ASSESSING THE IMPACT OF SPEED LIMIT INCREASES ON FATAL INTERSTATE CRASHES[1]

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EXECUTIVE SUMMARY

The purpose of the study is to investigate the relationship between speed limits and traffic-related fatalities. Specifically, we sought to answer the question: *Does an increase in the speed limit result in a higher incidence of fatal crashes?*

We used data from the *Fatality Analysis Reporting System (FARS)*, maintained by the National Highway Traffic Safety Administration (NHTSA). FARS provides monthly data on numbers of fatal crashes for each state, with separate counts for rural and urban interstates. We used data for the period 1975-98, 1998 being the last year for which data are available. Changes in interstate speed limits occurred primarily in 1987 (rural only) and in 1996 (both urban and rural).

We carried out the data analysis using a time series technique known as structural modeling. This approach enables us to partition a series into its trend, seasonal and irregular (or residual) components and to evaluate the impact of major interventions such as speed limit changes. Based upon a review of the past literature, we formulated the impact of a speed limit change as a one-time percentage increase in the number of accidents, after which the seasonal and trend patterns in the series would be expected to remain similar to those of past years. The analysis was performed for each state, separately for urban and rural interstates.

The principal conclusions from the study are as follows:

- 19 of 40 states experienced a significant increase in fatal crashes along with the FIRST speed limit increase on rural interstates.
- 10 of 36 states experienced a significant increase in fatal crashes along with SECOND speed limit increase on rural interstates.
- 6 of 31 states experienced a significant increase in fatal crashes along with the speed limit increase on urban interstates.
- 29 states exhibited significant seasonality on rural interstates.
- 18 states exhibited significant seasonality on urban interstates.

Although the results are statistically significant as noted above, the numbers in some states may be small.

The seasonal patterns probably reflect changes in the number of vehicle miles traveled (VMT), with peaks occurring during holiday seasons. Seasonal analysis is critical to understanding any changes in pattern, since unadjusted comparisons for a few months immediately before and after a change could be seriously in error. Our analysis allows comparisons to be made after proper adjustment for seasonal effects. Overall, increases were seen in some states following speed limit changes. These increases were predominantly on rural rather than urban interstates.

INTRODUCTION

The purpose of this study is to investigate the relationship between speed limits and traffic-related fatalities. Specifically, we aim to answer the question: *Does an increase in the speed limit result in a higher incidence of fatal crashes?* Using a technique known as *structural modeling*, we are able to determine the impact past speed limit changes had on the number of fatal crashes on rural and urban interstates for each state based on its own, individual past experiences. This method also gives information about the seasonality, or monthly effect, of the number of fatal crashes. This introductory section continues the problem explanation by providing a historical perspective on speed limit increases and a summary of related studies. In the following sections we explain the analysis methodology used in specific detail with an example, describe the data source and present the key points from the data analysis.

The relationship between speed limit and number of traffic related fatalities is a subject of great interest to insurance companies, the government at all levels and the general public. Historically, the government has taken an active role in the determination of speed limits starting with the establishment of the National Maximum Speed Limit (NMSL) by Congress in January 1974. Prior to this legislation setting the maximum speed limit to 55 mph, many states posted limits as high as 70 to 75 mph. In April 1987, Congress passed legislation allowing states to increase speed limits to 65 mph on qualifying sections of interstate highways in rural areas with less than 50,000 population. Within a few months, 38 states raised the speed limits on appropriate roads. More recently, the National Highway System (NHS) Designation Act of 1995 was signed into law on November 28, 1995. This Act ended the Federal government's involvement in the establishment of speed limits, putting the responsibility for speed limit designation and compliance in the hands of the state governments that, in most cases, exercised their new rights and raised speed limits on rural and urban interstates.

Various studies have been performed with the express purpose of determining the impact of the speed limit increases on the number of traffic-related crashes and fatalities. The following is a representative selection of such studies with references therein:

- *Effects of the 65 mph Speed Limit Through 1990: A Report to Congress*; **National Highway Traffic Safety Administration**; May 1992.

This study looks at yearly interstate fatality data split by rural and urban roadways. The analysis is based on "expected historical trends." These projected counts were derived from statistical models based on the historical relationship between rural interstate fatalities and fatalities on other roadways. These results do not convey the impact of the speed limit increase on traffic fatalities. Rather, the study relates interstate deaths to non-interstate deaths; it also assumes a stationary, or non-changing, environment by fitting a global regression model. The authors then compare fatalities in 1986 with 1990 by computing percentage changes. This ignores historical trends and possible aberrant observations. This type of analysis may have "comparison bias." It is possible that more people chose to use interstates rather than alternative routes and that the increase in fatalities can be explained by Vehicle Miles Traveled (VMT) or actual roadway mileage. It also does not take into account the possibility that speed limits went up on several of the "other roads"—a relationship-changing event.

This paper does caution that care ought to be taken when interpreting the data. The authors note that results of individual states are probably not generalizable to the entire nation. They also point out that no statistical model is capable of controlling all of the factors that affect fatalities.

- Farmer, Charles M., Retting, Richard A., and Lund, Adrian K.; *Effect of 1996 Speed Limit Changes on Motor Vehicle Occupant Fatalities*; **Insurance Institute for Highway Safety**; October 1997.

This paper analyzes the effect of speed limit increases on interstates that occurred during and around 1996. This study employed linear regression models on trend and dummy variables to analyze the number of fatalities in states categorized by the time of their 1996 speed limit increase (early, late or none) and compare actual observed fatalities with the statistically computed, historically based trends. They first use percentage change between 1995 and 1996 to assess the impact of the 1996 legislation. They continually note that VMT may be able to explain the increase in fatalities, but the appropriate data are not available.

