increased if the aggregate vehicle speed increased, but the marginal increase in operating costs is very small. Virginia would lose an estimated additional $1.2 million in operating costs each year if the average vehicle speed increased from 60 to 63 mph on the rural interstates, with the bulk of these costs being incurred through the consumption of as much as an additional 400 barrels of fuel per day.

The other significant cost of an increased speed is accident costs, which include medical costs, legal and court costs, lost productivity, and property damage. This study has estimated that an increase in the average vehicle speed on Virginia's rural interstates from 60 mph to 63 mph will result in a marginal increase of 6 to 18 fatalities and 171 to

405 injuries. Actuarial data from the insurance industry (42) indicate that such an increase in accidents would result in an average economic loss of an estimated $5.8 million in Virginia each year, which would likely result in an increase in insurance premiums.

By this straightforward type of benefit-cost analysis, the marginal cost of an increase of average vehicle speed from 60 mph to 63 mph is $7.0 million per year and the marginal benefit of the increased speed is between $10.8 million and $35.7 million. If the most conservative estimate of benefit is adopted, this analysis implies that a marginal gain of at least $3.8 million would be realized from the speed change.

The Optimum Vehicle Speed

A second method of economic analysis of speed zoning is the determination of optimum vehicle speed, separate from the simple comparison of costs and benefits. Using objective analysis of collected data, microeconomic cost analysis can be used to determine the "one best speed" at which vehicles should travel over a highway system.

The classic model of optimum vehicle speeds was developed by J.C. Oppenlander at the University of Illinois in 1962 (43). Oppenlander established a criterion for the establishment of regulations controlling the speeds of highway motor vehicles on the premise that maximum and minimum speed limits should be established to minimize the costs of highway transportation. He concluded that this involved the establishment of speed limits that result in a majority of the highway traffic moving at that desirable speed that minimizes the consumption of resources that are a function of vehicular speed. He measured resource expenditures on a quantitative scale in the following categories based on the expenditure of resources per mile of travel: operation costs, accident costs, and time costs. Using conventional analysis, graphical relationships of these cost categories and the total costs of various vehicle speeds can be developed.

The speed at which vehicles must travel to minimize the cost of highway transportation can be selected from the minimum point on the total cost curve. This speed value is defined as the "optimal speed" for the specified conditions for which the curves are developed. Since speeds of highway vehicles are not uniform, the optimal speed must represent the central value of the distribution. In order words, the optimal speed should conform to the mean or median speed of the highway traffic.

Oppenlander asserted that in the development of vehicular speed regulations, it is necessary to consider the environmental factors of the specific segments of highway where speed will be regulated. The design of the highway, the volume of traffic, and the influence of weather are environmental variables that have a significant influence on vehicle speed, but these factors may not be present at all times. It is important to collect speed data so that these restraining conditions are represented in the data.

It would be improper to specify a maximum or minimum speed limit based on information obtained from economic analysis for ideal road and traffic conditions where these speeds are not feasible because of geometric, traffic, or environmental limitations. For those highway and street sections where there are limiting factors, the speed limit should be modified to allow for those limitations. After the optimal speed is adjusted for these limitations, the new speed value is defined as the "adjusted speed." Upper and lower speed limits are selected so that the average speed of travel on the roadway section being speed-zoned coincides with the adjusted speed. Oppenlander asserts that the resulting speed distribution produces traffic-stream characteristics that minimize the cost of transportation over the highway.

Speed-specific, quasi-experimental data on the cost of travel over Virginia's rural interstate highways at various vehicle speeds have not been collected. However, the Texas Transportation Institute has collected the data necessary to conduct the analysis described by Oppenlander (44).

The Texas data were collected by a telephone survey of individuals' daytime and nighttime driving speeds and vehicle operating costs on 4-lane and 2-lane rural highways. A sample of 500 people aged 18 and above was randomly selected across Texas to participate in the survey. A far superior study method was used in an earlier survey in Texas. Test cars and radar were used on segments of highway, and speed was posted so as to create a quasi-experimental research design, to determine how people regulated their speed on highways. The results of that study, conducted by Neilon J. Rowan and Charles J. Keese in Texas in the late 1950s, were replicated by the later telephone survey data (45).

In addition to the data collected in Texas, data in Virginia have been collected from a variety of sources. For instance, it is estimated that 5.5 billion vehicle miles were traveled on Virginia's rural interstate highways in 1986, and the average vehicle speed has increased from 56.3 mph to 59.9 mph since the federal enabling legislation was passed.

The data from Oppenlander's original Illinois study, adjusted for the recent data from Texas and Virginia, yield cost components of rural interstate highway transportation as illustrated in Table 7 (Daytime) and Table 8 (Nighttime). The data used in this model are characterized as operation cost, time cost, and accident cost to be consistent with the simple cost-benefit comparison described above. The operation cost

TABLE 7

Dollar Per Mile Costs of Vehicle Travel at Various Speeds, Daytime

Speed	Operation Cost	Time Cost	Accident Cost	Total Cost
30	.125	.277	.07	.472
35	.121	.237	.04	.398
40	.118	.208	.02	.346
45	.122	.184	.02	.326
50	.124	.166	.02	.310
55	.127	.151	.01	.288
60	.137	.138	.01	.285
65	.148	.128	.02	.296
70	.161	.119	.02	.300

TABLE 8

Dollar Per Mile Costs of Vehicle Travel at Various Speeds, Nighttime

Speed	Operation Cost	Time Cost	Accident Cost	Total Cost
30	.125	.277	.18	.582
35	.121	.237	.09	.448
40	.118	.208	.03	.356
45	.122	.184	.03	.336
50	.124	.166	.02	.310
55	.127	.151	.02	.298
60	.137	.138	.02	.295
65	.148	.128	.02	.296
70	.161	.119	.04	.320

data were collected by the Texas Transportation Institute in their telephone survey of Texas drivers on rural interstate highways. The time-cost data were calculated using the average wage of a worker in Virginia of $8.30 per hour. The accident cost data were derived from the original data collected by Oppenlander in Illinois and were adjusted for inflation (46).

An analysis of the cost components of highway transportation provides a determination of the optimal speed. The minimum of the total cost curves yields an optimal speed estimate, over the range of evaluated speeds, of 60 mph for both daytime and nighttime speeds, as is illustrated in Figure 7 and Figure 8.

According to Oppenlander, vehicle speeds on that portion of the highway that is to be speed-zoned should have the optimum speed as its measure of central tendency. Also, the proper introduction of an upper speed limit should reduce the variability of vehicular speeds and, therefore, make individual speeds more nearly equal to this desired value. The upper speed limit can be calculated by adding the standard deviation of the roadway's speeds being zoned (5.63 miles per hour on Virginia's rural interstates) and the number of standard deviations from the mean to the 85th percentile speed in a normal distribution (1.04). This method yields a optimum speed limit of 65 mph. Ironically, however, the optimum speed of 60 mph has been achieved at a 55 mph speed limit, and a 65 mph limit is projected to increase the average speed 3 mph above the optimum.

Conclusion

There are two methods of economic analysis that yield conclusions about speed zoning on Virginia's rural interstate highways. The direct comparison of costs and benefits suggests that raising the speed limit on Virginia's rural interstates would result in a benefit to cost ratio of nearly 2 to 1. The optimum speed approach suggests that the optimum vehicle speed on Virginia's rural interstates is 60 mph, and the optimum speed limit using the traditional methods of traffic engineering is 65 mph.

Opinion Research

As mentioned earlier, approximately 1380 persons were interviewed concerning their view on the 65 mph vs. 55 mph speed limit issue during September of 1987. Of those, 52% were male and 48% were female. About 56% lived in an urban area and 39% lived in a predominantly rural area. Most respondents were drivers (91%). Of those sampled, 8.5% were under

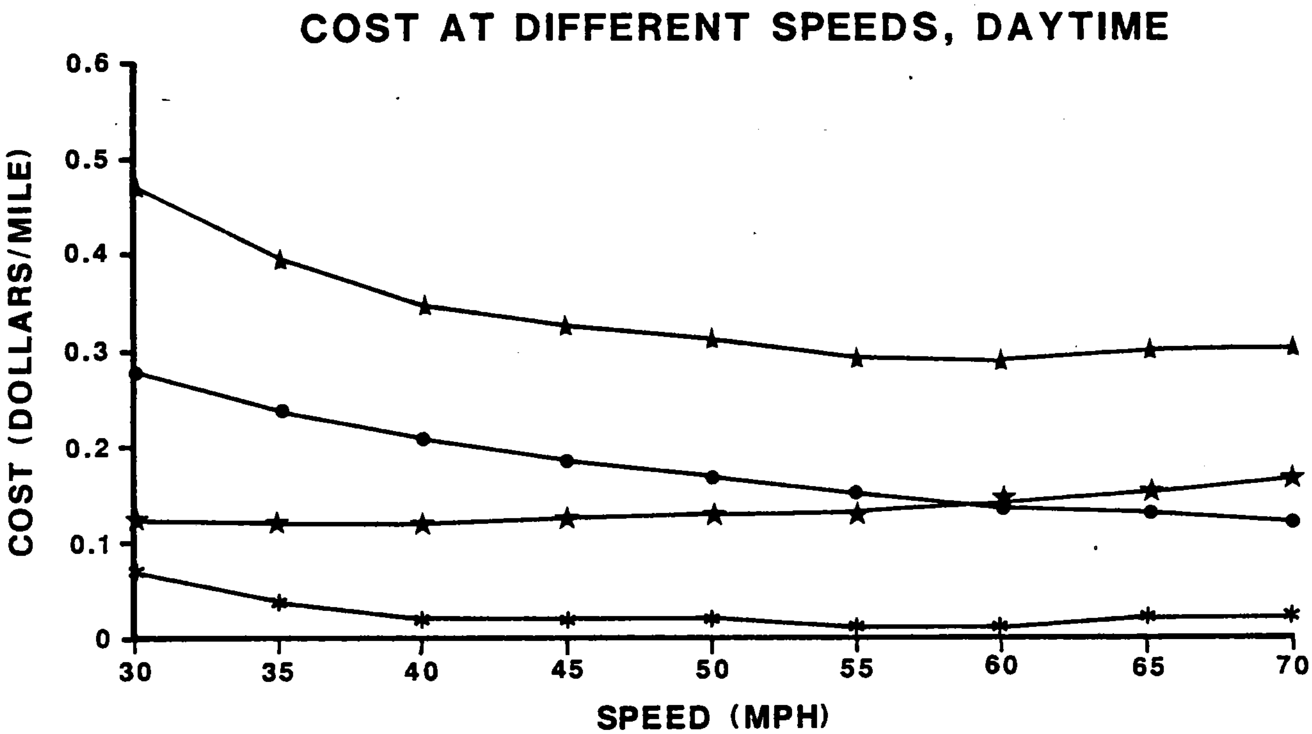

FIGURE 7. Dollar per mile costs of vehicle travel at various speeds, daytime.

