Evaluation of Speed Limit Policy Impacts on Iowa Highways

tech transfer summary

Analyzing the effects of maximum speed limits on traffic fatality rates can bring to light some of the potential ramifications of increasing Iowa's rural interstate speed limit.

Objectives

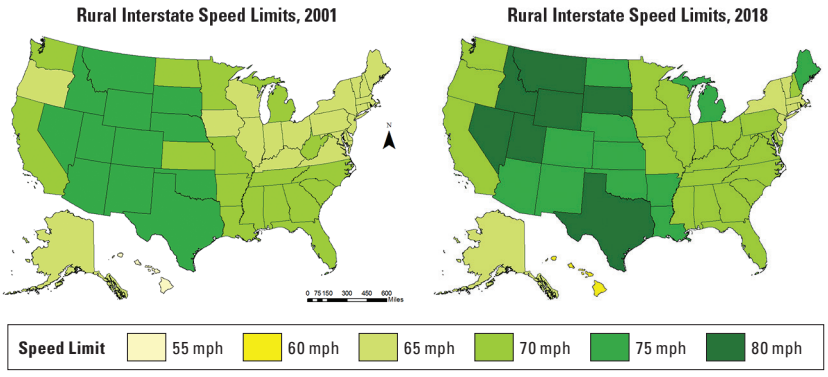
This study examined the potential impacts of raising the maximum speed limit on Iowa's rural interstates by analyzing the effects of speed limit increases across the US, with emphasis on the more recent increases to 75 mph and above. The study also revisited fatal crash trends in Iowa since the state raised the rural interstate speed limit to 70 mph in 2005.

Background

Following the introduction of the National Maximum Speed Law (NMSL) in 1974, a series of longitudinal studies showed significant decreases in traffic fatalities. Following the repeal of the NMSL in 1995, fatality rates were similarly observed to be higher in states with greater maximum speed limits. After states were given the authority in 1987 to increase speed limits on rural interstates to 65 mph, another round of studies showed marked increases in fatalities.

Other studies, largely focusing on trends after 1987, have yielded mixed results. Some have indicated that speed limit increases have had disparate effects in different states, with some states seeing fatality rates decrease or remain steady. Other studies have found that speed limit increases have little to no effect on crash severities.

Since 2001, 25 states have raised their maximum statutory speed limits on rural interstates. For its part, Iowa increased its maximum speed limit for rural interstates from 65 to 70 mph in July 2005. As of 2018, 18 states had a maximum speed limit of 75 or 80 mph, including Midwest states such as Kansas, Nebraska, and South Dakota.



Maximum rural interstate speed limits in 2001 (left) and 2018 (right)

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RESEARCH PROJECT TITLE
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PRINCIPAL INVESTIGATOR
Christopher Day, Affiliate Researcher
Center for Transportation Research and Education, Iowa State University
cmday@iastate.edu / 515-294-2140
(orcid.org/0000-0002-3536-7211)

CO-PRINCIPAL INVESTIGATORS
Anuj Sharma, Research Scientist
Center for Transportation Research and Education, Iowa State University
(orcid.org/0000-0001-5929-5120)

Peter Savolainen, Professor
Civil and Environmental Engineering
Michigan State University
(orcid.org/0000-0001-5767-9104)

MORE INFORMATION
intrans.iastate.edu

CTRE
Iowa State University
2711 S. Loop Drive, Suite 4700
Ames, IA 50010-8664
515-294-8103

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Problem Statement

The Iowa legislature has recently discussed the possibility of further raising the state's maximum rural interstate speed limit. While the effects of speed limit changes have been studied extensively, research has been somewhat limited with respect to the more recent increases to speeds of 75 mph and above.

Research Description

Three longitudinal analyses were conducted to explore fatality trends on rural interstates in consideration of maximum speed limits and other factors: nationwide state-level and road-level analyses and an Iowa-specific road-level analysis.