This study continues by noting that while the national fatality toll for 1996 changed very little compared to 1995, the change in the fatality toll for individual states varied markedly between significant decreases and increases. It is also states that total Interstate fatalities increased for the 11 states that increased speed limits. The authors of this study do note that there has been an increasing trend in the portion of the fatalities that occur on roads posted 55 mph or greater and that some increase in fatalities on interstates is to be expected. Overall, this study presents a very thorough before and after comparison using percentage changes. A linear trend model, with an intervention variable, is used to compare actual 1996 fatalities with estimated 1996 fatalities based on historical trends. The combination of using annual data and non-adaptive trends limits the value of the comparisons.

- *The Effect of Increased Speed Limits in the Post-NMSL Era: Report to Congress*; **National Highway Traffic Safety Administration**; February 1998.

This study also investigates the effect of the 1995-1996 speed limit increases on rural and urban interstates (specifically only states that had increased between December 8, 1995 and April 1, 1996 are considered). They group states into "changers" (12 count) and "non-changers" (18 count) where the latter serve as a comparison for the former. They modeled the logarithms of fatality counts for each year during 1990-1996 as functions of time and type of state. Both linear and quadratic time variables were included. The impact of the speed increase was modeled using a dummy variable equal to one in 1996 and 0 in previous years. They also included an interaction term between state group and the 1996 indicator to represent the difference between pre-1996/1996 changes for the two state types while accounting for the time trend. If this interaction term is significant, they claim that it can be concluded that the 1996 departure from the time trend among the states that increased limits is different from that of the comparison states. Again, the method may suffer from "comparison bias." The foremost problem with this type of analysis is that using such a linear and quadratic trend model is not appropriate for these series and does not perform as the authors claim it does. Including a quadratic trend may lower the residual variance for the in-sample fit, but it will damage the predictive ability of the model. By looking at the plot of Actual and Trend for rural Arizona in Figure 1, we can see that a global quadratic trend in the model does not provide a reasonable description for the length of the series.

- Ledolter, J. and Chan, K.S.; *Evaluating the Impact of the 65 mph Maximum Speed Limit on Iowa Rural Interstates.* **The American Statistician**; Volume 50; Number 1; February 1996.

This study examines whether a significant change in the fatal and major-injury accident rates can be detected following the implementation of a higher speed limit on rural interstates in Iowa. The authors have access to quarterly data on traffic speed, traffic volume and traffic safety. To answer the posed question, they fit a time series intervention model relating number of accidents to be proportional to traffic volume and include time trend and intervention variables for the May 1987 change and quarterly seasonality. The authors find that expected numbers of fatal accidents in Iowa rose by 2 incidents per quarter on rural interstates, a statistically significant increase.

BASIS FOR THE PRESENT STUDY

Since the data are collected over time in regularly spaced intervals, the impact of the speed limit changes on traffic accidents may be analyzed via time series analysis and, in particular, intervention analysis. Intervention analysis is used when a change in the environment occurs at a known time and affects the phenomenon of interest (see Kendall and Ord, Chapter 13 or DeLurgio, Chapter 12 for a description). In this case, the known change is the change of speed limit. More specifically, since the change in speed limit is more or less permanent, a step intervention is most appropriate. That is, we hypothesize that the change in speed limits results in a permanent shift in the number of accidents. In this study the shift is measured as a percentage increase since we use a logarithmic transform; see the last paragraph of the next section.

DATA SOURCE

The data analyzed in this study are the number of fatal crashes per month for each state separated by rural and urban interstates. We used fatal crashes rather than number of deaths since we regard the accidents data as a more reliable guide to road safety conditions. The number of fatal crashes was determined from the *Fatality Analysis Reporting System* (FARS) which is publicly available at the website http://www-fars.nhtsa.dot.gov/. The database was downloaded in *SAS*© format. At this site, it is possible to query the FARS database for yearly statistics for 1994-1998. We are confident, since our monthly values sum up to the yearly values reported by the online system, that we were able to successfully extract the appropriate data. Note that our yearly totals do not always exactly match the yearly totals given in the studies mentioned previously. These discrepancies can be attributed to the changing of the FARS Database structure, differences in opinion on which roadways were included, or user error. Again, since our data set matches the online database query totals, we are satisfied with the quality of our data compilation.

In this study, we analyze the natural logarithm of the number of fatal crashes per month. The use of logarithms allows us to consider percentage changes rather than absolute shifts and stabilizes the variance of the series. Since some of the months have a zero number of fatal crashes, it is necessary to add 1 to each month prior to transforming the data. Thus, when looking at the plots of the data, it should be remembered that the series is shifted up by one unit.

METHODOLOGY

The data used in this study are the number of fatal crashes for each month (from January 1975-December 1998) for each state separated by rural and urban interstates. Such data are known as a *time series*. *Time Series Analysis* is the field of studying, modeling and forecasting processes that change over time. When we consider the impact of an increase in speed limit on the number of fatal crashes, we are mainly concerned with the modeling aspect of time series analysis, looking backwards in time to see "what happened." There are many techniques for this type of analysis. Most of these techniques assume that, over time, the average level and variation of the series both stay constant. In practice, this is rarely the case.

In 1986, Andrew Harvey and James Durbin produced a study entitled "The effects of seat belt legislation on British road casualties: a case study in structural time series modeling," which appeared in the Journal of the Royal Statistical Society—Series A, volume 149. In their investigation, these two outstanding researchers introduced a novel method of analyzing the impact of government legislation called *Structural Time Series Modeling*. Previous methods used for this type of study required the researcher to manipulate the series until its average level and variation remained constant over time. Thus, all obvious trends, cycles, seasonalities, etc. were removed prior to modeling. In the structural approach, models are set up explicitly in terms of components of interest such as trends, seasonals and cycles. In addition, instead of assuming that these components remain constant over time, this approach allows them to evolve through time. This approach is intuitively appealing since environments that generate time series often do not remain constant. The computer package *STAMP*© *5.0*, developed by Harvey and his associates, was used to perform the analyses presented in this study.