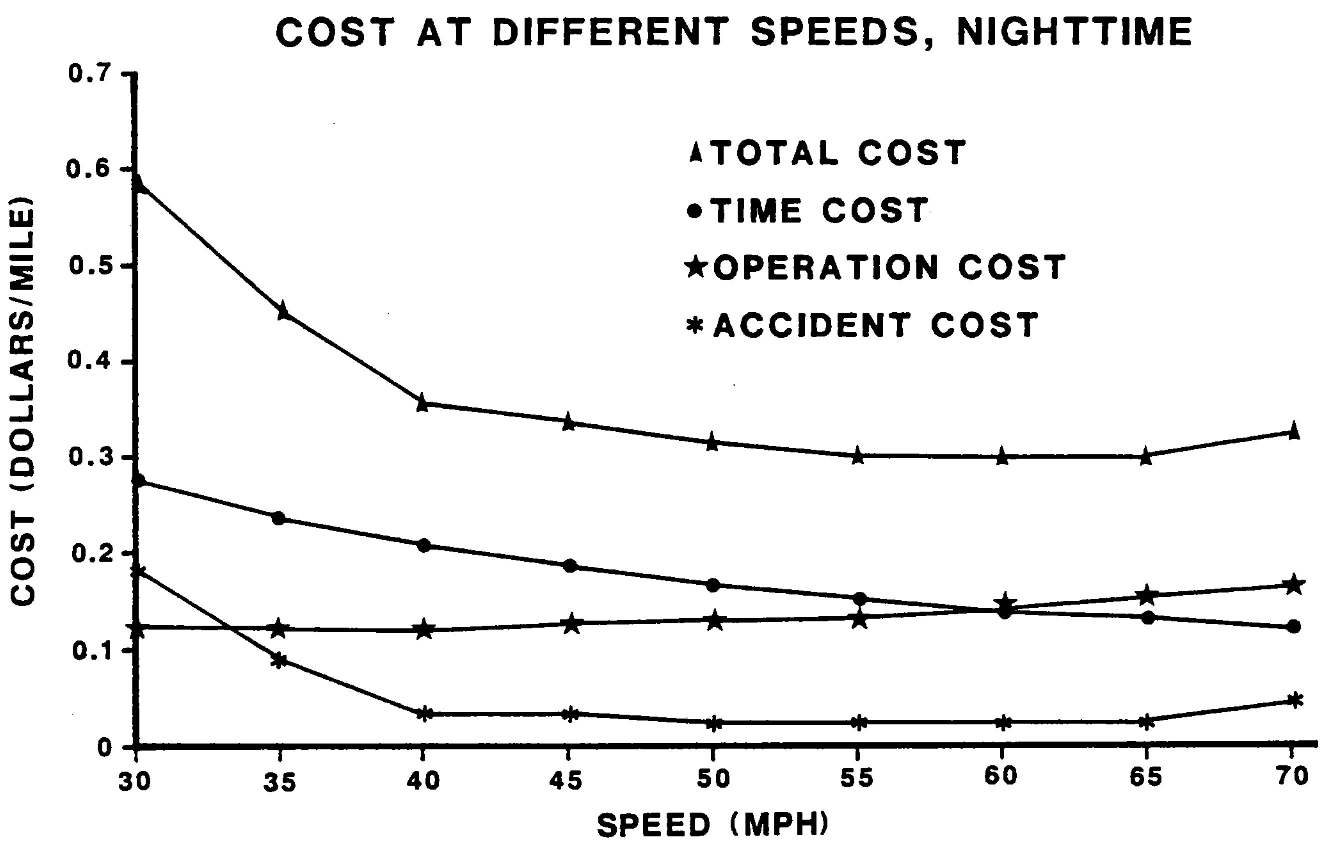

FIGURE 8. Dollar per mile costs of vehicle travel at various speeds, nighttime.

21, 52.2% were between 21 and 40, 28.1% fell between 41 and 60, and 11.1% were over 60.

The first substantive question on the survey asked respondents to decide what the maximum speed limit should be in Virginia. About 43% picked 65 mph, 40% picked 55 mph, and about 9% picked 60 mph as the ideal speed limit (see Table 9). Men were distinctly more in favor of the 65 mph speed limit than were women. Drivers were also more in favor of 65 mph than non-drivers and persons living in urban areas preferred the 65 mph speed limit to the 55 mph speed limit more often. Younger persons also showed strong support for the 65 mph speed limit more often than older persons. Of those persons picking a speed limit over 55 mph, about 66% wanted it imposed on all interstate roads, and about 14% wanted the higher speed limit imposed on all interstate and primary roads (see Table 10). Interestingly, only about 7.6% of those questioned wanted the higher limit imposed on rural interstates only, the option allowed by the Congress. While they supported the higher limit less often than men, women were slightly more liberal with regard to where they wanted it imposed. Persons living in urban areas were more likely to want a higher limit only on the interstates, and persons living in rural localities were more likely to impose the limits on both primary and interstate highways.

Respondents were then told of the legislation allowing the states to raise the maximum speed limit on the rural interstates and asked if they preferred retaining 55 mph on all roads or raising the limit to 65 mph as the Congress allowed (see Table 11). About 60% of those polled preferred raising the speed limit to 65 mph, but 37% preferred retaining 55 mph. Again, men were more in favor of the 65 mph speed limit, with women evenly split between the two options. Drivers preferred an increase in speed limit more than non-drivers, and persons in urban areas also preferred the increase more often than persons living in rural areas. Also, the younger the respondent, the more likely he or she was to prefer a 65 mph speed limit on rural interstates. These findings are particularly interesting in light of the results of previous polls from 1978, 1979, and 1983 (see Table 12). When asked a slightly different question, much less support was shown for changing the 55 mph speed limit, although support for 55 mph had eroded somewhat over time.

Respondents were then asked why they preferred either retaining 55 or raising the limit to 65. The responses are listed in Table 13. For persons advocating the 65 mph speed limit, the most common answers were: (1) because people are driving faster anyway (23%), (2) because travel time will be reduced (15%), (3) because traffic flow will improve (11%), and (4) because highways are designed for these higher speeds (8%). For persons advocating the 55 mph speed limit, the most common answers were: (1) because more accidents would occur if the limit were raised (23%) and conversely because accidents would not increase if the limit were

TABLE 9

"What do you feel the maximum speed limit should be in Virginia?"

By Sex

	Less Than 55	55	60	65	More Than 65
Male	11 (1.5)	224 (31.3)	48 (6.7)	377 (52.7)	55 (7.7)
Female	24 (3.7)	330 (50.3)	79 (12.0)	209 (31.8)	14 (2.1)
TOTAL	35 (2.5)	554 (40.4)	127 (9.3)	586 (42.7)	69 (5.0)

By Driving Status

	Less Than 55	55	60	65	More Than 65
Driver	26 (2.1)	475 (37.8)	116 (9.2)	570 (45.3)	71 (5.6)
Non-Driver	8 (6.7)	79 (65.8)	11 (9.1)	15 (12.5)	7 (5.8)

By Residence

	Less Than 55	55	60	65	More Than 65
Urban	21 (2.8)	282 (37.2)	64 (8.4)	347 (45.6)	45 (5.9)
Rural	8 (1.5)	236 (43.6)	58 (10.7)	14 (39.6)	25 (4.6)
Other	4 (6.6)	25 (40.9)	5 (8.2)	22 (36.1)	5 (8.2)

TABLE 9 (CONTINUED)

"What do you feel the maximum speed limit should be in Virginia?"

By Age

	Less Than 55	55	60	65	More Than 65
16-20	1 (1.1)	19 (21.6)	7 (7.9)	53 (60.2)	8 (9.1)
21-30	7 (2.5)	88 (31.0)	22 (7.7)	150 (52.8)	17 (6.0)
31-40	2 (0.6)	128 (35.6)	47 (13.1)	153 (42.6)	29 (8.1)
41-50	7 (3.3)	83 (39.7)	21 (10.1)	90 (43.1)	8 (3.8)
51-60	2 (1.1)	81 (44.5)	11 (6.0)	80 (44.0)	8 (4.4)
61-70	6 (4.3)	80 (56.7)	9 (6.4)	44 (31.2)	2 (1.4)
71- Older	4 (5.1)	55 (69.6)	6 (7.6)	12 (15.2)	2 (2.5)

TABLE 10

"Where or on which highways should this maximum speed limit be imposed?"
(speed limit 60 or above)

By Sex

	Rural Interstate	Urban Interstate	All Interstates	All Interstates and Primaries	Other	Everywhere
Male	46 (9.3)	1 (0.2)	328 (66.4)	70 (14.2)	43 (8.7)	6 (1.2)
Female	17 (5.0)	1 (0.3)	224 (66.5)	47 (13.9)	137 (11.0)	11 (3.3)
TOTAL	63 (7.6)	2 (0.2)	552 (66.4)	117 (14.1)	17 (2.0)	80 (9.6)

By Driving Status

	Rural Interstate	Urban Interstate	All Interstate	All Interstates and Primaries	Other	Everywhere
Driver	62 (7.8)	2 (0.3)	529 (66.9)	112 (14.1)	73 (9.2)	13 (1.6)
Non-Driver	1 (2.5)	0 (0.0)	23 (57.5)	5 (12.5)	7 (17.5)	4 (10.0)

TABLE 10 (CONTINUED)

"Where or on which highways should this maximum speed limit be imposed?"
(speed limit 60 or above)

By Residence

	Rural Interstate	Urban Interstate	All Interstates	All Interstates and Primaries	Other	Everywhere
Urban	38 (8.0)	1 (0.2)	328 (68.9)	58 (12.2)	42 (8.8)	9 (1.9)
Rural	23 (7.1)	1 (0.3)	198 (61.1)	55 (17.4)	40 (12.4)	7 (2.2)
Other	2 (6.9)	0 (0.0)	19 (65.5)	4 (13.8)	3 (10.3)	1 (3.4)

By Age

	Rural Interstate	Urban Interstate	All Interstates	All Interstates and Primaries	Other	Everywhere
16-20	5 (7.1)	--	42 (60.0)	13 (18.6)	8 (11.4)	2 (2.9)
21-30	18 (9.4)	1 (0.5)	121 (63.0)	32 (16.7)	18 (9.4)	2 (1.0)
31-40	21 (8.9)	--	166 (70.3)	30 (12.7)	16 (6.8)	3 (1.3)
41-50	10 (8.0)	--	88 (70.4)	11 (8.8)	12 (9.6)	4 (3.2)
51-60	7 (6.6)	1 (0.9)	72 (67.9)	15 (14.2)	9 (8.5)	2 (1.9)
61-70	1 (1.6)	--	46 (73.0)	7 (11.1)	7 (11.1)	2 (3.2)
71-	1 (3.6)	--	11 (39.3)	8 (28.6)	6 (21.4)	2 (7.1)

TABLE 11

"Congress has recently passed a law allowing states to raise the speed limit on rural interstate highways to 65 mph. Do you feel that Virginia should raise its maximum speed limit to 65 on rural interstates or retain the 55 mph maximum speed limit on all roads?"

By Sex

	Raise to 65	Retain at 55	Other
Male	511 (71.3)	192 (26.8)	14 (2.0)
Female	310 (47.3)	317 (48.3)	29 (4.5)
TOTAL	821 (59.8)	509 (37.1)	43 (3.1)

By Driving Status

	Raise to 65	Retain at 55	Other
Driver	708 (62.2)	434 (34.6)	40 (3.2)
Non-Driver	41 (34.5)	75 (63.0)	3 (2.5)

By Residence

	Raise to 65	Retain at 55	Other
Urban	483 (63.6)	257 (33.8)	20 (2.6)
Rural	300 (55.5)	221 (40.9)	20 (3.7)
Other	33 (54.1)	27 (44.3)	1 (1.6)

TABLE 11 (CONTINUED)

"Congress has recently passed a law allowing states to raise the speed limit on rural interstate highways to 65 mph. Do you feel that Virginia should raise its maximum speed limit to 65 on rural interstates or retain the 55 mph maximum speed limit on all roads?"

By Age

	Raise to 65	Retain at 55	Other
16-20	69 (78.4)	17 (19.3)	2 (2.3)
21-30	197 (69.4)	83 (29.2)	4 (1.4)
31-40	226 (62.9)	118 (32.8)	15 (4.2)
41-50	137 (65.2)	69 (32.9)	4 (1.9)
51-60	99 (54.4)	76 (41.8)	7 (3.8)
61-70	61 (43.3)	76 (53.9)	4 (2.8)
71- Older	24 (31.6)	51 (67.1)	1 (1.3)
Refused	8	19	6

TABLE 12

Previous Support for the 55 mph Speed Limit

"The 55 mph speed limit has been in effect since 1973. Do you feel the maximum speed limit should remain at 55 mph?"

	Remain at 55 mph	Change	Undecided
1978	79.1	20.2	0.7
1979	73.7	25.7	0.5
1983	66.1	31.8	2.1

TABLE 13

Reasons for raising the speed limit to 65 mph on rural interstates or retaining the 55 mph speed limit on all roads.

Reasons:	Raise to 65 mph	Retain at 55 mph
Shorter travel time.	240(15.3)	--
Better for business.	13 (0.8)	--
Other states are doing it.	80 (5.1)	2 (0.2)
Better traffic flow.	174(11.1)	5 (0.6)
55 doesn't save lives.	24 (1.5)	--
Roads are designed for higher speeds.	131 (8.4)	2 (0.2)
Feels comfortable at that speed.	77 (4.9)	16 (1.9)
People are driving faster anyway.	367(23.5)	50 (5.8)
Higher limit make common practice legal.	58 (3.7)	--
Accident won't increase.	83 (5.3)	65 (7.6)
Fuel economy will suffer.	2 (0.1)	46 (5.4)
More accidents will occur/safety.	6 (0.4)	197(22.9)
Less comfortable at higher speed.	3 (0.2)	56 (6.5)
Roads not designed for higher speed.	3 (0.2)	32 (3.7)
Most will go faster after speed increase.	2 (0.1)	126(14.6)
Other	301(19.3)	263(30.5)

TABLE 14

Perception of Current Speed Limits by Sex

	Speed Limit		
Sex	Less Than 55	55	More Than 55
Male	2 (1.8)	104 (95.4)	3 (2.7)
Female	1 (0.6)	168 (94.9)	8 (4.5)

not raised (7%), (2) because most people will go much faster after the speed limit is increased (15%), and (3) because the respondents themselves felt more comfortable at the current 55 mph speeds (7%).

