



THE IMPACT OF THE 65 MPH SPEED LIMIT IN ARIZONA

A RESEARCH REPORT FROM THE

Arizona Statistical Analysis Center

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by

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IN THIS REPORT...

Traffic crashes and casualties have escalated dramatically in the wake of the new law raising the maximum speed limit from 55 to 65 mph on Arizona's rural interstate highways. Traffic crashes increased 32 percent on these highways after the new law, while deaths and injuries resulting from those crashes rose 36 percent. At the same time, no appreciable increase of traffic crashes or casualties was measured on Arizona's urban interstate highways--those highways on which the maximum speed limit remained at 55 mph.

These findings were uncovered in an impact assessment of the April 1987 law conducted by the Arizona Statistical Analysis Center. A summary of the research is presented in this report.

The research employed an analysis that compared highways on which the maximum speed limit was raised with highways on which the speed limit remained at 55 mph. Highway figures for fatal and injury-producing traffic crashes, as well as resulting deaths and injuries, were compiled from records of the Arizona Department of Transportation for the period January, 1982 to December, 1988. Interrupted time-series methods were used to measure changes in the data from pre- to post-law periods.

The analysis further showed that the increase in traffic casualties following the new law was permanent. Through December, 1988, over 1,000 deaths and injuries were attributed to the higher speed limit. In other words, an additional three deaths and 50 injuries have occurred on Arizona's rural interstates in each month since the 65 mph speed limit became law. The report concludes that these casualties would not have occurred if the speed limit had remained at 55 mph.

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Background

The Surface Transportation and Uniform Relocation Assistance Act of 1987 permitted states to raise the maximum speed limit from 55 to 65 mph on rural interstate highways. Congress's action was a major break with previous policy. A national maximum speed limit of 55 mph was initially mandated by Congress in 1974. This law was adopted as an energy conservation measure in response to the OPEC oil embargo of 1973. By the time the resulting oil crisis came to an end, however, transportation officials had established that the reduced speed limit was also saving many lives on the Nation's highways. Because of its value to traffic safety, the 55 mph national speed limit remained intact until the law was changed in 1987.

Soon after Congress revised its policy, the Arizona State Legislature voted overwhelmingly to raise the 55 mph speed limit within the Congressional guidelines. On April 15, 1987, Governor Evan Mecham signed House Bill 2206, and a maximum speed limit of 65 mph became law on Arizona's rural interstate highways. The new law provided that the 65 mph speed limit would apply to "the interstate system highways located outside of an urbanized area with a population of 50,000 or more persons." Interstate highways within the State's urban areas retained the existing 55 mph limit.

Along with Arizona, thirty-seven other states adopted the higher speed limit in 1987. By mid 1988, many of these states released traffic statistics comparing equal time periods before and after implementation of the new limit. Twenty-seven of the states showed sizeable increases in traffic deaths on highways where the speed limit was raised. In contrast, few of the same states showed similar increases on highways where the existing 55 mph speed limit was retained (Stamler Publishing Company, January 30, 1989).

Traffic safety advocates, the insurance industry, and others opposed to the higher maximum speed limit, attributed the rise in traffic deaths to the rise in allowable highway speeds. On the other hand, proponents of the higher speed limit questioned this interpretation. They argued that conclusions could not be drawn from the data without assessing historical trends on the affected highways or without considering other possible explanations for the increase in traffic deaths.

Research Methodology and Analysis

To clarify the effect of the 65 mph speed limit in Arizona, the Arizona Statistical Analysis Center conducted an interrupted time-series quasi-experiment of the new law. The interrupted time-series research design is considered by social scientists as the one of the most appropriate methods for measuring the impact of a new law. The analyst introduces even greater control by employing this design within a quasi-experimental framework, under which the ability to interpret results is considerably enhanced. Combining the two techniques permits an analysis that accounts for both historical trends in the data and the possibility of rival explanations.

