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**Did the 65 MPH Speed Limit
Save 3,113 Lives?**

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ABSTRACT

In 1987, most states raised the speed limit from 55 to 65 mph on portions of their rural interstate highways. There was intense debate about the increase, and a number of studies of the effects have already been published. These studies share a common flaw: they only measure the *local* effects of the change.

There are strong theoretical reasons why the effects of the new speed limit must be evaluated in terms of *system-wide* consequences. This paper develops that theory, applies it to evaluate the new 65 mph speed limit, and obtains surprising results. Contrary to prior studies, I find that the 65 mph limit has reduced fatalities. The best estimate is that the states which adopted the 65 mph limit saved 3,113 lives in 1987 and 1988, compared to the states that did not change the speed limit.

I. INTRODUCTION

In 1987, amid widespread controversy, 38 states raised the speed limit to 65 mph on sections of their rural interstate roads. Anticipation of the consequences varied widely: some predicted carnage, others said fatalities would decline. As might be expected, there have been numerous studies of the new speed limit.

Most of these studies looked at the *number* of fatalities, before and after the increase to 65 mph. The number almost always increased since traffic almost always increased -- but we should be looking at rates, i.e., fatalities per vehicle mile traveled (VMT). And all of the studies have confined themselves to looking at local effects: did raising the speed limit on highway X affect fatalities on highway X or in its immediate neighborhood?

This study treats highways and enforcement as a total system: it looks at the statewide consequences of raising the speed limit. Contrary to the conclusion of the local-effect studies, I find that the 65 mph speed limit reduced the fatality rate, probably saving some 3,113 lives in its first two years.

II. THEORY: POLICE ENFORCEMENT AND TRAFFIC BEHAVIOR AS A SYSTEM

Highway patrol resources are limited. If more officers are assigned to enforce speed limits on rural interstate highways, fewer can be assigned to such other safety activities as drunk driving checkpoints. Absent any external political pressure, police administrators try to balance their resources across the

alternative safety activities. But if the federal government threatens to impose serious financial penalties on states that do not meet a particular speed limit criterion, the states may respond by altering the balance of their patrol activities.

Highways are also an interdependent system: "restrictions" on one road will cause some drivers to switch to other roads. A restriction might be a construction project, an accident, or an "unreasonable" speed limit. The more advance notice there is of a restriction, the more switching behavior we would anticipate. We would also expect system interactions between policing activity and drivers' choice of highway.

The 55 MPH Limit and the Misallocation of Police Resources

Although the federal government has no direct power to set speed limits, it was able to do so indirectly through financial pressure. It threatened a reduction in federal highway funding to any state that did not establish a 55 mph speed limit. There were also detailed compliance requirements: speed monitoring programs were established, and states were required to report the proportion of drivers who exceeded the new limit. If the majority of a state's drivers did so, then its highway funds would be cut.

Given such financial pressure, it is reasonable to suppose that state governments might ask their highway patrols to give special attention to enforcing speed limits so as to generate favorable compliance-statistics. In turn, this might cause highway patrols to concentrate their resources on the

interstate highways since these highways have the densest concentration of high speed traffic, and hence a patrol-hour of activity there will control the greatest number of potential speeders. On the other hand, the interstates are only a small proportion of total highway miles and they were already the safest roads in the state. So it is not obvious that overall safety would benefit if patrol resources were taken from other duties to control speeders on the interstates.

That is, it is possible that the federal mandates might cause patrol resources to be used in a manner that would maintain highway funding rather than in a manner that would maximize highway safety (Lave, 1988). In fact, 29 percent of patrol staff hours were devoted to rural interstate highways, though these highways accounted for only 9% of total fatalities (NRC, 1984, p.227). The National Research Council's commission to study the effects of the 55 mph limit (NRC, 1984) heard testimony on this point. The commission asked highway patrol officials from a number of states to think about the following situation: suppose you were permitted to change your manpower allocation in any way you wish, would you leave the allocation as it is now? Some state officials wanted to devote more resources to dangerous roads and dangerous activities such as drunken driving, justifying the change in terms of reducing overall fatalities. Other state officials, perhaps suspicious of the political implications of such a question, simply answered: No, 55 mph is the law, and it's my job to enforce the law. In its final report, commenting on the allocation of highway patrol resources in 1984, the NRC commission said: "This (existing)

allocation, however, is not entirely optimal either from the standpoint of total travel on these highways, or total motor vehicle deaths." (NRC, 1984, p.226).