Finally, given that the mean traveled speed has already increased in Virginia, there is some concern that Virginia drivers might believe that the speed limit has already been increased to 65 mph. In order to test this belief, a separate survey was conducted, polling respondents concerning the current speed limit in the state. About 95% of the 286 persons surveyed indicated correctly that the speed limit was 55 mph (see Table 14). Less than 1% underestimated the limit, and about 3.7% overestimated the current speed limit. Although the sample size for this survey was small, it indicates that increased mean speeds in the state are probably due to some factor other than lack of knowledge concerning current speed limit.

Special Interest Groups

After a review of organizations active in Virginia, 87 were identified as having an interest in policy decisions concerning the speed limit. Of these groups, officers or the executive directors of 84 were successfully contacted and polled concerning their views on the speed limit issue. Of the groups polled, 13 groups either refused to comment or considered the issue "beyond the purview" of their organization. The results of the remaining 71 successful interviews are briefly summarized in Table 15. It is interesting to note that although a number of groups have an official or unofficial position on the speed limit issue, only six plan any lobbying efforts during the upcoming General Assembly session, three of these being local Highway or Transportation Safety Commissions.

Sixteen of these local Highway or Transportation Safety Commissions were selected at random to be surveyed. Of these, six had addressed the issue. Frederick County was in favor of raising the speed limit to 65 mph and has forwarded a motion to the Frederick County Board of Supervisors proposing official recognition of this position. Prince Edward County and Smyth County also either officially or unofficially supported a 65 mph speed limit. On the other hand, Danville County's Commission is steadfastly opposed to increasing the speed limit on rural interstates. It believes that a higher interstate speed limit will increase speeds on all roads and cites the switch from bi-annual to annual motor vehicle safety inspections as a secondary safety issue supporting retention of the current maximum speed limit. The Henrico County Commission also supported the 55 mph speed limit. Finally, several local commissions did not realize that the proposed speed limit change would affect only rural interstates, but believed the 65 mph speed limit was an option for all four-lane divided highways.

TABLE 15

Special interest groups and their positions on the speed limit issue

	Official Position				Unofficial Position				Lobbying		
	None	55	65	Other	None	55	65	Other	Yes	No	Unsure
AAA - National				x*						x	
AAA - Northern Virginia				x							x
AAA - Richmond				x			x			x	
AAA - Tidewater			x							x	
American Academy of Physicians	x				x					x	
American Assoc. of Automobile Medicine	x				x					x	
American Assoc. of Motor Vehicle Admin.		x								x	
American Association of Retired Persons (Nat'l)	x					x					x

*65 mph speed limit on all four-lane, limited access interstate roads.

	Official Position				Unofficial Position				Lobbying		
	None	55	65	Other	None	55	65	Other	Yes	No	Unsure
American Association of Retired Persons (Virginia)		x								x	
American Judges Association	x				x					x	
American Package Express Carriers Assoc.		x								x	
American School and Commercial Safety Association	x				x						x
American Truck Dealers	x					x				x	
American Trucking Association		x								x	
Association of American Physicians & Surgeons	x				x					x	
Auto Importers of America	x				x					x	
BMW-507 Owners Association			x							x	

	Official Position				Unofficial Position				Lobbying		
	None	55	65	Other	None	55	65	Other	Yes	No	Unsure
Citizens Coalition for Rational Traffic Laws			x								
Highway Users Federation-Nat'l		x								x	
Highway Users Federation-Va./Roanoke (Va. Motor Vehicle Conference)	x					x				x	
Interstate Carriers Association		x								x	
Judge Advocates Association	x				x					x	
Manufactured Housing Institute	x				x					x	
Medical Society of Virginia	x					x					x
Mothers Against Drunk Drivers		x									x
National Automobile Dealers Assoc.	x				x					x	
National Corvette Owners Association	x						x			x	

	Official Position				Unofficial Position				Lobbying		
	None	55	65	Other	None	55	65	Other	Yes	No	Unsure
National Defense Transportation Assoc.	x				x					x	
National District Attorneys Assoc.	x				x					x	
National Institute of Victomology			x								x
National Insurance Consumer Organ.		x							x		
National Moving & Storage Assoc.	x					x				x	
National Private Trucking Association		x							x		
National Sheriff's Association	x				x						x
National Society of Prof. Engineers	x				x					x	
National Tank Truck Carriers		x								x	
Northwestern University Traffic Inst.		x								x	

	Official Position				Unofficial Position				Lobbying		
	None	55	65	Other	None	55	65	Other	Yes	No	Unsure
Professional Car Society	x				x					x	
Professional Insurance Agents-Nat'l	x					x				x	
Professional Insurance Agents-Va.	x				x					x	
Recreational Vehicle Dealers Association			x							x	
Recreational Vehicle Industry Assoc.	x				x					x	
Regional and District Carriers Conference		x								x	
Regular Common Carrier Conference		x								x	
Society for Risk Analysis	x				x					x	
Southern Transportation League	x						x			x	
Specialized Carriers & Rigging Assoc.		x								x	

	Official Position				Unofficial Position				Lobbying		
	None	55	65	Other	None	55	65	Other	Yes	No	Unsure
Va. Academy of Physician Asst.		x							x		
Va. Association of Chiefs of Police			x								x
Virginia Institute of Traffic Eng.	x				x					x	
Va. Road & Transp. Builders Assoc.	x				x					x	
Virginia Safety Association		x								x	
Virginia Sheriff's Association	x				x						x
Va. Trucking Association		x									x
World Assurance for Employees of Public Agencies	x				x					x	
Albemarle Co. Highway Safety Comm.	x				x					x	
Amherst County Highway Safety Comm.	x					x				x	

	Official Position				Unofficial Position				Lobbying		
	None	55	65	Other	None	55	65	Other	Yes	No	Unsure
Danville Highway Safety Comm.	x					x			x		
Essex County Trans. Safety Comm.	x				x					x	
Fairfax City Highway Safety Comm.	x				x					x	
Fairfax County Highway Safety Comm.	x				x					x	
Frederick Co. Trans. Safety Comm.			x							x	
Halifax Highway Safety Commission	x				x					x	
Henrico Co. Trans. Safety Comm.		x							x		
Norton Highway Safety Commission	x				x					x	
Patrick Co. Trans. Safety Comm.	x				x						x
Portsmouth Highway Safety Comm.		x							x		

	Official Position				Unofficial Position				Lobbying		
	None	55	65	Other	None	55	65	Other	Yes	No	Unsure
Prince Edward Trans. Safety Comm.			x							x	
Richmond Highway Safety Commission	x				x					x	
Smyth County Highway Safety Comm.	x						x			x	
Va. Beach Transportation Safety Comm.	x				x					x	

<u>No Comment/Non-Issue</u>

Alliance for Clean Energy
American Orthotic & Prosthetic Association
National School Transportation Association
National Association of Truck Stop Operators
Council of Better Business Bureaus
National Center for State Courts
American Blood Organization
Military Benefit Association
Life Insurance Conference
Ruritan National
American Academy of Physician Assistants
National Association of Physician Nurses
Truck Trailer Manufacturers

<u>Groups Unable to Contact</u>

Petersburgh Highway Safety Commission
Tazewell County Safety Commission
National Association of Injured Persons

Approximately one third of the interviewed organizations aligned themselves with one of the following trade/service organizations: the American Trucking Association (ATA), the Highway Users Federation (HUF), or the American Automobile Association (AAA). The ATA was, by far, the largest independent group. The ATA supports retention of the 55 mph speed limit because it "saves lives; reduces fatalities, injuries, and accident severity; conserves fuel; causes less wear and tear on equipment; and reduces 'splash and spray' by trucks on wet pavement." It should be noted that the ATA has additional economic reasons to favor the retention of the 55 mph speed limit. According to ATA, in the years since the adoption of the NMSL, many trucks have been geared to a maximum speed of 58 mph and truck routes have been established to conform not only to the 55 mph limit, but also to the maximum 10 hour per day work requirement. Thus, any change of the speed limit would require rerouting of trucks and displacement of trucking centers. All organizations that were ATA members staunchly held the "party-line," but a recent former member did come out in favor of raising the speed limit, saying it would be better, not worse, for business. It should be noted that at this time neither the ATA members nor the recent defector plan on lobbying, but if initial reports from the General Assembly show support of a 65 mph speed limit in Virginia, the ATA may lobby.

The HUF is a trade association for groups who use the road system in their business. As with the ATA, the HUF supports the retention of the 55 mph speed limit, but does not plan on lobbying at the state level.

Perhaps the most interesting remarks came from the AAA, which believes that states should have the option to decide the speed limit on multi-lane, limited-access interstate roads. In Virginia, this policy translates to favoring "liberalization" of the speed limit to 60 mph or 65 mph. What is especially interesting with the AAA position is the call for follow-up studies. The AAA is accepting of a higher speed limit, but believes monitoring must continue to ensure highway safety. If safety is compromised at a higher speed limit, the AAA believes that the states must lower the speed limit.

Federal Compliance Monitoring Program

Federal policy dictates that each state monitor speeds on roads posted at 55 mph and that each state maintain a minimum of a 50% compliance rate with the limit, given adjustments for speedometer error and other externalities. The penalty for non-compliance is a loss of up to 10% of the state's federal-aid highway funds.

Several states that had either been assessed or threatened with the penalty expressed deep dissatisfaction with the program and the 55 mph

NMSL. Their argument was that the 55 mph NMSL was unreasonable and impossible to enforce on the rural interstates, which traditionally had the worst level of non-compliance. Their opinion was that if speed limits were raised, voluntary compliance would increase, the new limit could be enforced, and the threat of unreasonable sanction would be removed. In fact, the federal enabling legislation removes rural interstate sections whose speed limit is raised above 55 mph from the monitoring program, and the roadways with the worst compliance records would cease to affect the state's level of compliance. Thus, a major factor cited by many states as a reason for raising speed limits is the removal of the immediate threat of federal sanctions. Unfortunately, states that do not raise the rural interstate speed limit may be in increasing danger of losing federal-aid highway funds should rural interstate speeds increase and those roads remain part of the monitoring program.

The most recent compliance monitoring data indicate that the passage of the federal enabling legislation has affected speeds on Virginia's interstate highways. In the third quarter of the federal fiscal year 1986, only 60.5% of the rural interstate traffic was exceeding 55 mph; however, in 1987, non-compliance with the 55 mph speed limit has risen to 82.3% on the rural interstate system. Fortunately, even if non-compliance reaches 100% and all rural interstate traffic exceeds even 60 mph, Virginia should not be in danger of losing federal-aid highway funds.

In the third quarter of 1987, approximately 46% of the cars on Virginia's sample of 55 mph roadways were traveling faster than 55 mph. The federal compliance formula, however, allows for an adjustment such that half of the vehicles traveling faster than 55 mph but not exceeding 60 mph are not counted in the non-compliance figures. Hence, when the third quarter figures are adjusted, Virginia only had approximately 33% of the vehicles at monitoring stations not in compliance with the 55 mph speed limit.

The worst-case scenario for Virginia would be for all of the vehicles to be traveling faster than 60 mph on the rural interstate, which is far from realistic if the speed limit remains at 55 mph. Even had this been the case in the third quarter of 1987, only approximately 50% of the total Virginia sample would have been exceeding 55 mph, and less than 32% would have been exceeding 60 mph. Thus, even this unlikely scenario would have produced an adjusted non-compliance figure of 41%, or 9 percentage points lower than is necessary for federal-aid highway funds to be in jeopardy.

Likewise, if Virginia chooses to raise speeds on the rural interstate, federal-aid highway funds will not be threatened. Because the rural interstates have the worst compliance rates, raising the speed limit and thereby dropping those sections from Virginia's sample could only improve the Commonwealth's compliance figures. Hence, the federal compliance monitoring program and the federal-aid highway dollars that are tied to that program should not be a factor weighed in the decision to retain or to raise the speed limit on Virginia's rural interstates.

Collateral Issues

At the outset of this research, a number of issues and concerns that were felt to be central to the analysis and the decision under review were identified. However, as the process of data gathering and data analysis went forward, some issues began to appear to be more secondary than primary. These issues were not dropped as matters for study, but they did receive a more cursory review and are presented here as collateral issues.