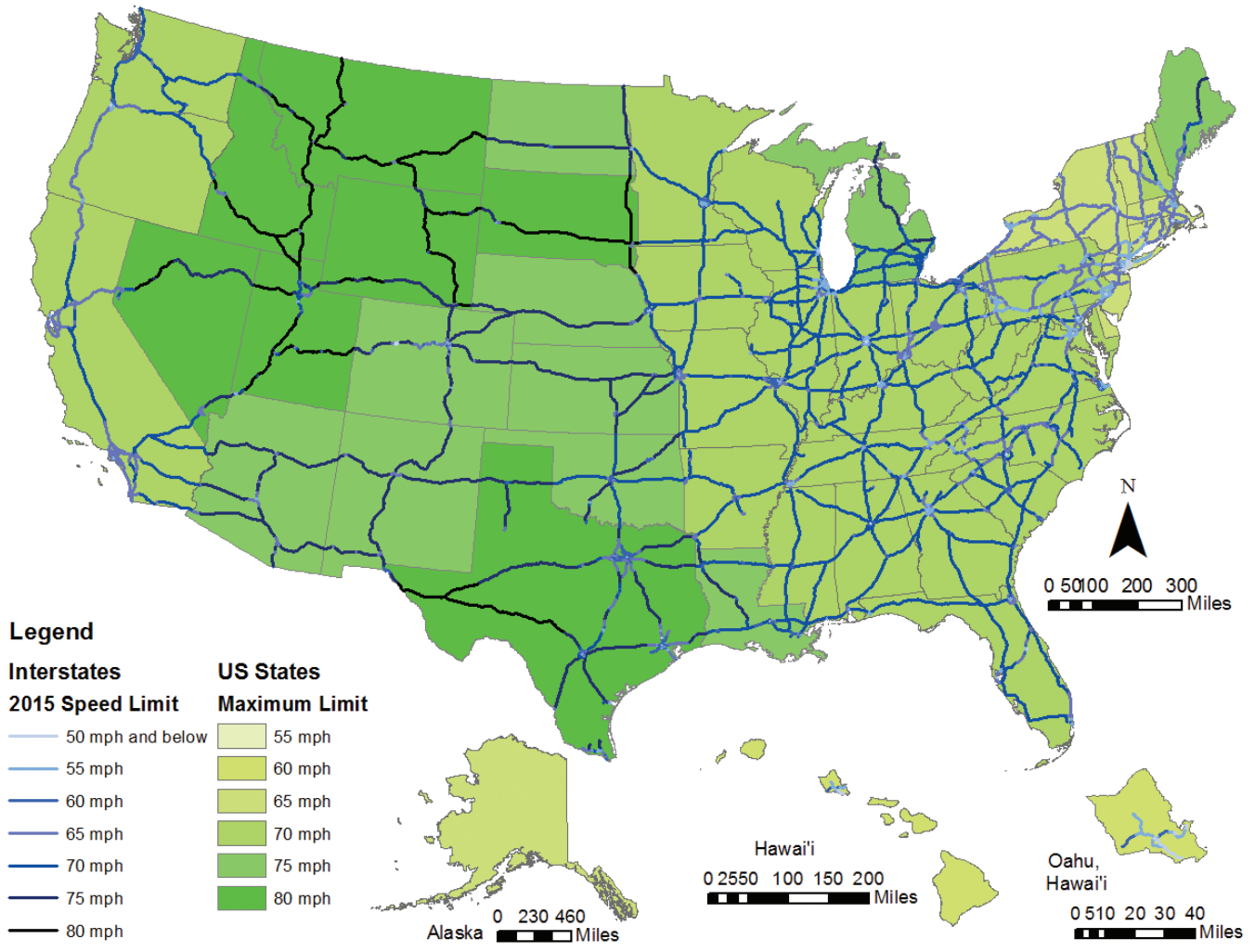
Nationwide Analyses

For the nationwide analyses, data sets were prepared at two levels of aggregation: the state-level, where total rural interstate fatalities were aggregated for each state over each year of the analysis period, and the segment-level, where rural interstate fatalities were aggregated on individual road segments within each state. The analysis period was from 2001 through 2016.