Data used in the analysis were obtained from the Arizona Department of Transportation. Monthly figures for fatal and injury crashes as well as resulting deaths and injuries were compiled from each rural and urban interstate highway segment for the period January, 1982, to December, 1988. Fatality or injury data were not used separately because monthly observations of the individual series were not large enough for adequate analyses.

As a first step in the analysis, it is necessary to construct quasi-experimental contrasts using the compiled data. Briefly, a quasi-experimental contrast consists of two time series that, when analyzed and compared, are subject to interpretation within some predetermined quasi-experimental logic.

In this study, two quasi-experimental contrasts are employed. First, the time series of fatal and injury-producing crashes on interstate highways on which the speed limit had been raised is contrasted with the series of like data from interstate highways on which the speed limit had not been raised, remaining unchanged. Second, crash-related deaths and injuries on interstates with the increased limit are likewise contrasted with the analogous series from interstates retaining the existing limit. In each case, the quasi-experimental logic suggests that the intervention of the 65 mph speed limit should affect the series on which the speed limit was raised (i.e., the experimental series), and should not affect the series on which the speed limit remained the same (i.e., the control series).

The contrasts of the time series also enable, to a large extent, a determination of whether the impact of the higher speed limit was caused by the change in law or by some other influence on the series. Since the experimental and control series of each contrast are measured equally, an event or situation that affects traffic in general should affect both series (whereas the increased speed limit should affect only the experimental series).

An increase in State tourism, for example, should be evidenced in higher deaths and injuries in both the experimental and control series due to increased driving in the State. If this occurred around the time that the speed limit was raised, an increase in crash-related deaths and injuries would be observed in both time series, making it impossible to isolate the effect of the higher speed limit on the experimental series. If, on the other hand, crash-related deaths and injuries increase at the point of legal intervention in the experimental series, and do not increase at the point of legal intervention in the control series, then the analyst can rule out alternative explanations, such as a rise in State tourism, and conclude that the increase in deaths and injuries is the result of the higher maximum speed limit.

Once the quasi-experimental contrasts have been constructed, Autoregressive Integrated Moving Average (ARIMA) models are then developed to describe the intrinsic movement and characteristics of each time series. A third time series, specifying the change in law (i.e., the intervention component), is then added to each model. Using this intervention component, an analyst can measure the change that occurs as an experimental or control series moves from the pre-law period to the post-law period.

At this stage, the point of intervention for analysis must also be determined. Though laws become effective on a certain day, the point at which a legal intervention can be effective is often difficult to identify. Laws aimed at deterring an undesirable behavior, for example, may not become fully effective until the provisions of the law are widely known by the targeted population. Publicity is

usually the vehicle by which a law becomes known. Indeed, previous research suggests that the impact of a law is rarely isolated from the effect of publicity surrounding the law.

In this research, selection of the intervention point was based primarily on two considerations. First, while the 65 mph maximum speed limit became effective Arizona's rural interstate highways on April 15, 1987, the following month (May) was chosen as the point of initial impact simply because it is the first full month following the intervention. Second, selecting April as the initial point of impact was considered troublesome because of extralegal variables surrounding the new law's inception. Drivers' adjustment to the new speed limit was thought to be one of these factors. Since average driving speeds were already well over the legal 55 mph maximum, it was predicted that, after the change in law, drivers would only gradually and cautiously readjust their average speeds to a level around or over 65 mph.

Evidence from prior research suggests that drivers might also be reticent in adjusting their average speeds due to the massive publicity given to the increased speed limit. Publicity surrounding other legal interventions has almost always exaggerated the public's perception of efforts to enforce the new laws. It was therefore hypothesized that the publicity surrounding Arizona's raised speed limit initially restrained rather than encouraged drivers to increase existing speeds. Speeds would then be expected to rise to higher levels once the publicity died down and drivers, through their own experience, realized that law enforcement efforts were no greater than before the change in law. Assuming that such a process would run its course by the end of April, May, 1987, was chosen as the point at which the impact of the 65 mph speed limit would be initially realized.