Stopping Distance

Vehicle stopping distances can be affected by various factors such as driver reaction time, vehicle velocity, gradient of the roadway, and the friction between the vehicle's tires and the pavement. To estimate the effect that speed has on stopping distances, the stopping distances of a vehicle on a dry, level paved surface were estimated by adding the distance traveled by a vehicle from the instant the driver sights an object to the instant the brakes are applied (i.e., driver perception and reaction time) to the braking distance for a given speed, which is calculated by the formula

$$S = \frac{V^2}{30\ (F)}$$

where S = the braking distance in feet

V = vehicle speed in mph

F = the coefficient of friction

In Table 16, reasonable estimates for the coefficient of friction on dry, level pavement are used to calculate the stopping distances for 50 mph through 70 mph. As this table indicates, the 8.3% increase in traveled speed from 60 mph to 65 mph results in a 14.8% increase in total stopping distance. Further, the 18% increase in speed from 55 mph to 65 mph results in 32% increase in stopping distance.

TABLE 16

Speed and Stopping Distances

Speed	Coefficient of Friction*	Braking Distance (ft)	Reaction Time/Distance (ft) (2.5 Seconds)	Total Stopping Distance (ft)
50 mph	0.62	135	183	318
55 mph	0.60	168	202	370
60 mph	0.58	207	220	427
65 mph	0.56	252	238	490
70 mph	0.54	303	257	560

* Source: AASHTO

Vehicle Fleet and Vehicle Mix

As mentioned previously, characteristics of the existing vehicle mix have changed significantly in recent years, and it is possible that these changes may interact with changes in average speeds to produce more serious crashes. More small cars, many with less powerful four-cylinder engines, were introduced into the vehicle population to increase overall fuel economy. Small cars tend to be more often involved in single vehicle crashes than their larger counterparts (47). Crashes involving small (and lighter weight) cars are more likely to be severe than are those involving heavier vehicles (48,49), and drivers of small cars are twice as likely to be killed in the event of a crash than drivers of large cars (50,51). Occupants of subcompacts are six to eight times as likely to die (37). Drivers of cars with lower horsepower have higher accident involvement rates than drivers of cars with higher horsepower ratings (52). At the same time, the size and weight of large commercial motor carriers have increased. Large truck accidents tend to be more severe than accidents involving only passenger cars (53). Trucks account for 6% of all accidents but 12% of all fatal crashes (54). In most cases, it is the occupant of the other vehicle that gets killed (55). This polarization within the vehicle mix increases the likelihood that accidents that occur will involve vehicles of differing sizes, which would, in turn, increase the likelihood of injury.

Administrative Costs and Benefits

Either retaining or raising the speed limit on the rural interstate system will involve certain administrative costs to the Commonwealth. If the speed limit is raised, the VDOT will be responsible for signing the affected sections. The traffic engineering division of the VDOT estimates that there are approximately 400 speed limit signs on rural interstates. The numbers on the signs could be overlayed with a new limit for a cost of approximately $25 per sign. A replacement sign, which might be needed in the case of a truck speed limit differential, would cost approximately $150 if the existing supports were used. Finally, the VDOT estimates that the cost of adding "REDUCED SPEED AHEAD" signs at change areas, in accordance with the Manual on Uniform Traffic Control Devices, will be approximately $1,300 per change area (5). Obviously, much of the expense of these signs can be attributed to providing additional signs and supports on both sides of the roadway, which are needed to provide for maximum effectiveness.

Table 2 showed that in the third quarter of the federal fiscal year 1986 approximately 60.5% of the traffic on the rural interstates was exceeding 55 mph. In the same quarter this year, approximately 82.3% of the rural interstate traffic was traveling faster than 55 mph. Hence, if the 55 mph speed limit on the rural interstate is retained, the need for enforcement is likely to increase. However, if the speed limit is increased and voluntary compliance with the new limit is greater than that with the current limit, which is likely given the trend in other states, then the need for rural interstate speed enforcement may decrease; however, increased enforcement and police presence will be needed at change areas and on the urban interstate to minimize any spillover of the higher speeds.

Mandatory Safety Belt Use Law

Safety belts have been estimated to be between 40% and 45% effective in preventing fatalities in crashes that are life-threatening (56,57,58,59). In crashes in which the impact velocity is less than 35 mph, however, safety belts are almost 100% effective in preventing death.

Logically, it would be expected that faster speeds would be associated with a diminished effectiveness of the belt system's ability to prevent traffic fatalities. However, a recent study found no significant relationship between vehicle speed and safety belt effectiveness (60). At high speeds, safety belts remain very effective in some types of crashes, such as rollovers, but are less effective in others, such as head-on crashes. This great amount of variance in safety belt effectiveness prevents determining whether vehicle speed independently of other factors is related to belt-system effectiveness in preventing fatalities.

SHOULD VIRGINIA INSTITUTE A SPEED LIMIT DIFFERENTIAL FOR CARS AND TRUCKS?

Virginia has in the past established differential speed limits for cars and trucks weighing 7,500 pounds or more. The use of a differential limit was a popular idea during the 1950s and 1960s. In fact, at one time more than half of the eastern states had differential speed limits for cars and trucks. The use of a differential speed limit ended abruptly with the onset of the energy shortage and the institution of the 55 mph NMSL. Currently, however, at least 7 of the 38 states raising speed limits to 65 mph have established some type of speed limit differential based on vehicle class. The purpose of this section is to discuss the reasoning behind the original establishment of differential limits and to determine if this reasoning applies to current conditions in Virginia.

Most of the arguments put forth by the proponents of a differential speed limit seem to make intuitive sense. Most were based on a recognition of the obvious differences in the characteristics of trucks (and all other larger and heavier vehicles) and passenger vehicles. Due to their increased weight, trucks have a slower rate of deceleration than do passenger cars. Thus, the braking distances for large trucks are longer than for smaller vehicles. The higher the speed, the more the difference there is between cars and trucks in terms of stopping distance, which makes consideration of this factor important when raising limits.

While this argument seems reasonable, it must also be recognized that there are differences in the characteristics of cars and trucks that would negate the need for a differential limit. For instance, trucks tend to put the driver in a position relative to the road that is higher than in passenger vehicles. Thus, the driver's sight distance is increased, thereby giving him or her more reaction time when encountering an obstacle. This in some part may counteract the deleterious effects of increased stopping distance.

Most arguments for a truck speed limit differential are based on the rationale that if the speeds of one class of vehicle are lowered, there will be an improvement in safety conditions. From the literature, it would seem that changing the speed characteristics of a roadway may be more directly related to safety. Certain characteristics of the speed distribution on given roadways are directly related to the safety conditions on those roadways. Absolute speeds are related to the severity of crashes once they occur. The variation in the speeds of the vehicles traveling on the same road is related to the number of interactions between those vehicles, which in turn is related to the potential for accident occurrence. Additionally, the degree of symmetry of the speed distribution is also related to accident potential. These theoretical speed relationships appear to have held true in Virginia during the 1973-1974 energy shortage. A typical speed distribution for the interstate system during that time period appears in Figure 9. As shown in this figure, coincident with the significant reduction in accidents that occurred between 1973 and 1974, the speed variance on interstates was reduced and the symmetry of the curve was enhanced. These changes were not noted for roadways that did not experience a change in speed limit.

Speed distributions for 1986 and 1987 on the same interstate roadway appear in Figures 10 and 11. (It should be noted that since the locations of speed stations may have changed between 1974 and 1986, these figures may not be directly comparable.) From these figures, it can be noted that although the speed variances in each differ from the other, they are still less than the 1973, pre-energy crisis estimate for this roadway.

The establishment of a differential speed limit for cars and trucks would have the effect of building in an increase in speed variation, since the purpose of establishing the differential is to ensure that the two classes of vehicles travel at differing speeds. On the interstate system, this would theoretically serve to increase the number of rear-end and lane-change interactions between passenger cars and trucks, increasing the potential for accidents. It is also likely that these resulting accidents would be more serious than crashes between passenger vehicles, since the disparity in size between two crashing vehicles is related to the severity of injuries to the occupants of the smaller vehicle. Although very few studies have examined the relationship between the truck speed differential and accidents, those that have been conducted do not support the use of the differential limit. A 1974 study in Maryland compared accident rates for trucks on roadways with a differential limit with equivalent roadways without. No relationship between truck speed differences and accidents was shown in this study.

Proponents of another argument make the assumption that trucks violate speed limits more often than passenger cars and thus will travel at the same speed as cars only if the differential speed limit is set lower. According to this argument, the establishment of a speed differential will lead to more uniform speeds overall. There is some indication that this is not true. In 1971, Virginia's 85th percentile speeds for both cars and trucks were about 5 mph above the respective speed limits. By 1973, the last year in which Virginia had a speed limit differential, the 85th percentile speed for trucks was about 5 mph over the speed limit, while for cars, the 85th percentile speed was only 3.5 mph over their limit. In 1974, when the speed limits for both cars and trucks were changed to 55 mph, the 85th percentile speed was 65 mph

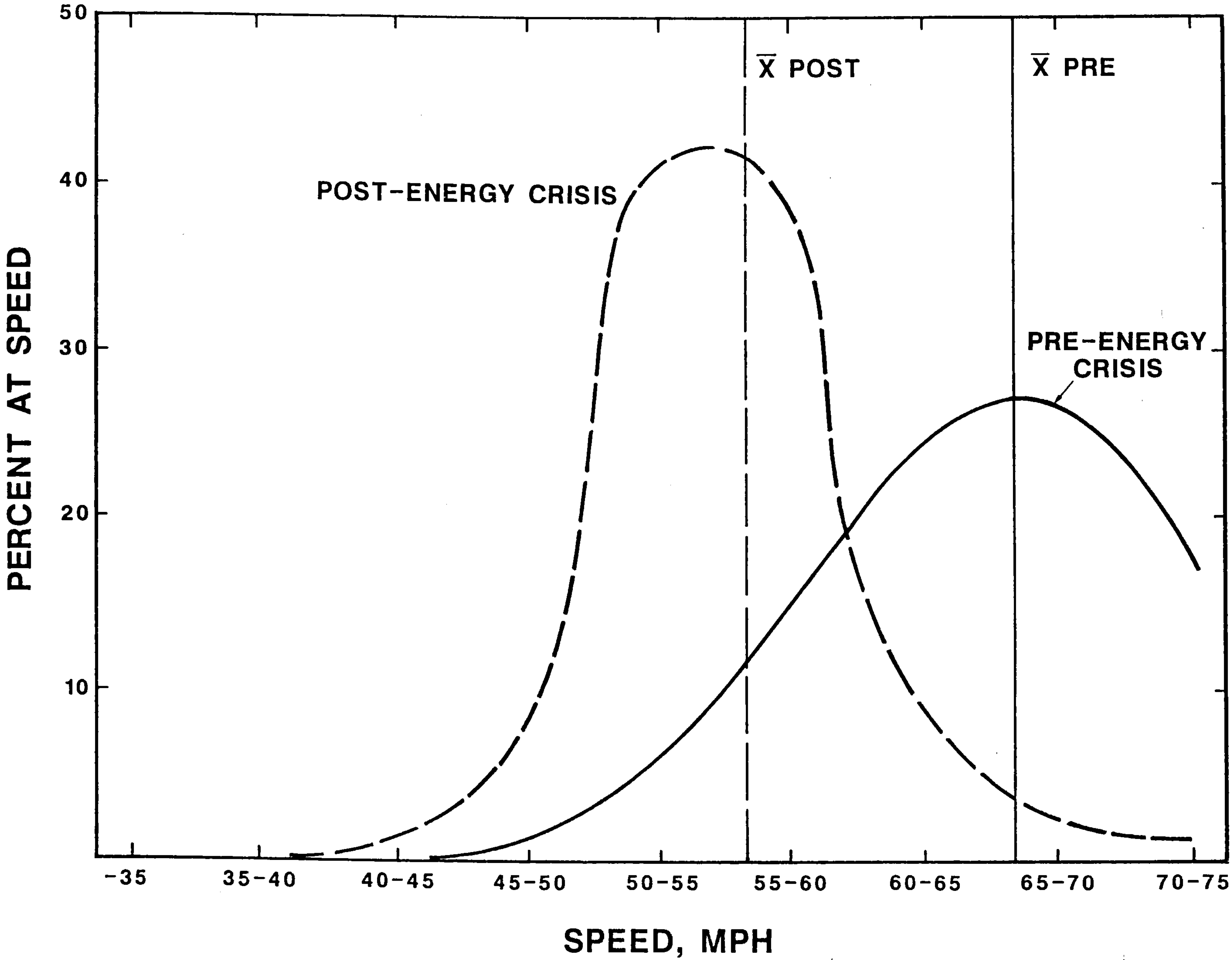

FIGURE 9. Speed distribution on Interstate 64 in Virginia.