At the annual meeting of the Transportation Research Board in January 1987, the highway patrol chiefs of Arizona, California, Maryland, and Virginia made similar comments. Some asked for the freedom to reallocate resources. Others refused to tackle the question, but even they did not claim that the existing manpower allocation was optimal.

Three years later there was formal testimony on these issues before the "Surface Transportation Subcommittee" of the House of Representatives. On April 24, 1990, the Commissioner of the California Highway Patrol, M.J. Hannigan, testified:

"Speed enforcement is important...However, I cannot look at this problem with blinders. My resources, like yours are limited. I must search for the most effective use of these funds. My responsibility to the citizens of California dictates that I achieve the maximum impact by setting priorities. And although speed enforcement is important, it is not our only priority. It is part of our balanced and comprehensive approach to traffic safety." pp. 6-7.

Commissioner Hannigan went on to say:

"To improve a state's mileage death rate, comprehensive programs are needed that permit a state to customize the appropriate mix of DUI, speed, seat belt, commercial and other types of enforcement and education. We do not think compliance requirements and the distribution of federal resources should be excessively focused on any one program area, such as speed." p. 10

The International Association of Chiefs of Police (IACP) reported the results from a survey of its members in testimony before the same subcommittee on March 22, 1990:

"In states where compliance figures are satisfactory, often times this is because other safety priorities such as DWI and drug interdiction are relegated to secondary and tertiary priority. Thus, we in law enforcement are in the classic Catch-22. If we don't comply, safety is negatively impacted because our funds are reduced. If we do comply, safety is negatively impacted because other priorities are reduced. It's hard to see how we can win this one, Gentlemen." (p. 2, emphasis in the original)

Attached to their testimony was a copy of an official IACP resolution, passed in 1988, which says in part:

"...sanctions also force the over-concentration of limited resources for the express purpose of attaining compliance rather than application of resources in a manner most effectively enhancing total highway safety..."

That is, the federal sanctions associated with the 55 mph speed limit produced a misallocation of highway patrol resources. The increase to a 65 mph limit in some states would have reduced the pressure to concentrate on speeders, and would have allowed patrol resources to be shifted to activities that the patrols believed would have greater impact on safety.

These new patrol activities would be spread across all highway types, hence the effects of the new speed limit would be spread across all highway types. *Thus, to measure the impact of the change to 65 mph, we must look at the change in the statewide fatality rate.*

The 55 MPH Limit and the Misallocation of Vehicle Traffic

Obviously, some of the traffic diverted from one highway will show up on others. Prior to the imposition of the 55 mph limit in 1974, we would have expected many drivers to go out of their way to use the high speed interstate highway system. After the new limit was passed a driver choosing between a 55 mph rural interstate and a 55 mph country road was more likely to select the scenic route. We would expect a similar effect for urban interstates. Likewise, with patrol resources concentrated on the interstates, it is likely that at least some drivers selected non-interstate highways because of the chance to drive faster than 55 mph without as much danger of being caught.

There is also a likelihood of traffic diversion from rural interstates to urban highways: because of the 55 limit, some people who might have done their weekend pleasure drive out on the rural interstates may decide to take their trip in an urban area instead. Again, this is a transfer of traffic from safe to unsafe roads.

Viewed from a safety perspective, these motivations cause a misallocation of traffic, moving it from safe roads to dangerous ones.

The misallocation of traffic and the misallocation of police resources combine to systematically overstate the safety effects of the 55 mph speed limit on the interstate highways. The extra policing resources on these roads lowers the fatality rate below what it would be with a 55 mph limit and a normal

amount of policing. And the artificially decreased traffic volumes on these roads obviously lower the fatality rate too.

The Overall Safety Effect of Raising the Speed Limit

What happens to the fatality rate on *rural interstates*? There are a number of competing effects: (i) An increase in traffic on the interstates, lured by the chance to drive faster, would increase fatalities. (ii) A decrease in speed-variance among drivers (suppose everyone had wanted to drive 65 mph, but some had previously chosen to obey the 55 limit and some had not) would decrease fatalities (Lave, 1988). (iii) And conversely an increase in variance would increase fatalities. (iv) And the effect of higher average speed, itself, is not clear (Lave 1985, 1989). We cannot say, a priori, what the combination of effects will produce.