As an example of this method of analysis, consider rural interstates in Arizona. The speed limit was changed in April 1987 and December 1995. The original time series is shown in Figure 1. The series is decomposed into trend, seasonal and irregular components that are represented graphically in Figures 1-3. We can see visually that there is a significant increase in the trend around 1987 but none around 1995. This indicates that around 1987, the average number of fatal crashes significantly increased, but not so elsewhere. This increase occurs at the same time as a speed limit increase. Statistically, the 1987 speed limit increase resulted in a 41% increase in rural interstate crashes in Arizona. There is no statistical evidence that the 1995 speed limit increase had any additional effect on the number of fatal crashes. Next, we see from the seasonal component that there appears to be a strong monthly effect on the number of fatal crashes. For this example, there are considerably more crashes in June, July and August compared to the other months. Such seasonal patterns exist for most states and reflect the higher traffic levels in summer months. The irregular component is simply what is left over after the trend and seasonal components are taken into account. Since the irregular component is small compared to the actual series, most of the structure in the data is accounted for by the trend and seasonal components.

The Structural Time Series Modeling approach tells us that there is a strong seasonal effect on the number of fatal crashes and that there is a significant increase in the number of such crashes around the time the speed limit was changed. However, we observe from the plot of the Trend component that it appears that after the initial jolt of the speed limit change, the trend gradually moves back towards the level prior to the speed limit increase. This phenomenon was observed for a number of states, but not for all. The overall U.S. figures in Figure 7 show a slight decline in the post-1987 period but the picture is less clear because the state laws were enacted at different times. There are several possible explanations for such reductions including:

1. Drivers adjusted to driving at higher speeds
2. States increased enforcement of driving laws
3. Automobile safety was improved.

However, we stress that our analysis was not designed to examine these questions; rather, they are important issues for further investigation.

KEY POINTS

INDIVIDUAL STATES

The rural and urban interstates of each state were analyzed using the structural modeling approach with deterministic step intervention variables at the time(s) of the speed limit increases. Rural interstates are subject to 1987 and 1996 changes while urban interstates were only changed around 1996. We will refer to the changes around that 1987 time period as the FIRST speed limit increases and those made around 1996 as the SECOND speed limit increases.

We can see the significance of the speed limit increases graphically with the following code:

Code	
0	No Change
1	Not Significant at 0.1 Level
2	Significant at 0.1 level

We can summarize the findings as follows:

- 19 of 40 states experienced a significant increase in fatal crashes along with the FIRST speed limit increase on rural interstates (Figure 4).
- 10 of 36 states experienced a significant increase in fatal crashes along with SECOND speed limit increase on rural interstates (Figure 5).
- 6 of 31 states experienced a significant increase in fatal crashes along with the speed limit increase on urban interstates (Figure 6).

Table 1 shows the states that had significant changes on rural interstates, the estimated monthly percentage impact of the speed limit change and the number of fatal crashes in 1986-1988. From this table, we can see the monthly percentage increase in the number of fatal crashes attributable to the speed limit changes. The number of total fatal crashes for 1986-1988 are included for two reasons: 1) To interpret the percentages in terms of real numbers and 2) To see if the number of fatal crashes decreases in the year after the speed limit change. The importance behind Reason #1 is, without minimizing the value of human life, to see what the significant increase translates to in terms of actual number of crashes. For example, suppose a state averages 36 crashes per year, or 3 per month and the estimated monthly increase of fatal crashes is about 33%. The expected increase in the number of crashes is about one per month. Although statistically significant, such an increase is small in absolute numbers and may be attributable to other factors. The importance behind Reason #2 is to assess whether drivers gradually adjust to new driving conditions. For example, Arizona, displayed graphically in Figure 1, had an increase in the number of crashes the year of the speed limit change, but a decrease from that level in subsequent years. This suggests that drivers in Arizona may have learned how to safely drive at the new limit. Such patterns are not consistent across states and this issue requires further investigation.

Table 2 shows the same information for the urban interstates and also includes 1998 data. Table 2 includes only states that experienced a statistically significant increase in the number of fatal crashes. During the 1996 set of changes, some states encountered a negative impact—that is, a decline in the number of fatal crashes—along with the speed limit increase. While this effect may be real, it is difficult to attribute it to the increase in speed limits, so the results are not included in Table 2.

In order to get an idea of how many fatal crashes are associated with a particular speed limit increase, we can “remove” the effect of the increase from those states that had a significant increase in fatal crashes and analyze the difference between the expected and actual numbers. The predicted number of fatal crashes had the speed limit not increased is approximated by dividing the observed number of fatal crashes by (1 + the %-Change). Tables 3 and 4 show this information separated by rural and urban interstates. We see that the estimated overall percentage increases are along the same order as the individual increases resulting in approximately an additional 200 rural and 80 urban fatal crashes. It is important to note that these numbers only represent a crude approximation of the effect of the speed limit increase.

SEASONALITY

One of the powerful benefits of using structural modeling is that, instead of removing seasonality, the effect of being in a specific month is directly modeled. The strength of the seasonal pattern was one of the most surprising aspects of this analysis. It is shown graphically below that:

- 29 states exhibited seasonality at the 0.05 level of significance on rural interstates (Figure 8)
- 18 states exhibited seasonality at the 0.05 level of significance on urban interstates (Figure 9)

where the legend is interpreted as:

Code	
0	Not significant
1	Significant at 0.1 level
2	Significant at 0.05 level

The extent of seasonality is different for each state. Most states typically have a higher number of fatal crashes in August. Some states have different patterns that have interpretations unique to that state. For instance, Florida tends to have more fatal crashes in March on its urban interstates. This corresponds to the time most college students are on Spring Break and many choose to drive to locations in Florida. In general, seasonal peaks appear to coincide with peak holiday seasons. Most states do not produce data on vehicle miles traveled, so we cannot adjust the data in a consistent manner for such effects.