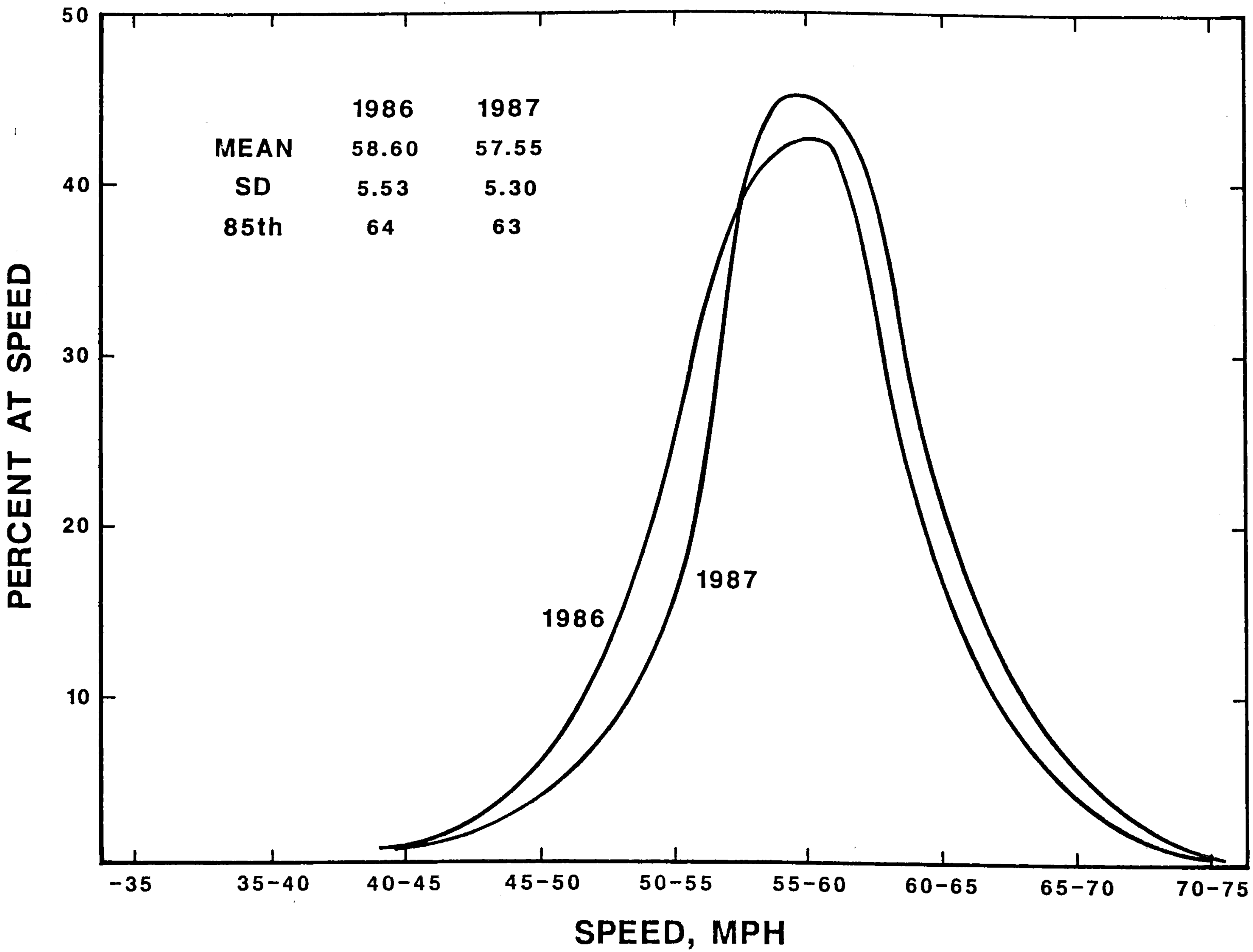

FIGURE 10. Speed distribution on Interstate 64 in Louisa County (rural) [Station 1167].

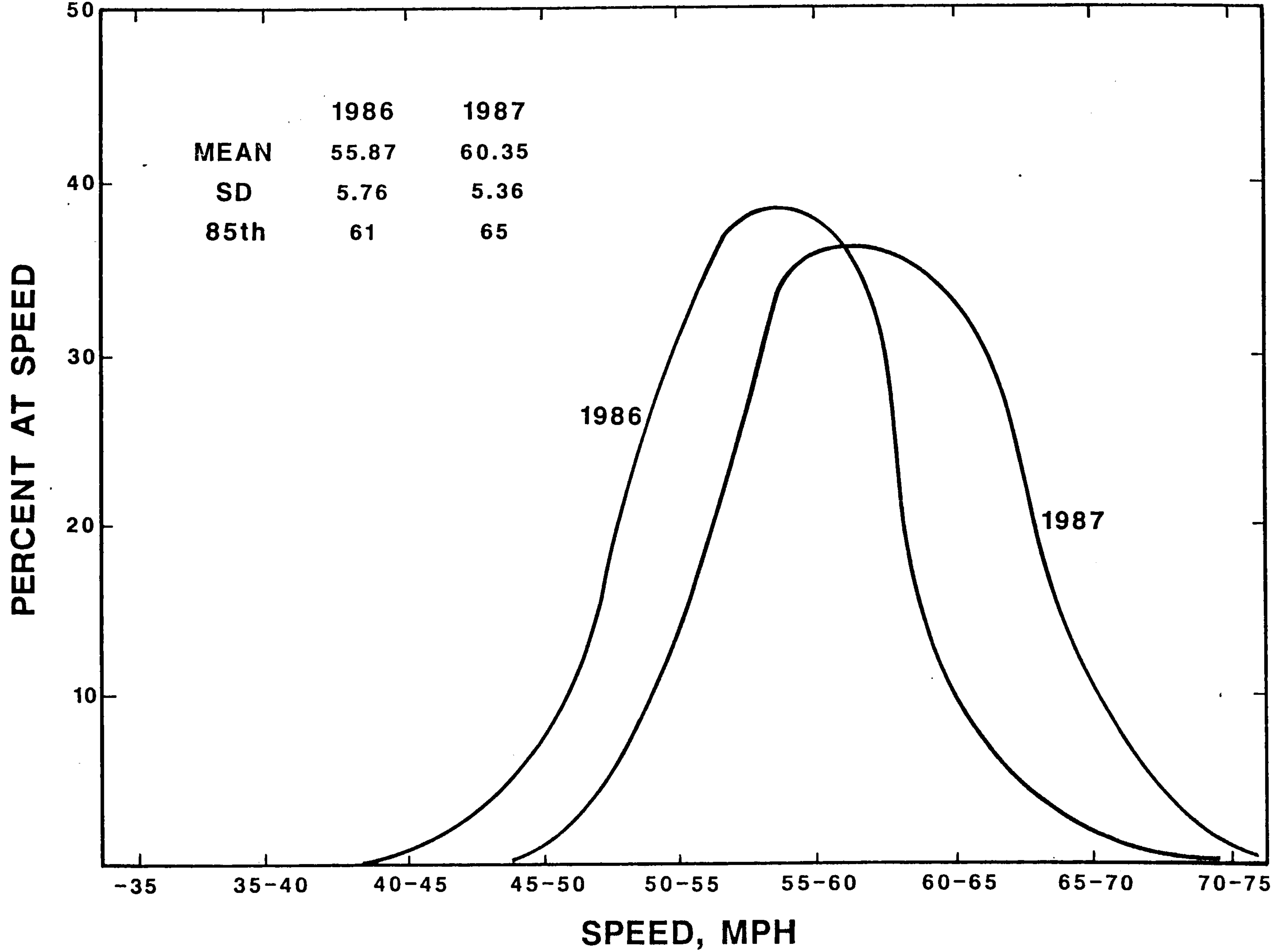

FIGURE 11. Speed distribution on Interstate 64 in York County (rural) [Station 1363].

for cars and 65 mph for trucks. In a survey conducted in April of 1987, the 85th percentile speed for trucks was 63.5 mph. For all vehicles for April through June of 1987, the 85th percentile speed was 65 mph. While these two 1987 figures do not cover the same time period, they support previous statistics indicating that trucks do not necessarily violate speed limits more than other vehicles.

Data from Illinois also support the conclusion that trucks do not inherently travel faster than passenger cars. Illinois established a truck speed differential in April of 1987, when they raised the speed limit for cars to 65 mph but retained the 55 mph speed limit for trucks. As shown in Figure 12, prior to establishing the differential, trucks traveled a little over 1 mph slower than passengers cars. Car speeds increased slightly after their speed limit was raised, but truck travel slowed by about 2 mph. Instead of creating more uniform speeds, the Illinois speed differential increased the variation between cars and trucks, thereby increasing the number of possible interactions. If theory holds true, this increased variation in speeds and interactions should result in an increase in accidents.

In summary, if a differential speed limit were imposed for trucks that is lower than that for passenger cars, it is likely that speed variation would increase along with traffic related interactions between cars and trucks. Thus, it is likely that more accidents would occur. Whether or not these accidents will be less severe than those occurring without a differential limit is unknown. While establishment of a uniform speed limit for all vehicles will avoid artificially increasing car/truck accidents, it should be remembered that trucks have never been allowed to travel at 65 mph on any Virginia highways.

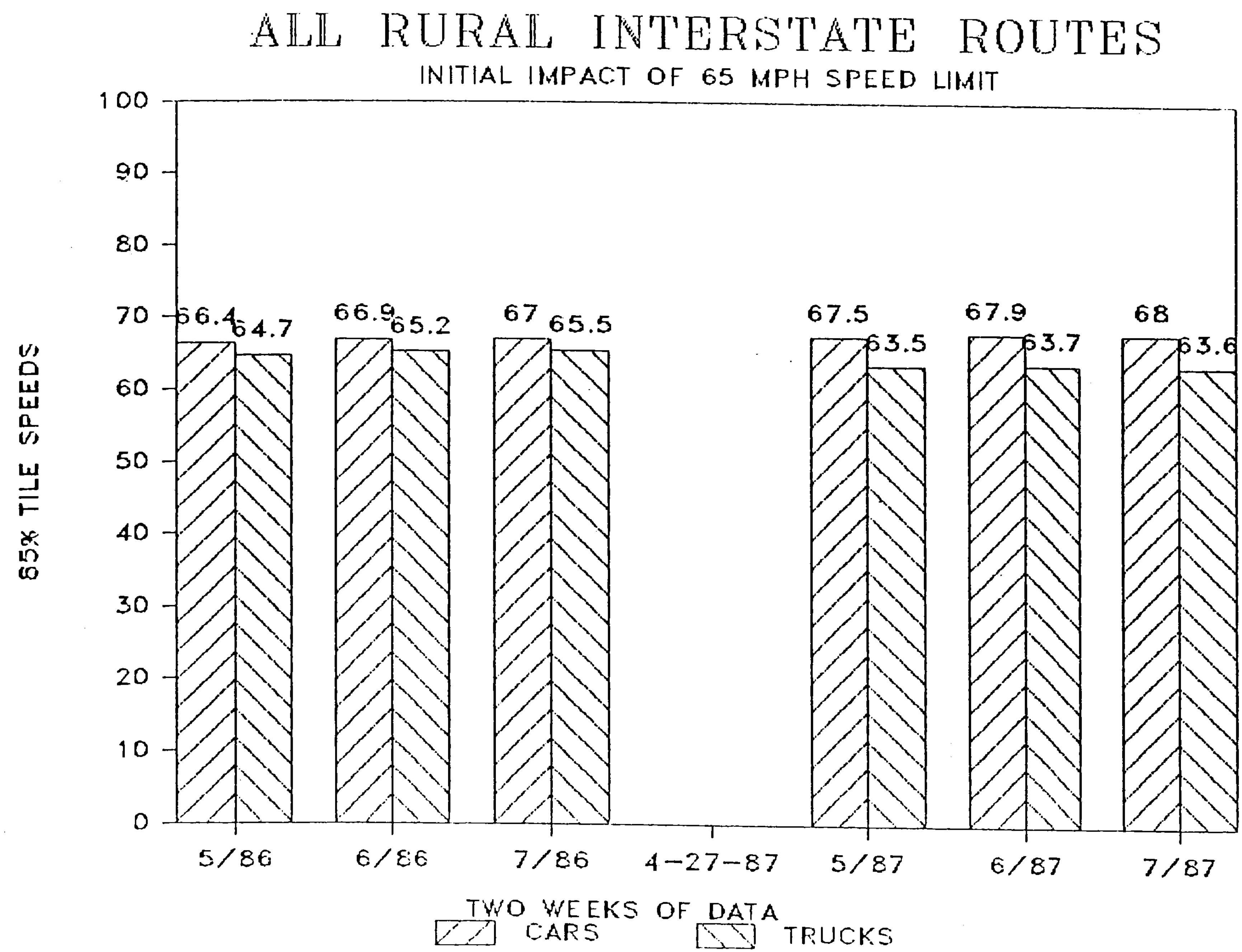

FIGURE 12. Truck and car 85th Percentile speeds in Illinois.