What happens on *other roads*? If patrol resources had been misallocated in response to federal pressure to enforce the 55 limit (Lave, 1988), then removing the federal pressure should bring about a better use of patrol resources and a decrease in fatalities on non-interstate roads. Likewise, any diversion of traffic onto the rural interstates should decrease fatalities on non-interstate roads (Kamerud, 1988; Lave, 1988).

Although the competing effects make it difficult to predict the net result of the new speed limit, the theory does lead to one absolutely certain and

unambiguous conclusion:

To evaluate the effect of the increase to 65 mph, we must look at total fatality rates for the entire state.

III. METHODOLOGY

The estimation of fatality rates is highly sensitive to sample size. If some piece of highway normally has, say, 50 fatalities per year, a few random individual accidents can greatly affect the apparent fatality rate. Such fluctuations cause very serious problems when we are trying to evaluate the effects of a safety intervention policy: suppose the fatality rate falls five percent, does that mean the new policy worked? Or suppose the rate remains the same, does that mean the new policy failed? The answer in both cases is: we just don't know because the expected yearly fluctuations in these rates are larger than the probable effects from the new policy.

Yet a number of studies of the new speed limit have relied on small samples from some specific highway type within a specific state. The statistics from such studies are likely to be unreliable because the effects of the small percentage change in fatality rates can be hidden amid the noise from the fluctuations of random accidents when the baseline number of accidents is small. This is especially true when we decompose the overall change to look at individual highway types in an effort to understand which components produce the overall change.

I correct for these problems in several ways: (i) I use the overall state fatality rate, which is calculated from a much larger and more stable number -- and given the conclusions of Section-II, it is the only correct measure. (ii) I aggregate states into two large groups: those that raised the speed limit to 65 mph in 1987, versus those that have not changed the speed limit at all. There are 38 states in the first group and 8 states in the second: the aggregation of the data also enhances the statistical reliability of the calculated fatality rates.

For each group of states, I compute the total fatality rate: the sum of overall statewide fatalities across the entire group, divided by the sum of statewide VMT. I do this for 1986, the last full year of data before the change in the speed limits, and for 1988 the latest data available. To evaluate the effects of the new speed limit, I compare the change in fatality rates, over time, for the 65 mph states against the change in fatality rates in the 55 mph states.

In effect, I am analyzing a test group against a control group. The time period is the same for both groups so we are holding constant many of the effects that might be operating on the fatality rate: long term trends, improvements in auto safety features, roads, driving habits, or seat belt usage; and also the effects of economic influences. Furthermore, the aggregation into groups of states enhances reliability for the same reason that an average is a more reliable estimator than a sample of one: the effect of a positive idiosyncratic influence on the fatality rate in one state, will tend to be canceled out by the effect of a negative idiosyncratic influence in another state.

IV. RESULTS

The analysis is based on data compiled by NHTSA (1989, pp. 33-44). Table I shows the basic results. Looking at the states that raised their speed limits in 1987: the overall fatality rate fell by 4.68 percent in 1987, compared to the year before when the limit had been 55 mph. Fatality rates then fell an additional 1.55 percent in 1988, compared to 1987. Looking at the states that did not change their speed limits: fatality rates were essentially unchanged in 1987 compared to the year before, and they fell by 2.55 percent in 1988 compared to 1987. The overall change in fatality rates from the year before the change to the year after the change was 6.15 percent in the 65 mph states, and only 2.62 percent in the 55 mph states. It is reasonable to interpret the 2.62 percent drop as being the normal downward trend in fatality rates that has gone on for the past half century.