AGGREGATE ANALYSIS

Though the analysis is by state, it is of interest to generalize the effect of speed limit increases to the nation as a whole. To answer this question, we use a “Super T-Test” which is a t-test on the t-values of the intervention variables. Positive t-values indicate a positive (increase) impact of the number of fatal crashes. Individually, they determine the significance of the individual impact of the policy change. To answer the question whether or not fatal crashes increase along with speed limit increases, we perform a one-sided t-test testing whether or not the mean of the t-values of all of the intervention variables are significantly greater than zero. If we reject the null hypothesis, then we can conclude that there is indeed an increase in the number of fatal crashes. It DOES NOT tell us, however, how large this increase is, only whether on average an effect exists.

- Super-T Test for Rural Interstates

	Test Value = 0			
	t	df	Sig. (2-tailed)	Mean Difference
FIRST	10.597	39	.000	1.2384
SECOND	4.009	36	.000	.6555

- Super-T Test for Urban Interstates

	Test Value = 0			
	t	df	Sig. (2-tailed)	Mean Difference
FIRST	1.373	30	.180	.2746

We see from the Super-T Tests that rural interstates tend to be affected by speed limit increases while urban interstates are not.

REFERENCES

Kendall, Maurice and J. Keith Ord, 1990. *Time Series. 3rd Edition.* Edward Arnold, London and Oxford University Press, New York.

DeLurgio, Stephen A, 1998. *Forecasting Principles and Applications.* Irwin McGraw-Hill, Boston.