WHERE COULD VIRGINIA RAISE RURAL INTERSTATE SPEED LIMITS?

Rural Interstate Miles

The federal enabling legislation grants the states the ability to raise the speed limit, without penalty, to 60 mph or 65 mph on rural interstate highways. This legislation defines such eligible interstate miles as those that are located outside of urban areas with a population of 50,000 or more.

Table 17, compiled by the traffic engineering division of the VDOT (5), lists all of Virginia's qualifying mileage. This table shows that 789 miles, or 75 percent, of the Commonwealth's 1052 miles of interstate highway are eligible for a speed limit increase. Deciding which of these miles, if any, will be posted at the higher speeds is the prerogative of the state.

As was mentioned in an earlier section, 38 of the 48 states with eligible rural interstate miles have raised their speed limits to 65 mph. Appendix G, which lists excerpts from selected state statutes on the issue of the speed limit increase, shows that the broad authority to raise the speed limit is generally granted by the state legislature. The secretary or commissioner of the state department of highways and/or transportation is generally granted the authority, based on appropriate studies, to raise or lower the speed limit on any road or section of roadway given statutory maximum and minimum speeds. The legislative history of Virginia makes it likely that if the General Assembly passes legislation that would establish a maximum rural interstate speed limit of 65 mph, the authority to establish a lower limit on certain sections, where prescribed by traffic engineering and traffic investigations, would rest with the commissioner of the VDOT.

Summary of Other States' Guidelines for Raising the Speed Limit on Rural Interstate Highways

The selection of sections of the rural interstate highways at which the speed limit could be raised to 65 mph should be based on certain criteria. The guidelines used by other states will therefore give some indication of the factors that Virginia might consider.

Interviews were conducted with traffic and safety engineers of some of the states that have raised the speed limit on the rural interstate to 65 mph. Only states in the east were contacted, since traffic characteristics in these states are presumed to be similar to those in

TABLE 17

Sections of Rural Interstate Eligible for a Speed Limit Increase

Route	From	To	Length
64	West Virginia State Line	Route 81	57.33
64	Route 81	Route 781 (Albemarle Co.)	32.05
64	Biscuit Run Road OP	WCL Charlottesville	1.82
64	ECL Charlottesville	Route 157 (Henrico Co.)	58.30
64	0.37 Mi. W. Route 295	0.79 Mi. E. Rt. 143 (M.P. 14.89)	38.86
66	Route 81	0.54 Mi. E. Rt. 658 (Fairfax)	51.05
77	North Carolina State Line	Route 81	33.46
77	Route 81	West Virginia State Line	27.08
81	Tennessee State Line	SCL Bristol	0.69
81	Route 1712 (Washington Co.)	Route 777 (Roanoke Co.)	122.35
81	1.26 Mi. N. Roanoke-Botetourt CL	West Virginia State Line	176.21
85	North Carolina State Line	0.18 Mi. N. Route 1 (M.P. 21.55)	61.84
95	North Carolina State Line	SCL Petersburg	47.46
95	NCL Colonial Heights	Route 620 OP	1.75
95	Hanover-Henrico CL	Route 610 (Prince William Co.)	69.03
295	Route 64	2.03 Mi. E. Staples Mill Road	6.09
295	Route 95	Route 301	2.35
295	Route 640	Route 627	0.43
295	0.41 Mi. W. Route 64	0.08 Mi. E. Route 60	1.29
			789.44

Virginia. The 12 states contacted were Alabama, Florida, Kentucky, Louisiana, Maine, North Carolina, New Hampshire, New Mexico, Ohio, South Carolina, Vermont, and West Virginia.

Traffic engineering factors which were considered in these states were:

(i) ITE 55 mph Guidelines
(ii) Accident History
(iii) Design Speed
(iv) 85th Percentile Speed
(v) Traffic Volume
(vi) Level of Service

A few states, however, did not consider any additional factors other than that stipulated in the state legislation and designated that all rural interstate highways be posted at a maximum speed limit of 65 mph. Table 18 shows a summary of the factors considered by each state.

ITE 55 mph Guidelines

These guidelines were used by North Carolina and South Carolina to initially identify sections of highway eligible for raising the speed limits. These guidelines were not, however, used as the sole requirements, and adjustments were made to fit with the specific traffic and accident characteristics that exist in each state.

Accident History

This factor was used by six of the twelve states contacted. In general, accident data on all sections of the rural interstate highways were analyzed to determine those sections with consistently higher rates than the critical rate during the period of 55 mph speed limit. Some states such as New Mexico and North Carolina eliminated those sections with consistently higher accident rates from further consideration for increasing the posted speed limit. Some other states, such as South Carolina, eliminated those sections with consistently higher accident rates only if the design speed was also less than 65 mph. In such cases, the posted speed limit was raised to the design speed.

Design Speed

The same six states that used accident history as a factor also used design speed. Some of these states, such as Kentucky and Louisiana, did not eliminate any section because of design speeds less that 65

TABLE 18

Factors Considered in Selecting 65 mph Speed Limit Sections of Rural Interstate Highways

State	ITE 55 mph Guidelines	Accident History	Design Speed	85th Percentile Speed	Traffic Volume	Level of Service	State Legislation Only
Alabama							x
Florida		x	x				
Kentucky[a]		x	x				
Louisiana		x	x				
Maine							x
North Carolina[a]	x	x	x				
New Hampshire				x			
New Mexico		x	x		x		
Ohio[b]							x
South Carolina	x	x	x			x	
Vermont[a]							x
West Virginia							x

[a] These states did not eliminate any sections because of lower design speeds as all sections have design speeds higher than 65 mph.

[b] States that have differential speed limits for trucks.

mph, as all of the roads under consideration have design speeds of at least 65 mph. These states, however, would have eliminated sections with design speeds less than 65 mph if they had existed. Other states, such as South Carolina, raised the posted speed limit up to the design speed limit, which required that the posted speed limit be raised to only 60 mph on some sections of the rural interstate system.

85th Percentile Speed

Only the state of New Hampshire considered the 85th percentile speed in selecting eligible sections for raising the speed limit to 65 mph. Checks were made to ensure that the posted speed limit was not less than the 85th percentile speed. This resulted in all rural sections of the interstate system being posted at 65 mph.

Traffic Volume

In addition to other factors, New Mexico considered traffic volume to ensure that free flow would not be inhibited by high traffic volumes. However, no section was eliminated because of this factor.

Level of Service

This was considered a secondary factor by a few states in that it was ascertained that at least a level of service C would be maintained. This factor did not result in the elimination of any sections of the rural interstate highways.

The above summary indicates that apart from the requirements of a given state legislation, the predominant factors considered were the accident history and the design speed. This is in keeping with normal traffic engineering practice, although other factors such as 85th percentile speed and level of service are also commonly used.

Proposed Guidelines for Raising the Speed Limit on Virginia's Rural Interstate Highways

The commissioner of the VDOT now has, under the present law, the authority to reduce the speed limit on the interstate system based on the results of traffic engineering and traffic investigations. The researchers are of the opinion that this same procedure should be granted the commissioner should the rural interstate speed limit be raised by the General Assembly. The guidelines that follow are not proposed as warrants that should be written into law, but rather are presented with the hope that these guidelines will serve as a useful tool in the decision-making process.

These proposed guidelines have been developed after careful consideration of the traffic engineering factors normally taken into consideration in speed zoning as presented earlier, the factors that have been considered by other states, the ITE Guidelines, and the specific characteristics of Virginia rural interstate highways.

The following guidelines are proposed:

1. Accident history - A detailed analysis of accident rates on each section of the rural interstate highways should be carried out to determine those sections that have accident rates significantly higher than the state's critical accident rates for rural interstate highways. The state's critical accident rate may be determined by using the following expression currently used by the state:

$$p = c + k \frac{c}{m} - \frac{1}{2m}$$

Where: p = critical accident rate.

c = average accident rate for the category of highway being tested. (For sections, c is expressed in accidents per million vehicle miles; for spots, c is expressed in accidents per million vehicles.)

m = average vehicle exposure for the study period at the location. (For sections, m is expressed in million vehicle miles; for spots, m is expressed in million vehicles.)

k = constant.

The ratio of average accident rate over the past 3 years to the combined rate should be determined as:

$$F = \frac{\text{3 yr. average accident rate at a section}}{p}$$

The following conditions should then apply.

When (i) $F < 1$ Raise speed limit to 65 mph.

(ii) $F > 1$ If the major contributory cause for the accidents is speed-related, retain 55 mph.

(iii) $F > 1$ If the major contributory factor is not speed-related, consider design speed: if design speed is less than 65 mph, post at design speed; if design speed is 65 mph, or higher, post at 65 mph.

2. Design speed - A review of the design speeds of all sections of the rural interstate highways indicates that there is no section with design speeds lower than 60 mph. Also, sections with design speeds lower than 65 mph are usually very short. It is therefore impractical to use design speed as a sole criterion. The following conditions should however apply:

   (i) When design speed is greater or equal to 65 mph, raise speed limit to 65 mph.

   (ii) When design speed is lower than 65 mph and $F > 1$ and a major cause of accidents is not speed-related, post at design speed.

   (iii) When design speed is less than 65 mph and $F < 1$, allow 65 mph, but post advisory sign indicating maximum safe speed (i.e., design speed).

3. Minimum length of zone - No section with a speed limit of 65 mph should be less than 10 miles, and no section with a speed limit less than 65 mph should be less than 2 miles.

4. Monitoring study and analysis - It is essential that data on speed and other traffic characteristics be taken at regular intervals on a sample of the rural interstate system and adjacent urban interstate highways after the speed limit changes. Analysis of these data should be carried out and the results compared with similar data before the changing of the speed limit in order to determine whether any significant changes have occurred. Similar analysis should be carried out for accident rates so that if any significant changes are observed for accident rates, it can be determined whether they are mainly due to the change in speed limit.

These guidelines have not considered the 85th percentile speed, as these data are not readily available and will take considerable time to collect at all sections of the rural interstate highways. The researchers are of the opinion, however, that if the proposed guidelines are adopted, safe and reasonable maximum speed limits will be obtained for the different sections of the rural interstate system in Virginia.

SUMMARY OF FINDINGS

Speeds

- In June of 1987, the average speed on Virginia's rural interstate highways was 59.9 mph, an increase of 3.6 mph over the previous year. The 85th percentile speed was up by 3.0 mph, to 65.0 mph.

- In Georgia and Pennsylvania, where the rural interstate speed limit has not been raised, both average and 85th percentile speeds have increased in 1987 as compared to 1986. In Georgia, the average speed is up by 1.3 mph and the 85th percentile speed by 3.5 mph. In Pennsylvania, the average speed is currently 2.3 mph higher and the 85th percentile speed 2.6 mph higher than in 1986.

- Most states that have raised the speed limit on the rural interstates report between a 1 mph and 5 mph increase in average and 85th percentile speeds since the implementation of the new speed limit. Of the 38 states that have raised the rural interstate speed limit, eight enacted the change too late to provide any meaningful data for this report. Of the remaining 30, seven either had no speed data for the interstates posted at 65 mph or were not willing to release those data. Thus, this finding is based on data from 23 states: Arizona, Arkansas, California, Colorado, Florida Idaho, Illinois, Indiana, Iowa, Kansas, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, North Dakota, Oklahoma, South Dakota, Utah, Washington, West Virginia, and Wisconsin. Although not all of these states have complete pre-65 mph and post-65 mph speed data, the data that were collected indicate that few states experienced an increase in average or 85th percentile speeds of more than 5 mph. These data represent the best estimate of the short-term impact of raising the speed limit from 55 mph to 65 mph, but are not adequate to predict whether speeds will continue to increase or stabilize after the initial increase.

Accidents

- There are no conclusive crash, injury, or fatality data available to indicate the impact of the 65 mph speed limit in other states.

- An analysis of Virginia rural interstate accident and speed data revealed that increases in the average speed are significantly associated with increases in rural interstate injuries and fatalities as well as the injury rate and the death rate.

Economic Costs and Benefits

- An increase of 1 mph in the average speed on the rural interstate would result in an annual savings of more than 1.4 million hours in total travel time and 430,000 hours in commercial and business travel time.
- A 1 mph increase in the average speed on the rural interstate would result in an annual increase in vehicle operation costs, which includes an increase of 130 barrels of fuel per day.
- An increase in the average speed on the rural interstate would increase accident costs.