Table I: Change in Statewide Fatality Rates

	from 1986->1987	from 1987->1988	overall change 1986->1988
The 65 mph states	-4.68%	-1.55%	-6.15%
The 55 mph states	-.07%	-2.55%	-2.62%

Table II: Lives Saved by the 65 MPH Speed Limit

EFFECT DURING 1987

For the 65 mph states: Expected number of fatalities in 1987 if 1986 fatality rate had persisted:

$$\begin{aligned} &1986 \text{ fatality rate} * 1987 \text{ VMT} = \text{expected \# of fatalities} \\ &2.6123 * 14434 (10^8) = 37,706 \text{ fatalities} \end{aligned}$$

$$\begin{aligned} &\text{Lives saved if fatality rate falls by 4.68\%,} \\ &\text{(the observed change in the 65 mph states):} \\ &37706 * 4.68\% = 1,765 \text{ lives saved} \end{aligned}$$

$$\begin{aligned} &\text{Lives saved if fatality rate falls by 0.07\%,} \\ &\text{(the observed change in the 55 mph states):} \\ &37706 * 0.07\% = 26 \text{ lives saved} \end{aligned}$$

$$\begin{aligned} &\text{NET LIFE-SAVING ATTRIBUTABLE} \\ &\text{TO NEW 65 MPH SPEED LIMIT DURING 1987:} \\ &1765 - 26 = 1739 \end{aligned}$$

EFFECT DURING 1988

For the 65 mph states: Expected number of fatalities in 1988 if 1986 fatality rate had persisted:

$$\begin{aligned} &1986 \text{ fatality rate} * 1988 \text{ VMT} = \text{expected \# of fatalities} \\ &2.6123 * 14903 (10^8) = 38,931 \text{ fatalities} \end{aligned}$$

$$\begin{aligned} &\text{Lives saved if fatality rate falls by 6.15\%,} \\ &\text{(the observed change in the 65 mph states):} \\ &38931 * 6.15\% = 2,394 \text{ lives saved} \end{aligned}$$

$$\begin{aligned} &\text{Lives saved if fatality rate falls by 2.62\%,} \\ &\text{(the observed change in the 55 mph states):} \\ &38931 * 2.62\% = 1,020 \text{ lives saved} \end{aligned}$$

$$\begin{aligned} &\text{NET LIFE-SAVING ATTRIBUTABLE} \\ &\text{TO NEW 65 MPH SPEED LIMIT DURING 1988:} \\ &2394 - 1020 = 1374 \end{aligned}$$

$$\begin{aligned} &\text{NET LIFE-SAVING ATTRIBUTABLE TO} \\ &\text{NEW 65 MPH SPEED LIMIT DURING 1987 \& 1988:} \\ &1739 + 1374 = 3,113 \text{ ADDITIONAL LIVES SAVED} \end{aligned}$$

Table 2 takes the percentage estimates from Table 1 and applies them to calculate the estimated number of lives saved by the new speed limit. The top

half measures the effect in 1987 as follows. *First*, calculate the expected number of fatalities in the states that raised the speed limit: this is the 1986 fatality rate times the actual 1987 VMT; there would have been 37,706 fatalities in 1987 if the 1986 fatality rate had continued. *Second*, calculate the number of lives saved due to the observed 4.68 percent drop in the fatality rate; this shows that there were 1,765 fewer fatalities than would have been expected.

Third, adjust the 1,765 estimate because it gives too much credit to the 65 mph speed limit. After all, fatality rates might have declined anyway even if the speed limit had not changed; in fact, there has been an observed longterm historic decline. We need to calculate that effect and subtract it from the 1,765 estimate. There is no absolutely certain way to calculate such a contrafactual estimate -- what would have happened if the speed limit had not changed -- but there is a way to estimate it by using the control group, the states that did not change the speed limit. For the group of states that kept the 55 mph limit, the fatality rate declined by 0.07 percent. This is the estimate of the contrafactual question: what might have happened. If we apply this rate of improvement to the states that changed the limit, we calculate a reduction in fatalities of 26 lives.

That is the 65 mph states had 1,739 fewer fatalities during 1987 than would have been expected, using the 55 mph states as a baseline.

The bottom part of Table 2 does the same calculation for 1988 and concludes that an additional 1,374 lives were saved during 1988. Thus a total of 3,113 lives were saved during 1987 and 1988.

How certain is this result? Its accuracy depends on the truth of my control group assumptions: are the states that retained the 55 limit generally comparable to the states that changed to 65 mph? Many factors can influence the fatality rate. To be absolutely certain of these conclusions, we would need enormously more data than are available, to hold all those factors constant (Kamerud, 1988).

However, regardless of data limitations, this study has a significant number of advantages over the prior literature:

- (i) It uses the correct evaluation criterion -- the effect on total statewide fatalities.
- (ii) It aggregates the data into large groups, to produce far more reliable estimates of fatality rates -- they are more stable, and the implicit averaging process helps to compensate for the effects of excluded variables as well.
- (iii) The use of a control group should take care of most of the remaining problem of excluded variables.