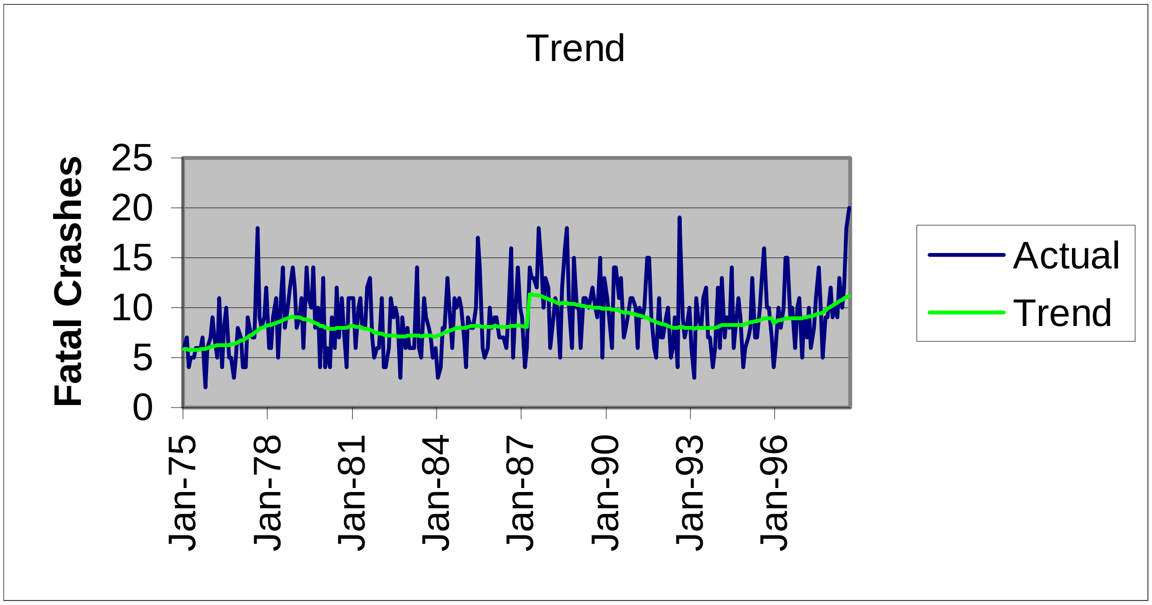

Figure 1: Trend Component for Rural Arizona

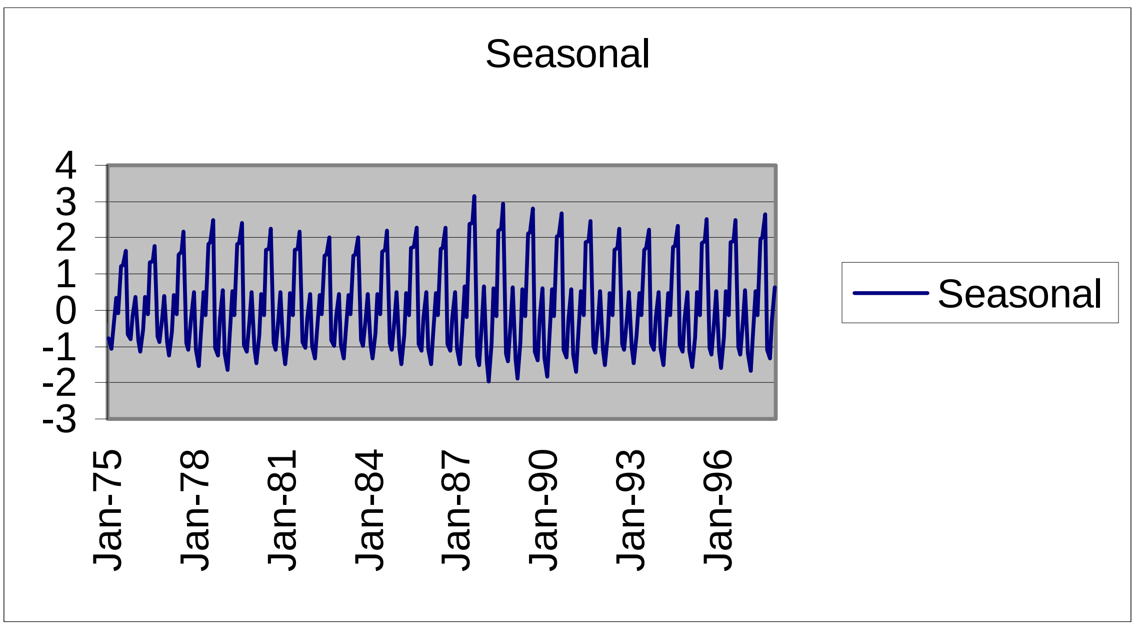

Figure 2: Seasonal Component for Rural Arizona

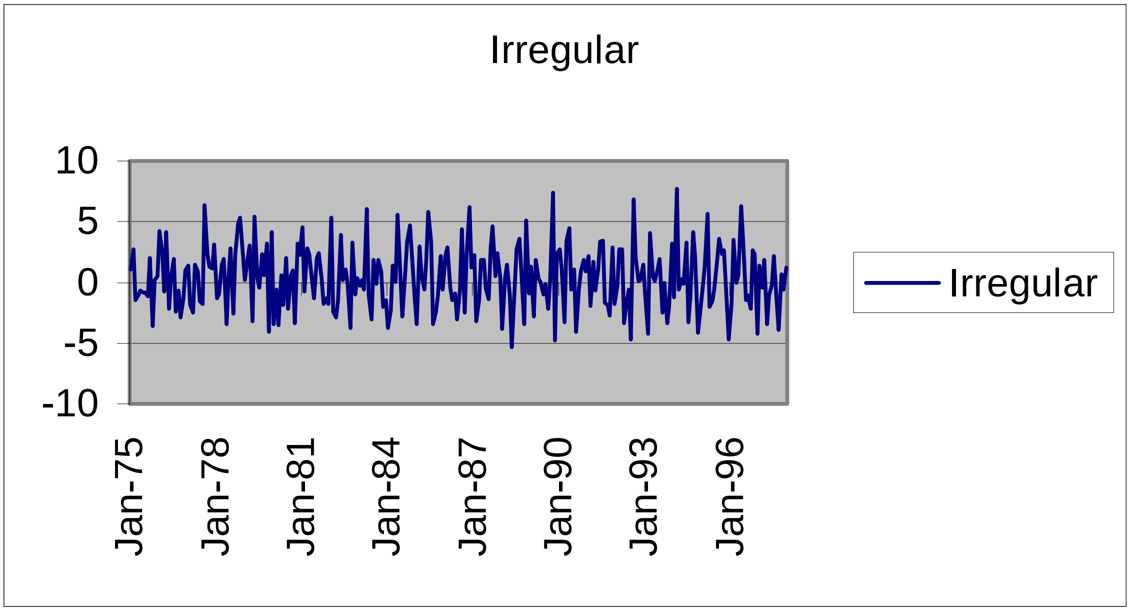

Figure 3: Irregular Component for Rural Arizona

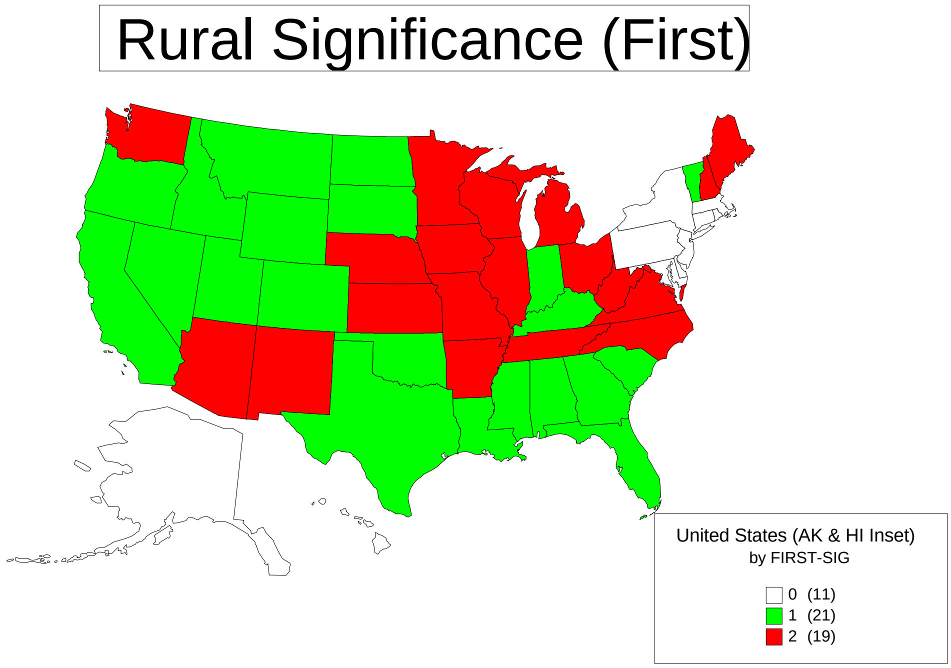

Figure 4: Significance Level of First Rural Limit Change

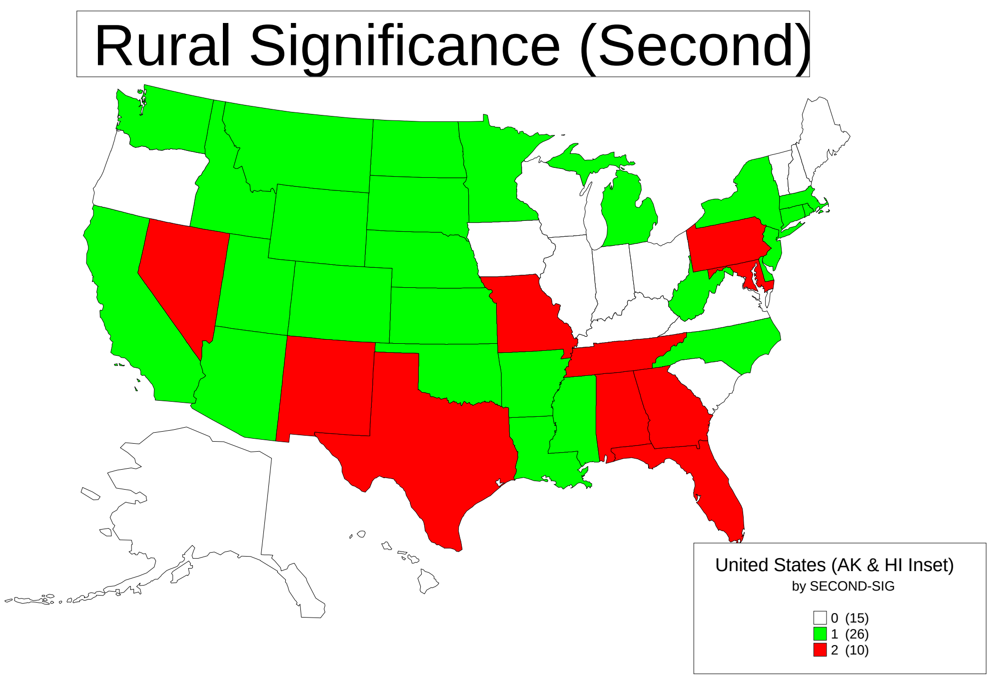

Figure 5: Significance Level of Second Rural Limit Change

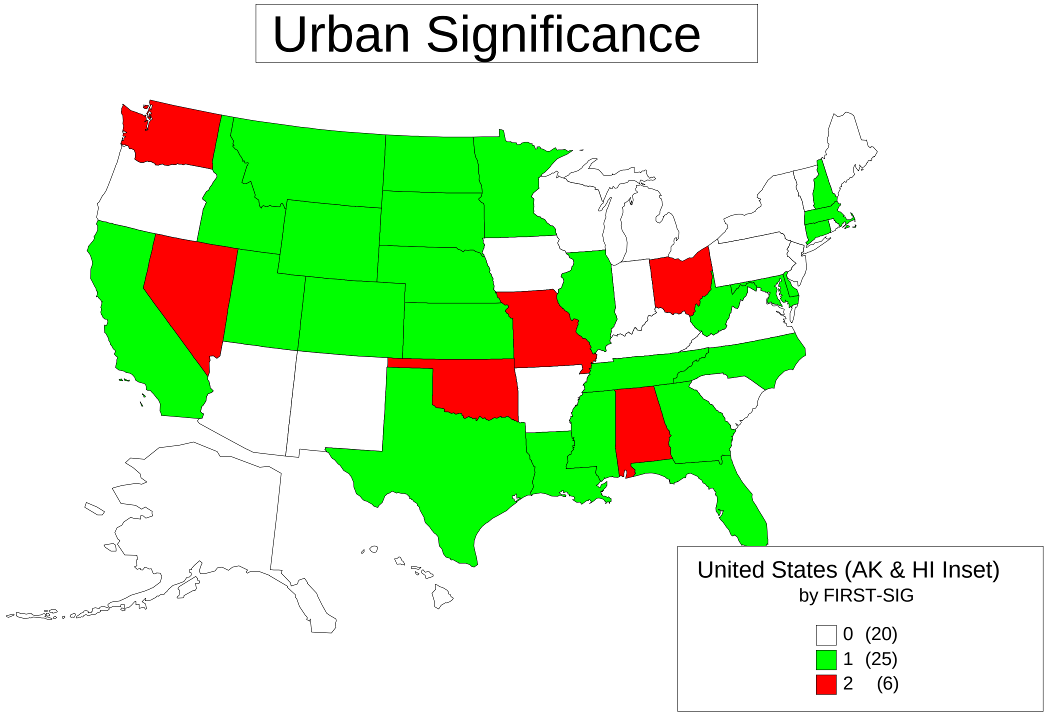

Figure 6: Significance Level of Urban Limit Change

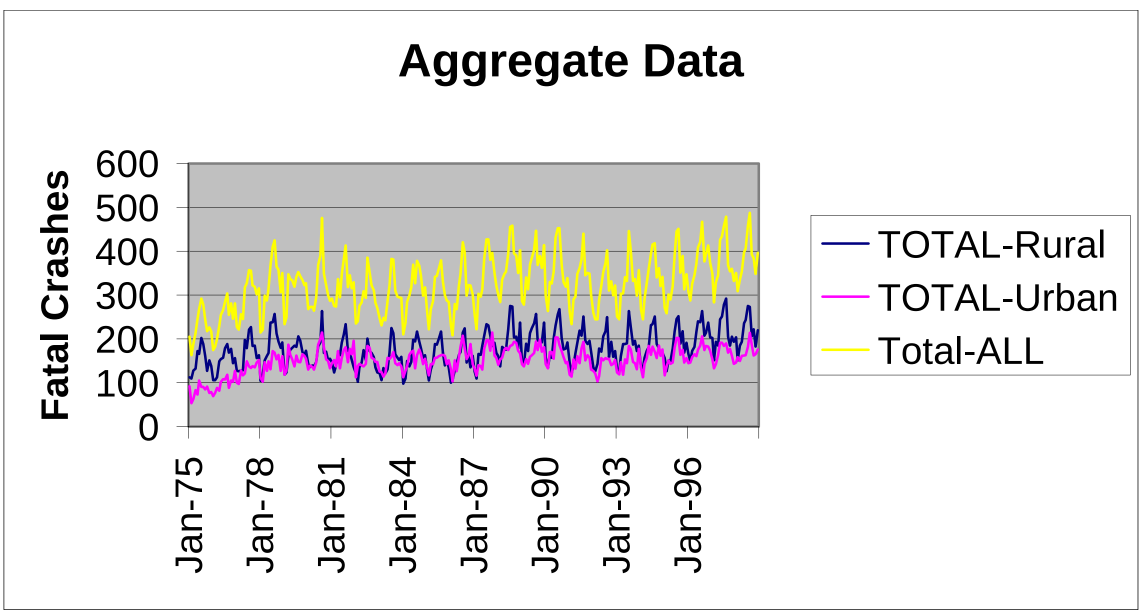

Figure 7: Rural, Urban and Combined Number of Monthly Fatal Crashes

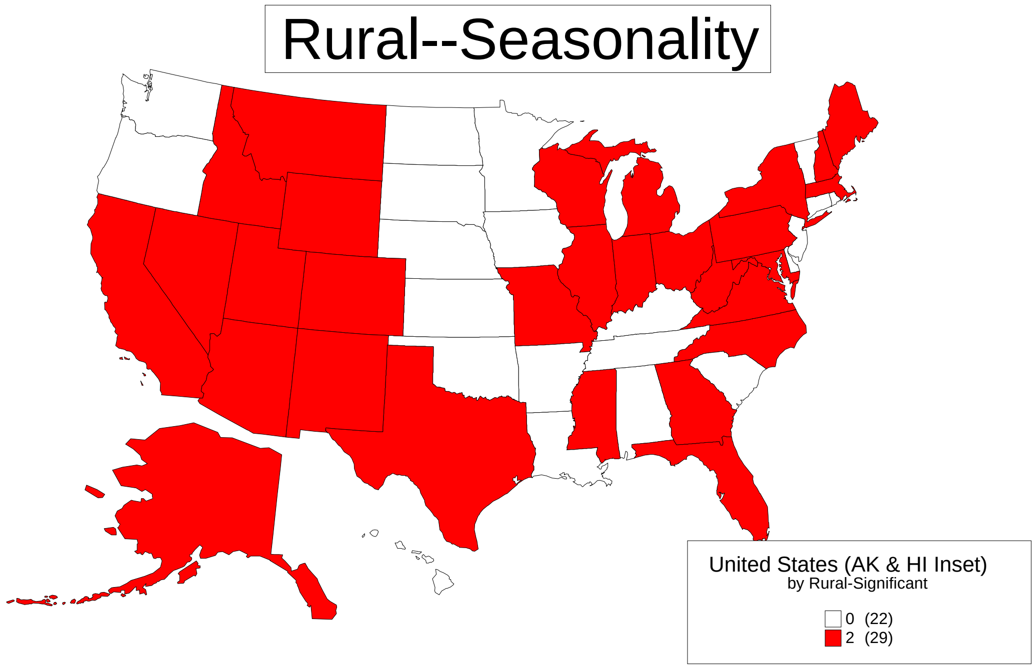

Figure 8: Rural Seasonal Component Significance Level

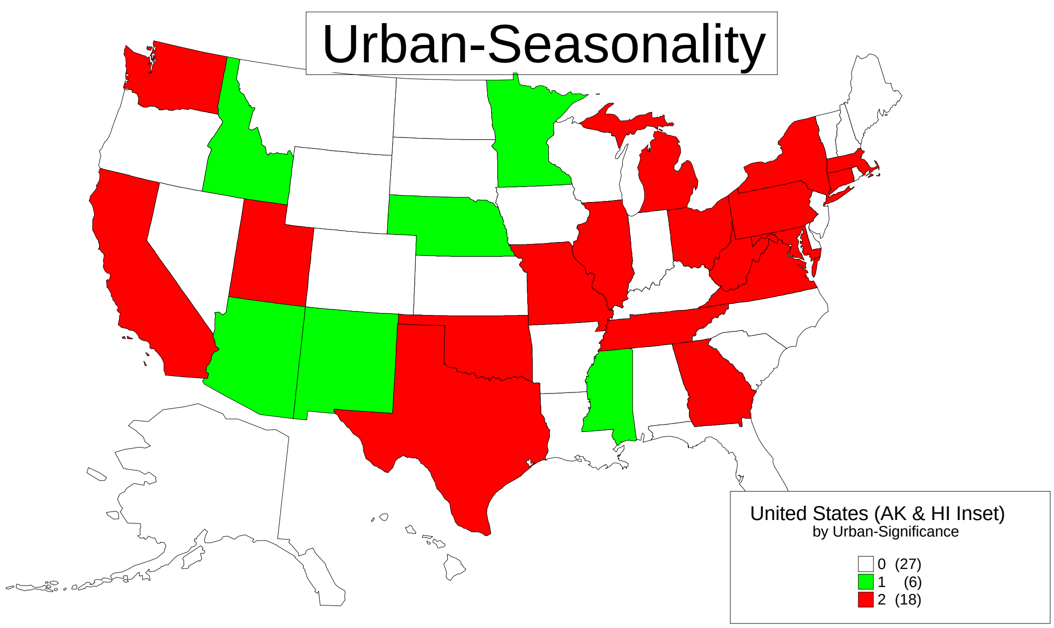

Figure 9: Urban Seasonal Component Significance Level

Table 1: Significant Rural Changes

STATE	FIRST CHANGE	SECOND CHANGE	1986 CRASHES	1987 CRASHES	1988 CRASHES	1995 CRASHES	1996 CRASHES	1997 CRASHES	1998 CRASHES
Alabama		24.8%	62	53	57	49	62	79	65
Arizona	41.0%		96	126	116	100	103	98	140