The state-level data set included information on traffic fatalities, roadway mileage, maximum speed limits, percentage of roadway mileage posted at different speed limits, vehicle miles traveled (VMT), and other variables. The road-level data set included much of this information, as well as the number of years since the speed limit change and other segment-related variables.

Regression models were estimated to explore how fatality risk changes based on speed limit and other factors. In the state-level analysis, the dependent variable was the number of fatalities on rural interstate highways in a state in a given year. Two regression models were compared: one that considered only the maximum posted speed limit in each state and one that accounted for the percentage of rural interstate mileage posted at the maximum speed limit.

In the road-level analysis, the dependent variable was the number of fatalities along a given interstate segment in a given year. Three models were estimated to examine different expressions of the dependent variable: total number of fatal crashes, fatal crashes involving speeding, and fatal crashes involving driver distraction.



Speed limits across the interstate system as of 2015

Iowa-Specific Analysis

The Iowa-specific data set compiled roadway, crash, and weather information from Iowa-specific data sources and speed information from automatic traffic recorders (ATRs) and INRIX probe data. The analysis period was from 2008 through 2016. Data from before 2008 were obtained from a previous evaluation of the effects of Iowa's 2005 speed limit increase.

The Iowa analysis aimed to explore how speeds vary across the Iowa interstate system and the relationship between speed and traffic safety. Three common speed measures—mean speed, 85th percentile speed, and speed variance—were examined with respect to roadway geometry and traffic volume using a seemingly unrelated regression equation (SURE) model.

Random effects negative binomial regression models were estimated to study how crash, injury, and fatality rates vary across the Iowa interstate network in light of speed measures and geometric and traffic characteristics. The dependent variable was the number of crashes at different severity levels in a given month on interstate highways with a 70 mph speed limit.

Key Findings

Nationwide Analyses

- The disaggregate state-level model that accounts for the proportion of rural interstate mileage posted at each speed limit better fits the fatal crash data than the model that only considers maximum statutory speed limits.
- The results of the nationwide state- and road-level analyses confirm prior research showing that states with higher rural interstate speed limits have a higher number of traffic fatalities.
- This effect is even larger when the analysis accounts for the proportion of rural interstate mileage in each state having higher posted speed limits.
- The increases in traffic fatalities may appear to taper off at the highest speed limits of 75 to 80 mph or above.
- Speed limit affects distraction-related fatal crashes more than it affects total fatalities or fatal crashes.
- Speeding-related fatal crashes are more strongly affected by speed limit on roads with a 70 or 75 mph speed limit than on roads with an 80 mph speed limit.

Iowa-Specific Analysis

- In Iowa, fatal and serious crashes increased in the few years after the 2005 speed limit increase but have generally declined since then.

Rural interstate segments with 70 mph speed limits selected for the Iowa-specific analysis

- Speeds are generally lower near urban areas, while speed variance is greater on urban interstates.
- The average and 85th percentile speeds were found to be influenced by roadway geometric characteristics.
- Speed variance was found to be the primary factor affecting crash rate. The impacts of speed variance were most intense for the most severe crashes.
- The mean speed showed statistically insignificant effects or a negative correlation with crashes, which is in line with prior studies.
- The lower crash frequencies found on segments with higher speeds may reflect more accommodating roadway geometry in such areas.

Implementation Readiness and Benefits

This study provides important insights that can be used to inform continuing speed limit policy discussions. The results generally provide additional empirical support for prior research, which has consistently shown that states with higher rural interstate speed limits experience a higher number of traffic fatalities.

Some effects of maximum speed limit on traffic fatalities remain uncertain. For example, because the highest speed limits have only been applied to a small subset of roadways in a given state, the effects of speed limit on crashes may be overstated or understated. Additionally, roads where the highest speed limits have been applied may inherently differ from roads where the speed limit has not changed, making it difficult to draw comparisons between the two road types. Moreover, the study does not explore the effects of speed limit changes on driver behavior throughout a state's road network, even on roads where higher speed limits have not been applied.