Literature Search: Will lowering roadway speeds change driver speeds?
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Request
NS580: Will lowering roadway speeds change driver speeds? Speeding is a top 5 factor in crashes in Minnesota. A person is about 74 percent more likely to be killed if they’re struck by a vehicle traveling at 30 mph than at 25 mph. Prioritizing the most effective methods to encourage safe speeds is critical to maximizing effort and funding to reach zero deaths on our roadways. Legislation has been proposed to allow Minnesota cities to reduce their minimum posted roadway speeds. It should be examined the extent to which driver speeds are changed with roadway speed changes that do not coincide with any additional infrastructure changes (e.g., road diet, center median, lane narrowing). Focus on past 5 years of research.

Resources searched
MnDOT Library catalog; TRID, RiP, Transport; Google Scholar

Results
Results 1-3 are studies done in the U.S., and results 4-8 are studies from Sweden, Great Britain, and Canada, all in the past 5 years:

1) Title: Lowering the speed limit from 30 mph to 25 mph in Boston: effects on vehicle speeds
Abstract: Effective January 9, 2017, the default speed limit on Boston streets was reduced from 30 mph to 25 mph. This study evaluated the effects of the speed limit reduction on speeds in Boston. Vehicle speeds were collected at sites in Boston where the speed limit was lowered, and at control sites in Providence, Rhode Island, where the speed limit remained unchanged, before and after the speed limit change in Boston. A log-linear regression model estimated the change in vehicle speeds associated with the speed limit reduction. Separate logistic regression models estimated changes in the odds of vehicles exceeding 25 mph, 30 mph and 35 mph associated with the lower speed limit. The speed limit reduction was associated with a 0.3% reduction in mean speeds (p=0.065), and reductions of 2.9%, 8.5% and 29.3% in the odds of vehicles exceeding 25 mph, 30 mph and 35 mph, respectively. All these reductions were statistically significant. Local communities should consider lowering speed limits to reduce speeds and improve safety for all road users. The current practice of setting speed limits according to the 85th percentile free-flow speeds, without consideration of other characteristics of the roadway, can be a hurdle for local communities looking to lower speed limits. Updated state laws that allow municipalities to set lower speed limits on urban streets without requiring costly engineering studies can provide flexibility to municipalities to set speed limits that are safe for all road users.
Full text: https://injuryprevention.bmj.com/content/early/2019/01/12/injuryprev-2018-043025

2) Title: Safety and operational impacts of setting speed limits below engineering recommendations
Source: Accident Analysis & Prevention, vol. 121 (Dec. 2018)
This study quantifies the operational and safety impacts of setting posted speed limits below engineering recommendations using field data from rural roads in Montana. Vehicle operating speeds and historical crash data were collected at multiple sites with posted speed limits set equal to engineering recommendations and sites with posted speed limits set lower than engineering recommendations. Linear, quantile and logistic regression models were estimated to predict mean operating speed, 85th...
percentile operating speed and speed limit compliance, respectively, as a function of various roadway characteristics and level of speed enforcement. The Empirical-Bayes before-after approach was also used to develop crash modification factors (CMFs) that describe the expected change in total and fatal + injury crash frequency when setting posted speed limits lower than engineering recommendations. Because safety data were collected over a long time period, temporal adjustments were incorporated to account for yearly changes in crash reporting, traffic characteristics and other variables. The results revealed that speed limit compliance worsened as the difference between the engineering recommended and posted speed limits increased. The presence of verified heavy police enforcement reduced both mean and 85th-percentile operating speeds by approximately 4 mph and increased speed limit compliance. The safety analysis found a statistically significant reduction in total, fatal + injury, and property damage only (PDO) crash frequency at locations with posted speed limits set 5 mph lower than engineering recommendations. Locations with posted speed limits set 10 mph lower than engineering recommendations experienced a decrease in total and PDO crash frequency, but an increase in fatal + injury crash frequency. The safety effects of setting speed limits 15 to 25 mph lower than engineering recommendations were less clear, as the results were not statistically significant, likely due to the small sample of sites included in the evaluation. Overall, the results suggest that setting posted speed limits 5 mph lower than the engineering recommended practice may result in operating speeds that are more consistent with the posted speed limits and overall safety benefits.