Arkansas	32.6%		26	30	34	28	38	28	46
Florida		37.2%	105	96	153	102	116	166	133
Georgia		30.0%	66	52	65	50	100	73	85
Illinois	21.9%		48	59	73	58	68	71	74
Iowa	35.8%		12	21	29	20	21	22	21
Kansas	23.1%		17	22	24	27	18	23	14
Maine	18.4%		13	8	20	9	8	12	14
Maryland		37.4%	20	17	19	16	15	26	18
Michigan	46.7%		14	34	44	34	46	40	46
Minnesota	25.7%		9	19	21	15	15	12	31
Missouri	13.0%	42.2%	58	53	54	66	87	93	98
Nebraska	35.5%		12	12	20	19	21	22	28
Nevada		27.1%	22	35	32	44	53	44	62
New Hampshire	21.4%		5	6	19	6	10	10	8
New Mexico	15.8%	25.5%	66	103	78	87	85	105	102
North Carolina	42.6%		40	58	76	55	71	50	53
Ohio	46.6%		34	54	47	45	46	44	39
Pennsylvania		36.4%	56	68	69	52	64	54	67
Tennessee	15.5%	40.4%	53	70	73	74	86	70	97
Texas		18.0%	164	195	236	201	220	217	200
Virginia	31.6%		39	39	64	74	59	71	62
Washington	24.5%		26	32	40	35	43	30	39
West Virginia	46.2%		14	13	29	38	48	40	34
Wisconsin	24.3%		15	13	24	16	27	25	20
US TOTALS			***1834***	***2141***	***2391***	***2210***	***2441***	***2518***	***2591***
%CHANGE				***16.74%***	***11.68%***		***10.45%***	***3.15%***	***2.90%***

Table 2: Significant Urban Changes