Table 1: Impact Estimates of the 65 mph Maximum Speed Limit

Measure	Series Average ¹ (Per Month)	Change in Series Level		
		Percent Change	Raw Impact	Net Impact
Fatal and injury crashes on 65 mph interstates	93	32.1%	30	599
Fatal and injury crashes on 55 mph interstates*	58	-4.9%	-3	-56
Crash-related deaths and injuries/65 mph interstates	153	36.0%	55	1102
Crash-related deaths and injuries/55 mph interstates*	85	1.4%	2	24

¹Preintervention series.

*The impact of the intervention on this series is not statistically significant at the $p < .05$ level.

Raw Impact = Numeric rise or fall in the time series following the intervention.

Net Impact = Crashes, Deaths, etc., avoided (-) or incurred (+) through the duration of the impact on the series.

Results of the New Law

Each time series was assessed for an abrupt and permanent impact pattern beginning in May, 1987. Results of these analyses are presented in Table 1. The change in series level reported in Table 1 describes the direction and magnitude of change from preintervention to postintervention observations of the time series. The magnitude of an impact is derived from the change effected in the first postintervention month (i.e., May, 1987). When this effect continues at more than 95 percent of its original strength over the remaining months of the time series, the duration of the impact is said to be permanent. An impact estimate is statistically significant when it is determined that the probability of obtaining the same estimate by chance is less than one in 20 (i.e., $p < .05$).

In the analyses shown in Table 1, fatal and injury crashes and crash-related deaths and injuries on 65 mph interstates represent the experimental time series--those that, according to the quasi-experiment, were expected to exhibit significant increases with the change in law--while fatal and injury crashes and crash-related deaths and injuries on 55 mph interstates represent the control time series--those that, according to the quasi-experiment, were *not* expected to exhibit significant increases with the change in law.

Results of the analyses met all the expectations of the time-series quasi-experiment. As predicted, both experimental series show statistically significant increases at the point of intervention. Moreover, the impact of the higher speed limit on each of these series was of sufficient strength to persist for over one-and-a-half years through December, 1988, the term of the analysis. The level of fatal and injury crashes on 65 mph interstates rose 32 percent with the onset of the new law, an increase of 30 crashes per month from an average of 93 crashes before the intervention (see Figure 1). Over the duration of the impact, the 65 mph speed limit produced about 600 more crashes than would have occurred if the speed limit had remained at 55 mph. Deaths and injuries on interstate highways with the higher speed limit surged 36 percent following the change in law, a monthly rise of 55 casualties from a preintervention average of 153 (see Figure 3). The analysis measured a cumulative cost of over 1,100 deaths and injuries as a result of the increased speed limit.

In line with prior expectations as well, the control series demonstrated distinct contrast with the experimental series. No significant impact, up or down, was detected for fatal and injury crashes or deaths and injuries on those interstate highways that retained the 55 mph maximum speed limit (see Figures 2 and 4). Furthermore, these findings also rule out, to a large degree, the possibility of other influences affecting the analysis.

Conclusions

There can be little doubt that the increased maximum speed limit has diminished traffic safety on Arizona's rural interstate highways. Proponents of the higher speed limit had argued that the 65 mph speed limit would only legalize preexisting driver speeds and would result in general compliance with the new maximum limit with little affect on traffic safety. The findings of this research indicate otherwise: that drivers' speeds had been tempered to some degree by the 55 mph maximum speed limit, and that with the legitimization of the higher limit, drivers increased their speeds to a point at which a significant loss of lives, limbs, and property resulted. In

Figure 1: Fatal and Injury Crashes on Arizona Interstate Highways with Increase to 65 MPH Maximum Speed Limit