Public-sector Opinion

- Approximately 60% of the respondents to the public opinion survey indicated that they would prefer a 65 mph speed limit on Virginia's rural interstates. About 37% prefer to retain the 55 mph speed limit on all roads, and about 3% were undecided.
- Approximately 95% of Virginians surveyed are aware that the Commonwealth's maximum speed limit is 55 mph.
- Of the 84 special interest groups polled, 27 favored the 55 mph speed limit, 13 favored the 65 mph speed limit, and the rest had no official or unofficial position. Only six groups plan to lobby at the upcoming session of the General Assembly.

Federal Compliance Monitoring Program

- Virginia has not been in danger of losing federal-aid highway funds attached to the federal compliance monitoring program and would not be in danger even if the 55 mph speed limit is retained.

Speed Differential

- In Virginia and in other states, contrary to common belief, trucks are not traveling faster than cars.
- In Illinois, where there is a truck speed limit differential, the 85th percentile speed for cars is 4.4 mph higher than that for

trucks -- a greater disparity than before the differential speed limit.

Guidelines Used in Other States

o States can be classified into two general groups with respect to guidelines used for selecting sections of highways on which the speed limit should be raised:

(i) Those states that have raised the speed limit to 65 mph on all sections of the rural interstate highways as required by the state legislation.

(ii) Those states that also considered other factors. The factors considered most frequently were accident history and design speed.

CONCLUSIONS

Speeds

- Were Virginia to increase the rural interstate speed limit to 65 mph, the average speed would probably increase by approximately 3 mph, to an estimated 63 mph.

Accidents

- An increase of 3 mph in the rural interstate average speed would be associated with an increase of between 6 and 18 fatalities and between 171 and 405 injuries, all other factors being equal. This increase in average speeds would also be associated with an increase of between 0.39 and 0.99 per hundred million vehicle miles of travel in the rural interstate death rate and an increase of between 7.62 and 16.02 per hundred million vehicle miles of travel in the rural interstate injury rate, all other factors being equal.

Economic Costs and Benefits

- An increase of 3 mph in the average rural interstate speed would provide an annual savings of an estimated 4.3 million hours in total travel time and 1.3 million hours in commercial and business travel time, thereby providing a conservative dollar-value benefit of $10.8 million.

- The increased accident and vehicle operation costs of the higher speeds would approach $7.0 million.

- The economic benefits of raising the speed limit to 65 mph would outweigh the costs by a minimum of $3.8 million.

Public-sector Opinion

- The majority of Virginians support increasing the rural interstate speed limit to 65 mph.

- The majority of special interest groups surveyed held no position on the speed limit issue and the majority plan no lobbying activities in the upcoming session of the General Assembly.

Federal Compliance Monitoring Program

- Regardless of the policy decision, Virginia will not be in danger of losing federal-aid highway funds.

Speed Differential

- Were Virginia to implement a truck speed limit differential, speed variance would increase, and there would be an increase in truck/car conflicts.

Traffic Engineering Tenets

- Increasing the speed limit on the rural sections of Virginia's interstate highway system would, in general, not violate the traffic engineering tenets for setting speed limits.

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GLOSSARY OF TERMS

85th Percentile Speed
The speed at or below which 85 percent of the vehicles travel and above which 15 percent of the vehicles travel. This is the speed at or around which the speed limit is normally set.

Average Speed
The average speed is the arithmetic mean or central tendency of the speed traveled on a highway that is obtained by adding together the vehicle speeds observed and dividing that total by the number of vehicles observed.

Capacity
The capacity is the maximum number of vehicles that have a reasonable expectation of passing over a given section of lane or a roadway during a given time period under prevailing roadway and traffic conditions.

Design Speed
The design speed is the maximum safe speed that can be maintained over a specified section of highway when conditions are so favorable that the design features of the highway govern.

Mean Speed
Same as average speed.

Median Speed
The median speed is the speed at or below which 50 percent of the vehicles travel and above which 50% of the vehicles travel.

Pace
The pace is that range of speed usually taken at 10 mph intervals that has the greatest number of observations.

Sight Distance
The sight distance is the length of the roadway a driver can see ahead of him at a particular time.

Stopping Sight Distance
The stopping sight distance for design purposes is usually taken as the minimum sight distance required for a driver to stop a vehicle after seeing an object in the vehicle's path without hitting the object.

APPENDIX A

Survey Questionnaire for the General Public

55 MPH NMSL QUESTIONNAIRE

General Public Version

Good Afternoon (Evening). My name is ____________________________ (use full name or pseudonym). I'm conducting a brief survey for the Virginia Transportation Research Council. May I speak with someone in your household who is 16 years of age or older?

(CONFIRM AGE PRIOR TO PROCEEDING)

I'd like to ask you a few questions concerning speed limits in Virginia. Your answers will be very valuable and will remain strictly confidential. (PROCEED TO FIRST QUESTION IF APPROPRIATE).

1. First, do you drive?

   1... Yes
   2... No
   9... Refused

2. What do you feel the maximum speed limit should be in Virginia?

   __________ (Code Actual Number)
   (98... Undecided; 99... Refused)
   (If Answer is 55 mph or less, skip to Question 4)

3. Where or on which highways should this maximum speed limit be imposed? (PROBE for best answer)

   1... Only On Rural Interstates
   2... Only On Urban Interstates
   3... Only On Primary Highways
   4... On All Interstates
   5... On All Interstates and Primaries
   6... On All Roadways Posted at 55 mph
   7... Everywhere
   8... Other (specify __________________________)
   9... Refused

4. Congress has recently passed a law allowing states to raise the speed limit on rural interstate highways to a maximum of 65 mph. Do you feel that Virginia should...(Read Responses):

1... Raise its maximum speed limit to 65 on rural interstates, or
2... Retain the 55 mph maximum speed limit on all roads?
3... Other (specify ______________________________)
4... Undecided
9... Refused

5. Why? (Probe for up to three answers)

1... shorter travel time
2... better for business
3... other states are doing it
4... better traffic flow
5... 55 doesn't save lives
6... roads designed for higher speeds
7... I feel comfortable at that speed
8... People are driving at the higher speeds anyway
9... Higher limit makes common practice legal
10... Most will only go a little faster after increase
11... Accidents won't increase much

20... fuel economy will suffer
21... more accidents will occur
22... less comfortable in fast traffic
23... I don't feel comfortable at higher speed
24... Roads not designed for higher speeds
25... Most will go much faster after increase

30... Other (specify______________________________)

99... Refused

6. In which county or city do you live?

____
(Enter County or City Code)
(998.. Unknown; 999.. Refused)

7. Would you consider the area in which you live to be basically... (Read Responses 1 and 2)

1... Urban, or
2... Rural
3... Suburban
4... Don't Know
5... Refused

8. In what year were you born?

____
(98.. Unknown; 99.. Refused; 88.. pre-1900)

Well, that's all of our questions. Can I answer any questions for you or is there any comment you'd like to make?

This survey has been sponsored jointly by the Department of Motor Vehicles, the Department of Transportation, and the Department of State Police. I'd like to thank you for your time and cooperation.

APPENDIX B

Survey Questionnaire for Special Interest Groups

55 VS 65 MPH INTERVIEW SCHEDULE

Special Interest Groups

Group Name:______________________________ Date:________________

Contact Name:____________________________ Number:______________

Position:________________________________

INTRODUCTION: introduce yourself, mention the task force and topic, and locate the individual most appropriate to the topic

1. Does your organization have an official position concerning retaining the 55 mph speed limit or raising speed limits on rural interstate highways in Virginia?

   1... No Official Position (Skip to Question 3)
   2... Supports 55 mph retention
   3... Supports with the provision: ____________________________
   ____
   ____

   4... Supports raising to _____ mph
   5... Supports with the provision: ____________________________
   ____
   ____

2. Do you have any written information on or supporting your group's position? (IF SO) Can we get a copy of the information?

   1... Yes
   2... No
   3... Received

3. Does your group have an unofficial position on this issue?

   1... No Unofficial Position
   2... Unofficial Support of 55 mph
   3... Unofficial Support of 65 mph

4. Why does your group hold this position? (Probe for any data supporting the position.)

1... shorter travel time
2... better for business
3... other states are doing it
4... better traffic flow
5... 55 doesn't save lives
6... Roads designed for higher speeds
7... People are driving at the higher speeds anyway
8... Higher limit makes common practice legal
9... Most will only go a little faster after increase
10... Accidents won't increase much

20... fuel economy will suffer
21... more accidents will occur
22... less comfortable in fast traffic
23... Roads not designed for higher speeds
24... Most will go much faster after increase

30... other (specify____)

____

99... refused

5. Does your group plan to lobby for or against speed limit legislation during the next General Assembly session?

1... Yes
2... No
3... Undecided
4... Refused

6. How many members does your organization have?

__________ In Virginia
__________ Nationally

Are there any other comments you'd like to make or questions that I can answer for you?

(Thank respondent and mention sponsorship)

APPENDIX C

Survey Questionnaire for Highway and Transportation and Public Safety Departments in Other States

General

1. When did the provision permitting 65 mph go into effect in (state)?

2. Who makes the decision as to where 65 mph will be in effect?

3. Are any segments of rural interstate now posted above the design speed due to the increase to 65 mph?

4. Do you make any special provision or corrections for design limitations such as physical improvements, warning signs, or other postings?

Speed Data

5. Since switching to 65 mph, do you have compliance data available?

6. If so, are compliance data available for 1984 through 1986 as well?

7. Can you provide 1984 through 1987 mean speed data for rural interstate sections now posted at 65 mph?

8. Can you provide 1984 through 1987 85th percentile speed data for rural interstates now posted at 65 mph?

9. Can you provide speed frequency data for 1984 through 1987 for sections of rural interstate now posted at 65 mph?

10. Can you provide data on compliance at change points (where 65 mph drops to 55 mph) on interstates and/or on non-interstates accepting traffic directly from 65 mph zones?

11. Can you provide data regarding the number of violations in 1984 through 1987 on sections of rural interstate now posted at 65 mph?

Accident Data

12. Can you provide comparison data on accidents on urban interstates, rural interstates, and other roads for 1984 through 1987?

13. Are these data further broken down to reflect accidents on 65 mph rural interstates and 55 mph rural interstates?

Differential

14. Does (state) employ any type of speed differential on rural interstates posted at 65 mph?

15. What are the reasons for having this differential?

APPENDIX D

Survey Questionnaire for Administrative Divisions in Other States

1. Why did (state) decide to permit 65 mph?

2. What were the major factors animating the decision?

3. What particular factors (safety, energy, time savings, etc.) provoked debate on this issue?

4. What interest groups pushed for 65 mph?

5. What interest groups were opposed to 65 mph?

APPENDIX E

Statistical Precision of Opinion Survey of the General Public

1. Statistical precision - mileage

$$N = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2 \, sd^2}{(M_1 - M_o)^2}$$

$$1380 = \frac{(1.96 + 0.87)^2 \, (7.1)^2}{\Delta^2}$$

$$\Delta = .54 \text{ mph}$$

2. Statistical precision - dichotomous choice

$$N = \frac{(Z_{1-\alpha} + Z_{1-\beta})(pq)^2}{(M_1 - M_2)^2}$$

$$1380 = \frac{(1.96 + 0.87)^2 \, [(.50)(.50)]^2}{\Delta^2} = \Delta^2 = .0005$$

$$\Delta = .019 \text{ or } 1.9\%$$

APPENDIX F

Rural Interstate Data: 1966 to 1986

Rural Interstate Data: 1966 to 1986

Year	Fatalities	Death Rate*	Injuries	Injury Rate*	Average Speed	VMT (Millions)
1966	82	3.51	1,660	71.03	60.3	2,337
1967	91	3.61	1,476	58.50	62.3	2,523
1968	74	2.63	1,867	66.32	62.5	2,815
1969	92	2.89	1,969	61.78	63.8	3,187
1970	67	1.92	1,940	55.62	64.5	3,488
1971	92	3.08	1,951	65.38	63.9	2,984
1972	78	2.36	2,036	61.70	64.9	3,300
1973	107	3.01	2,050	57.63	66.2	3,557
1974	56	1.65	1,193	35.16	58.7	3,393
1975	43	1.19	1,270	35.02	60.4	3,626
1976	65	1.70	1,278	33.41	59.0	3,825
1977	65	1.60	1,540	37.81	59.8	4,073
1978	54	1.25	1,813	42.12	58.9	4,304
1979	52	1.21	1,355	31.43	58.2	4,311
1980	53	1.24	1,483	34.71	57.9	4,272
1981	58	1.32	1,600	36.33	56.7	4,404
1982	53	1.13	1,646	35.11	58.7	4,688
1983	57	1.25	1,642	36.02	58.8	4,558
1984	55	1.12	1,920	39.22	58.8	4,896
1985	59	1.14	1,838	35.67	59.7	5,153
1986	45	0.81	1,966	35.60	58.1	5,522

* NOTE: Frequency rates are recorded per hundred million VMT.