STATE	CHANGE-%	1995 CRASHES	1996 CRASHES	1997 CRASHES	1998 CRASHES
Alabama	37.8%	32	49	66	49
Missouri	35.0%	56	85	82	94
Nevada	31.2%	14	23	15	14
Ohio	40.8%	60	64	64	78
Oklahoma	39.5%	36	47	46	31
Washington	32.1%	24	33	34	40
US TOTALS		***1919***	***2054***	***1998***	***2026***
% CHANGE			***7.03%***	***-2.72%***	***1.40%***

Table 3: Predicted number of fatal crashes attributed to the speed limit increase on rural interstates.

STATE	FIRST-%	SECOND-%	Predicted 1988	Predicted 1996	Predicted 1997	Predicted 1998
Alabama	0.0%	24.8%	57.0	49.7	63.3	52.1
Arizona	41.0%	0.0%	82.3	103.0	98.0	140.0
Arkansas	32.6%	0.0%	25.6	38.0	28.0	46.0
Florida	0.0%	37.2%	153.0	84.5	121.0	96.9
Georgia	0.0%	30.0%	65.0	76.9	56.2	65.4
Illinois	21.9%	0.0%	59.9	68.0	71.0	74.0
Iowa	35.8%	0.0%	21.4	21.0	22.0	21.0
Kansas	23.1%	0.0%	19.5	18.0	23.0	14.0
Maine	18.4%	0.0%	16.9	8.0	12.0	14.0
Maryland	0.0%	37.4%	19.0	10.9	18.9	13.1
Michigan	46.7%	0.0%	30.0	46.0	40.0	46.0
Minnesota	25.7%	0.0%	16.7	15.0	12.0	31.0
Missouri	13.0%	42.2%	47.8	61.2	65.4	68.9
Nebraska	35.5%	0.0%	14.8	21.0	22.0	28.0
Nevada	0.0%	27.1%	32.0	41.7	34.6	48.8