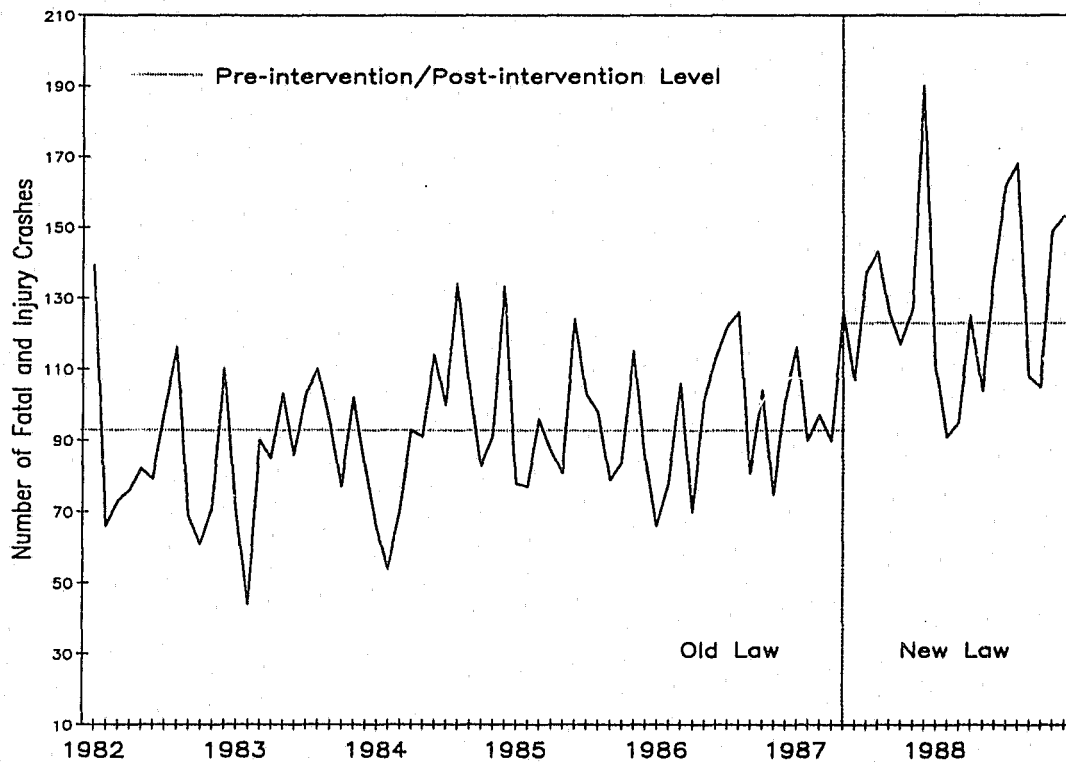


Figure 2: Fatal and Injury Crashes on Arizona Interstate Highways with No Change in 55 MPH Maximum Speed Limit