APPENDIX G

Selected State Statutes and Legislation

Selected State Statutes and Legislation

Alabama (Code of Alabama)

§ 32-5A-171 (2)-(3): No person shall operate a passenger vehicle, a passenger bus or any motor truck having a box or express type body, of three-quarters of a ton capacity or less . . . [or] a truck with a rated capacity of more than 3/4 ton at a rate of speed greater than 55 miles per hour at any time unless a different maximum rate of speed is authorized by the governor under authority granted in subdivision (4).

§ 32-5A-171 (4): The governor is hereby specifically authorized to prescribe the maximum rate of speed whenever a different rate of speed is required by federal law in order for Alabama to receive federal funds for highway maintenance and construction.

Arizona (Arizona Revised Statutes Annotated)

§ 28-702.01 (A): No maximum speed limit on any public highway in this state shall be in excess of fifty-five miles per hour notwithstanding any other higher maximum speed limit previously established pursuant to any other provision of law.

§ 28-702.01 (C): The director may order that this maximum speed limit be increased up to seventy-five miles per hour on an individual highway or on all highways in the state if the governor declares by proclamation that an emergency does not exist and that the receipt of federal highway funds would not be withheld.

Arkansas (Arkansas Statues Annotated)

§ 75-601(b): The Highway Commission shall, upon an engineering and traffic investigation, determine the maximum permissible speeds on controlled access highways which shall be effective when appropriate signs giving notice thereof are erected along the highway. Provided, the Highway Commission shall fix the maximum permissible speed of trucks with one and one-half (1 1/2) ton capacity or more at ten (10) miles per hour below the maximum permissible speed for automobiles.

California (California Legislative Service)

1987 Cal. Legis. Serv. ch. 25, amending Cal. Veh. Code § 22356: Whenever the Department of Transportation, after consultation with the Department of the California Highway Patrol, determines upon the basis of an engineering and traffic survey on existing interstate freeway segments, or upon the basis of appropriate design standards and projected traffic volumes in the case of newly constructed interstate freeway segments, that a speed greater than 55 miles per hour would facilitate the orderly movement of vehicular traffic and would be reasonable and safe . . . the [DOT], with the approval of the [DCHP], may declare a higher maximum speed of 60 or 65 miles per hour . . . . The [DOT] shall only make a determination under this section that is fully consistent with, and in full compliance with, federal law.

Colorado (Colorado Revised Statutes)

§ 42-4-1001 (7)(b): Notwithstanding any other provisions of this section, no person shall drive a vehicle on a highway . . . in excess of a maximum lawful speed of fifty-five miles per hour.

§ 42-2-1001 (7)(j): The provisions of this subsection (7) shall be in full force and effect for so long as the provisions of a federal national maximum speed limit are in effect. In the event of the repeal by the United States congress of a national maximum speed limit, the speed limits shall be returned to those which were in effect prior to January 24, 1974 . . . .

Florida (Florida Statutes Annotated)

§ 316.187 (2): The Department of Transportation is authorized to set such maximum and minimum speed limits for travel over those roadways under its authority as it deems safe and advisable, not to exceed as a maximum limit 55 miles per hour, but the maximum limit shall be increased to not more than 70 mph, in the event the Federal Congress approves such limits on limited access highways.

Idaho (Idaho Code)

§ 49-681 (2): Where no special hazard exists that requires lower speed . . . no person shall drive a vehicle at a speed in excess of . .

. Sixty-five (65) miles per hour on highways designated as permissible by federal law . . . .

Indiana (Acts, Indiana)

1987 Ind. Acts 180, amending Ind. Code § 9-4-1-57: (b) Except when a special hazard exists that requires lower speed . . . the limits specified in this section or established as authorized by this section shall be maximum lawful speeds . . . Sixty-five (65) miles per hour on any highway on the national system of interstate and defense highways located outside of an urbanized area (as defined in 23 U.S.C. 101) with a population of fifty thousand (50,000) or more. (c) The maximum speed limits . . . on a highway on the national system of interstate and defense highways [may be altered], by the department, by order of the director, to conform to any federal regulation concerning state speed limit laws.

Iowa (Iowa Legislative Service)

1987 Iowa Legis. Serv. S.F. 311, Sec. 2, amending Iowa Code § 321.285 (8): Notwithstanding any other speed restrictions, the speed limit for all vehicular traffic, except vehicles subject to the provisions of section 321.286 on fully controlled access, divided, multilaned highways including the national system of interstate highways designated by the federal highway administration and this state . . . is sixty-five miles per hour.

1987 Iowa Legis. Serv. S.F. 311, Sec. 11: CONDITIONAL EFFECTIVE DATE AND APPLICATION. This Act takes effect from and after the date of its enactment or the date federal legislation which modifies 23 U.S.C. § 154 by approving speed limits of at least sixty-five miles per hour becomes law, whichever occurs later. If the modification . . . does not apply to all fully controlled-access, divided, multilaned highways, [section 2 of] this Act . . . applies only to such highways or sections of highways for which a sixty-five mile per hour speed limit is permissible under the modification to 23 U.S.C. § 154 and subsequent modifications . . . .

Kentucky (Kentucky Revised Statutes Annotated, Official Edition)

§ 189.391 (1)-(2): Notwithstanding . . . the speed limit for all types of motor vehicles on any portion of any public highway of four (4) or more traffic lanes, the opposing lanes of which are physically separated by means other than striping, shall be fifty-five (55) miles per hour, unless speed limits for all types of motor vehicles were less than fifty-five (55) miles per hour on November 1, 1973. (2) The maximum speed limit on any public highway except those mentioned in subsection (1) shall be fifty-five (55) miles per hour.

§ 189.391 (4): In the event that the congress of the United States should raise or lower the speed limits as set out in subsections (1), (2), and (3), the secretary of the transportation cabinet shall alter the speed limits on the public highways of the Commonwealth of Kentucky to comply therewith.

Louisiana (Louisiana Revised Statutes)

§ 32:61: Text effective only if Congress repeals penalties for violating the fifty-five mile-per-hour speed limit. B. No person shall operate or drive a vehicle on any Interstate highways of this state in excess of sixty-five miles per hour.

Mississippi (Mississippi Code Annotated)

§ 63-3-501: The state highway commission may . . . increase the speed restrictions on any portion of the Interstate Highway System which has been completed by it, provided said speed restrictions are not increased to more than seventy (70) miles per hour for private passenger vehicles or passenger buses.

§ 63-3-503: Whenever the state highway commission determines that speed limits set forth in 63-3-501 are different from those speeds set forth in applicable laws of the Federal Government, then said commission may declare a speed limit which is consistent with such laws . . . .

Missouri (Missouri Legislative Service)

1987 Mo. Legis. Serv. S.B. 83, amending Mo. Rev. Stat. § 304.009 (1): The uniform maximum speed limit upon the roads and highways of this state which are not part of the interstate system of highway outside urbanized areas of fifty thousand population or more shall be fifty-five miles per hour. The uniform maximum speed limit upon the roads and highways of this state which are part of the interstate system of highways outside urbanized areas of fifty thousand population or more shall be sixty-five miles per hour for vehicles other than trucks . . .

of more than twenty-four thousand pounds. . . . [and] shall be sixty miles per hour for all trucks . . . of more than twenty-four thousand pounds.

Nevada (Statutes of Nevada)

§ 484.361 (4): It is unlawful for any person to drive or operate a vehicle of any kind or character at . . . [a] rate of speed greater than the speed limit set forth by the Federal Government if that limit is greater than 60 miles per hour.

New Hampshire (New Hampshire Revised Statutes Annotated)

§ 265:60 (II): [A]ny speed in excess of the limit specified in this section or established as hereinafter authorized shall be prima facie evidence that the speed is not reasonable or prudent and that it is unlawful: . . . (e) 70 miles per hour on the interstate system . . .

§ 265:62 (II): Notwithstanding . . . RSA 265:60, II, or any other law to the contrary, upon recommendation of the commissioner of transportation and a determination by the governor and council that it is in the public interest to conserve motor vehicle fuels or to conform with other national goals, the governor and council may establish temporary prima facie speed limits upon any part [of the interstate system] . . .

New Mexico (Laws of New Mexico)

1987 N.M. Laws ch. 73, amending N.M Stat. Ann § 66-7-302:

A. During the period that the federal government requires a maximum speed limit to be imposed by New Mexico, no person shall drive a vehicle on any public highway in New Mexico at a speed greater than fifty-five miles per hour or such other maximum speed limit as required by the federal government.

B. On the date that the federal government ceases to require a maximum speed limit of fifty-five miles per hour, the speed limits set forth in the Motor Vehicle Code shall be in effect unless otherwise specified by the federal government.

North Carolina (Advance Legislative Service to the General Statutes of North Carolina)

1987 N.C. Adv. Legis. Serv. ch. 164, amending N.C. Gen. State. § 20-141(b): Except as otherwise provided in this Chapter, it shall be unlawful to operate a vehicle in excess of the following speeds: . . . (2) Fifty-five miles per hour outside municipal corporate limits for all vehicles, except on rural Interstate Highways where the speed limit has been raised pursuant to G.S. 20-141(d)(2) . . . . [which] reads as rewritten: "(2) Whenever the Department of Transportation determines on the basis of an engineering and traffic investigation that a higher maximum speed . . . is reasonable and safe . . . upon any part of a highway designated as part of the Interstate Highway System . . . the [DOT] shall determine and declare a reasonable and safe speed limit . . . not [to] exceed 70 miles per hour. The [DOT] shall set the speed limit not to exceed that allowed by applicable Federal law on any part of the Interstate Highway System that they deem to be safe.

Oklahoma (Oklahoma Session law Service)
1987 Okla. Sess. Law Serv. H.C.Res. 1016:

WHEREAS, the congress of the United States has overridden the presidential veto of the federal highway legislation, H.R. 2; and

WHEREAS, said legislation contains provisions authorizing a speed limit of 65 mph on portions of the interstate highway system which are located outside urbanized areas of 50,000 or more and are therefore designated to be rural or small urban; and . . .

NOW, THEREFORE BE IT RESOLVED . . . SECTION 1. The legislature hereby instructs the Department of Transportation to post speed limit markers on the appropriate portions of the interstate highway system in Oklahoma which qualify for the 65 m.p.h. speed limit designation.

South Dakota (South Dakota Codified Laws Annotated)

§ 32-25-11.2: There is hereby established on all highways of this state a maximum speed limit of fifty-five miles per hour during the period of emergency energy conservation. However, the transportation commission may adopt rules . . . to establish a maximum speed limit of sixty-five miles per hour on any interstate highway located outside of an urbanized area of fifty thousand population or more during the period of emergency energy conservation.

Tennessee (Tennessee Code Annotated)

§ 55-8-152 (d): On all highways of the interstate and defense highway system and four-lane controlled-access highways which are federal or state routes of this state, it shall be unlawful for any person to operate or drive a motor vehicle at a rate of speed in excess of seventy-five (75) miles per hour. . . . [or] for any person to operate or drive a truck at a rate of speed in excess of sixty-five (65) miles per hour.

§ 55-8-152 (g): Notwithstanding any existing provision of this section to the contrary, it shall be unlawful for any person to operate or drive a vehicle upon any highway or public road of this state in excess of fifty-five (55) miles per hour . . . . The Governor is authorized and required to reinstate by executive order the speed limits in effect prior to March 3, 1974 when federal law and regulation permit him to do so without loss to the state of Tennessee of federal aid highway funds . . . .

Vermont (Vermont Statutes Annotated)

§ 23-1004: The traffic committee has exclusive authority to make and publish, and from time to time may alter, amend, or repeal, regulations pertaining to . . . speed limits . . . on the national system of interstate and defense highways and other limited access and controlled access highways within this state . . . . The regulations are applicable only to the extent that they are not in conflict with regulations or orders issued by any agency of the United States having jurisdiction and shall be drawn with due consideration for the desirability of uniformity of law of the several states of the United States.

Virginia (Code of Virginia)

§ 461-193(1)(a): The maximum and minimum speed limits on highways of this Commonwealth shall be as hereinafter prescribed. (1) Maximum limits. (a) Fifty-five miles per hour on the Interstate System of Highways or other limited access highways with divided roadways.

§ 46.1-193(3): Notwithstanding the foregoing provisions, the State Highway and Transportation Commissioner or other authority having jurisdiction over highways may decrease the speed limits set forth in subdivisions (1) (a) . . . . Such . . . decreased speed limits . . . shall be effective only when prescribed after a traffic engineering and traffic investigation and when indicated upon the highways by signs . . . .