New Hampshire	21.4%	0.0%	15.7	10.0	10.0	8.0
New Mexico	15.8%	25.5%	67.4	67.7	83.7	81.3
North Carolina	42.6%	0.0%	53.3	71.0	50.0	53.0
Ohio	46.6%	0.0%	32.1	46.0	44.0	39.0
Pennsylvania	0.0%	36.4%	69.0	46.9	39.6	49.1
Tennessee	15.5%	40.4%	63.2	61.3	49.9	69.1
Texas	0.0%	18.0%	236.0	186.4	183.9	169.5
Virginia	31.6%	0.0%	48.6	59.0	71.0	62.0
Washington	24.5%	0.0%	32.1	43.0	30.0	39.0
West Virginia	46.2%	0.0%	19.8	48.0	40.0	34.0
Wisconsin	24.3%	0.0%	19.3	27.0	25.0	20.0
Predicted Total			1317.3	1329.3	1314.4	1383.2
Actual Total			1516.0	1530.0	1525.0	1596.0
Approximate Increase			198.7	200.7	210.6	212.8
Percentage Increase			15.09%	15.10%	16.02%	15.39%

Table 4: Predicted number of fatal crashes attributed to the speed limit increase on urban interstates.

STATE	CHANGE-%	Predicted 1996	Predicted 1997	Predicted 1998
Alabama	37.8%	35.6	47.9	35.6
Missouri	35.0%	63.0	60.7	69.6
Nevada	31.2%	17.5	11.4	10.7
Ohio	40.8%	45.5	45.5	55.4
Oklahoma	39.5%	33.7	33.0	22.2
Washington	32.1%	25.0	25.7	30.3
Predicted Total		220.2	224.2	223.8
Actual Total		301	307	306
Approximate Increase		80.8	82.8	82.2
Percentage Increase		36.71%	36.91%	36.75%