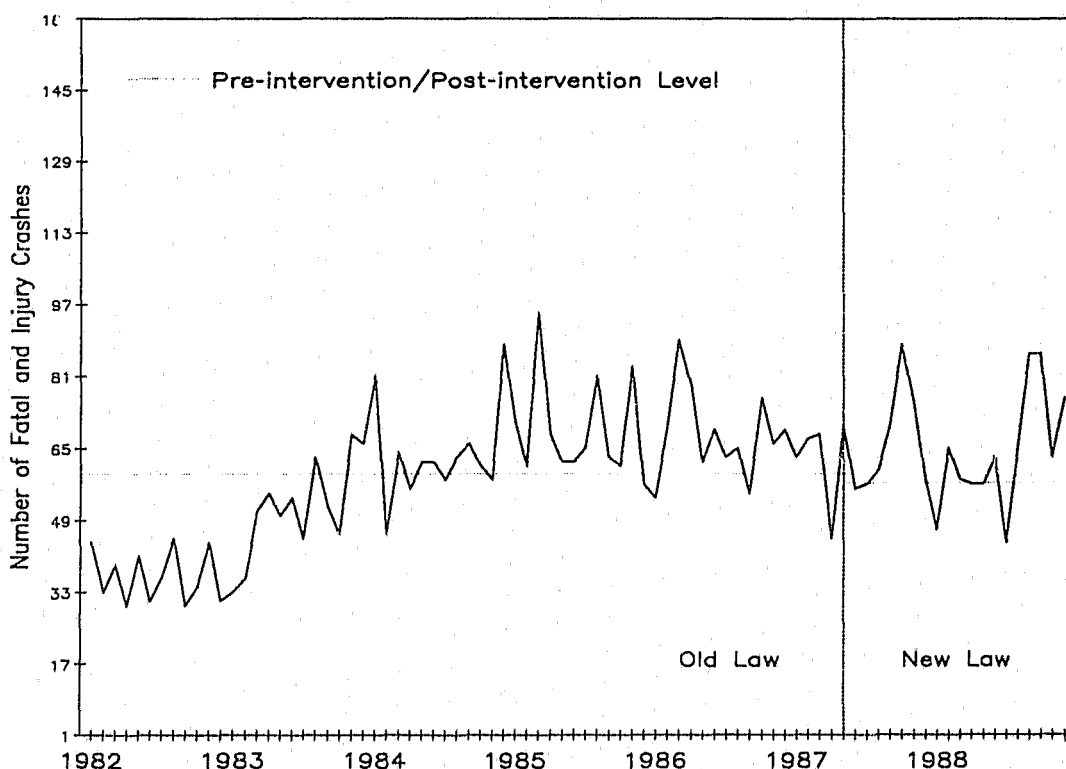


Figure 3: Crash-Related Deaths and Injuries on Interstate Highways with Increase to 65 MPH Maximum Speed Limit