That is, the methodology used here is not perfect but it is a real improvement over the methodology used in the prior studies -- studies which have not hesitated to claim they have proven that the effect of the 65 mph limit was an increase in fatalities.

V. ADDITIONAL EVIDENCE

This paper posits a connection between the misallocation of police resources, the misallocation of highway resources, and the overall statewide death rate. The relative decline in fatality rates (for those states that increased the speed limit) provides strong support for the theory. Is there any micro-level evidence as well, for example, are there data to show that police actually did reallocate resources, or that traffic actually did move between highway types?

Evidence for the reallocation of police resources. Appendix A in the National Highway Traffic Safety Administration's report (NHTSA, 1989) includes letters from a number of states responding to a request for information. Although the tone of NHTSA's questions seems to be asking the states for verification that they take speed enforcement very seriously, a number of states chose to address other issues. Nevada specifically comments that it did shift resources to other enforcement activities after the 65 mph limit was passed (page A-96). California, Montana, West Virginia, and Wyoming seem to be implying that they have changed also. And Ron Sostkowski, Director of State and Provincial Police within the International Association of Chiefs of Police, confirms that: (i) this has been a frequent topic of conversation at the annual meetings of state police chiefs, and (ii) the highway patrols in the states that raised their speed limits did use the opportunity to shift resources into activities that they thought would have greater safety impact.

Evidence for the reallocation of traffic. Is there any evidence that traffic did shift back to the high speed highways after the increase in speed limits? There are measurement problems here. We cannot use the simple, year to year change because there are strong overall trends in travel as well. So we need to measure change relative to some expected baseline. Table 3 does this in two different ways.

Part A, at the top concentrates on the 38 states that increased speed limits to 65 mph. For these states, it compares the VMT growth rate on specific highway types to the overall VMT growth rate in the state. For example, it shows that traffic on the rural interstate highways, in the 65 mph states, grew 1.73 times faster than the overall VMT growth in those states. Traffic on the non-interstate highways grew at only 89 percent of the overall VMT growth rate for these states. Both results are consistent with my theory.

Part A made internal VMT growth comparisons: highway type versus the state average. Part B compare the VMT growth in the 65 mph states to the growth in the 55 mph states, keeping highway type constant. Thus, looking at rural interstate highways, VMT grew 1.62 times faster in the 65 mph states than it did in the 55 mph states. And so on. These numbers are consistent with the expected pattern of traffic shifts that would be expected if the underlying theory were correct.

Table III: Reallocation of Traffic in the States that Raised the Speed Limit to 65 MPH

Part A: Using Own-Growth Rate (65 mph States) as Baseline

% Increase in Rural Interstate VMT
Divided by % Increase in Statewide VMT = 1.73

% Increase in Urban Interstate VMT
Divided by % Increase in Statewide VMT = 1.13

% Increase in Non-Interstate VMT
Divided by % Increase in Statewide VMT = .89

Part B: Using 55 mph State Growth Rates as Baseline

Rural Interstate Traffic: VMT Growth Rates
in 65 mph States Divided by 55 mph States = 1.62

Urban Interstate Traffic: VMT Growth Rates
in 65 mph States Divided by 55 mph States = 1.32

Non-Interstate Traffic: VMT Growth Rates
in 65 mph States Divided by 55 mph States = 1.36

To summarize: there is good evidence that the state highway patrols actually did reallocate resources in the manner we hypothesized; and there is some evidence that traffic patterns actually did shift in the manner we hypothesized. Certainly, the relative decline in fatality rates is consistent with the theory.

VI. CONCLUSION

Prior studies of the 65 mph limit have only measured the *local* effects of the change. But since enforcement and highways are an integrated, interactive system, the effects of the new speed limit must be evaluated in terms of their *system-wide* consequences.

Contrary to prior studies, I find that the states which adopted the 65 mph had a significant drop in overall statewide fatality rates. Furthermore, there is evidence that the change in speed limits was accompanied by an improved allocation of police resources and of highway traffic, in the manner predicted by the theory.

The best estimate is that the new 65 mph speed limit saved 3,113 lives in these 38 states during 1987 and 1988, compared to the states that kept the 55 mph limit.

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