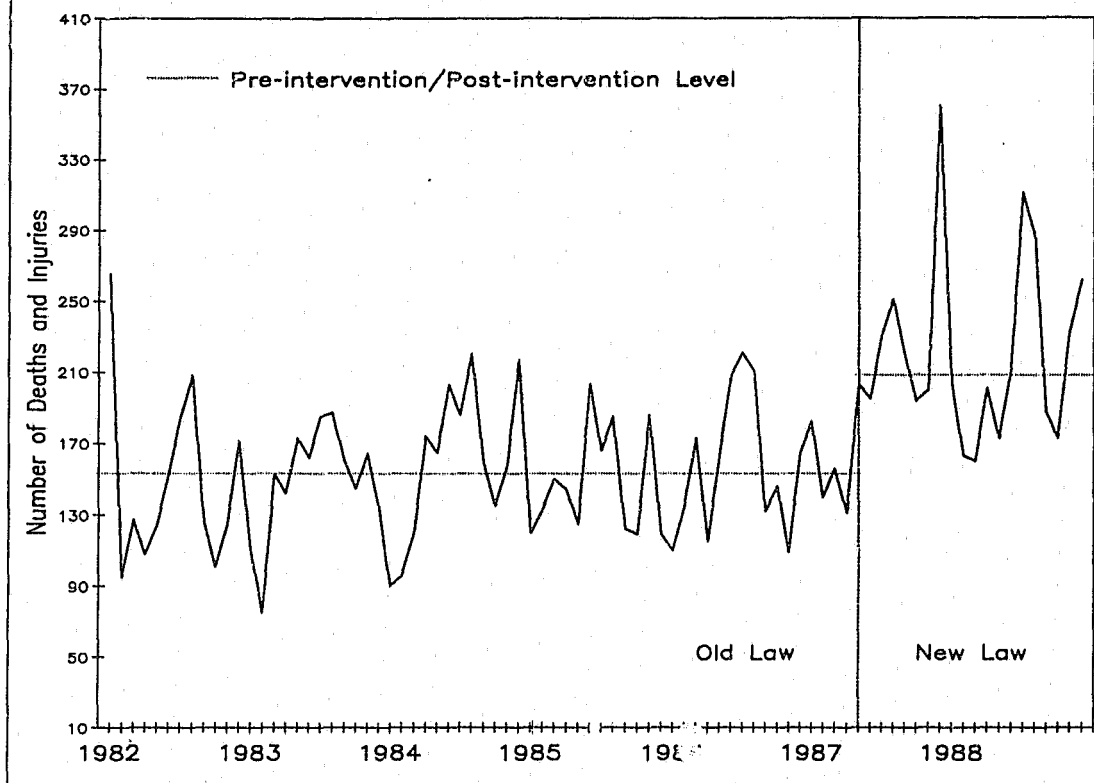
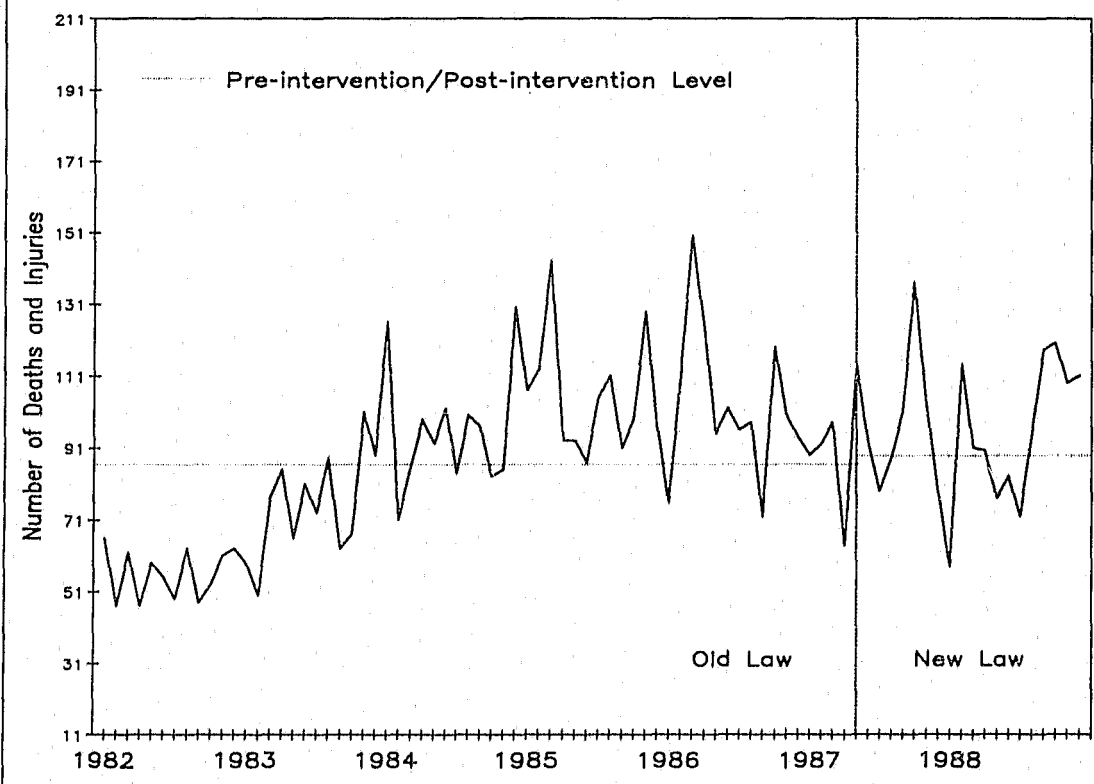


Figure 4: Crash-Related Deaths and Injuries on Interstate Highways with No Change in 55 MPH Maximum Speed Limit



every month since the speed limit was raised, Arizona's rural interstates have experienced about three deaths and 50 injuries more than would have occurred if the speed limit had remained at 55 mph. The findings of the study suggest that Arizona's driving population was safer when the State-wide maximum speed limit was 55 mph. To prevent a further eroding of traffic safety, the State would be wise to retain the 55 mph maximum on those highways where it is still the speed limit.

REFERENCES

Stamler Publishing Company, NHTSA study shows deaths up 19 percent on 65 mph rural interstates. *Highway and Vehicle Safety Report* 15, p. 2, January 30, 1989.