Full text available upon request: http://dx.doi.org/10.1016/j.aap.2018.08.029


3) Title: The Interrelationships between Speed Limits, Geometry, and Driver Behavior
Source: Midwest Transportation Center and Iowa State University Institute for Transportation (Nov. 2018)
Abstract: The relationship between speed and safety continues to be a high-priority research topic as numerous states consider speed limit increases. This study leveraged data from the Second Strategic Highway Research Program (SHRP2) Naturalistic Driving Study (NDS) to examine various aspects of driver behavior, including speed limit selection and engagement with in-vehicle distractions, as well as the impacts of these behaviors on crash risk while controlling for the effects of traffic, geometric, and environmental conditions. High-resolution time-series data were analyzed to examine how drivers adapt their speed on roadways with different posted limits, in speed limit transition areas where increases or decreases occur, as well as along horizontal curves, both with and without posted advisory speeds. The research also involved an investigation of the circumstances under which driver distraction is most prevalent. The factors associated with crash and near-crash events were compared with similar data from normal, baseline driving events across various scenarios to improve understanding of the nature of the precipitating events. Driver responses, including reaction times and deceleration rates, were examined during the course of crash and near-crash events to determine how driver response varied across various scenarios. Ultimately, this research provided important insights as to how drivers adapt their behavior and how these behaviors, in turn, influence the likelihood of being crash involved.


4) Title: Traffic safety effects of new speed limits in Sweden
Source: Accident Analysis & Prevention, vol. 114 (May 2018)
Abstract (truncated): The Swedish Transport Administration performed a review of the speed limits on the national rural road network, resulting in major changes of the speed limits on the rural road network. It was predominantly roads with a low traffic safety standard and unsatisfactory road sides that were selected for reduced speed limits, as well as roads with a good traffic safety record being selected for an increase in speed limits. The aim of this study is predominantly to describe and analyze the long-term traffic safety effect of increased, as well as, reduced speed limits, but also to analyze the changes in actual driving speeds due to the changed speed limits. Results show a reduction in fatalities on rural roads with reduced speed limit from 90 to 80km/h where the number of fatalities decreased by 14 per year, while no significant changes were seen for the seriously injured. As regards the change of mean speeds, a decrease in speed limit with 10km/h led to a decrease of mean speeds of around 2–3km/h.

Full text available upon request: http://dx.doi.org/10.1016/j.aap.2017.02.003
5) Title: The Bristol Twenty Miles per Hour Limit Evaluation (BRITE) study
Source: University of the West of England (2018)
Abstract: This study aimed to evaluate the impact of the roll-out of 20mph speed limits across the city of Bristol. The research took a holistic, public health approach to evaluation, using a variety of data sources to examine changes in vehicle speeds, road traffic casualties, levels of walking and cycling, public perceptions and attitudes, and reported levels of health and wellbeing across the city. The study found statistically significant reductions in average traffic speeds of 2.7mph across the city of Bristol, following the introduction of 20mph speed limits. This is a larger reduction than seen in previous evaluations in other cities. The study employed a more sophisticated analysis than previous studies of 20mph limits, including using individual speed data from over 36 million vehicle observations and controlling for other factors that might affect changes in traffic speeds. There has been a reduction in the number of fatal, serious and slight injuries from road traffic collisions, equating to estimated cost savings of over £15 million per year. Although there is still majority support for 20mph speed limits in Bristol, there remains concern about compliance and behaviour of other drivers. Walking and cycling across Bristol has increased, both among children travelling to school and adults travelling to work. The introduction of 20mph speed limits in Bristol offers a model for other towns and cities across the UK, who are seeking to reduce traffic speeds, cut road traffic casualties, and promote community health and wellbeing through road danger reduction. In order to assess effectiveness of 20mph speed limits, it is vital that other towns and cities follow Bristol’s example, and prioritise the ongoing collection and analysis of appropriate data on vehicle speeds, road traffic casualties and wider public health impacts.
Full text via http://eprints.uwe.ac.uk/34851/

6) Title: Support and compliance with 20 mph speed limits in Great Britain
Abstract: There are a number of challenges relating to both the support of and compliance with speed limits. The introduction of 20 mph limits in Great Britain is no exception: the recent rise in the deployment of these limits in urban settings has created a need to understand these issues in more depth. This paper reports a study undertaken by the authors that used a population wide survey of GB drivers to explore how support and compliance were interlinked. Whilst as expected many supporters said they would comply with the limits, and many opponents might not comply, more surprisingly it was also found that some supporters claimed not to comply, while some opponents of 20 mph limits were compliers. Explanations included the strong likelihood of strong moral adherence to not breaking laws amongst opponent–compliers, and self-enhancement bias amongst supporter–non-compliers. This paper explores the incidence of these effects and their implications in detail.
Full text available upon request: http://dx.doi.org/10.1016/j.trf.2015.03.002

7) Title: Speed limit reduction in urban areas: A before–after study using Bayesian generalized mixed linear models
Source: Accident Analysis & Prevention, vol. 73 (Dec. 2014)
Abstract: In fall 2009, a new speed limit of 40 km/h was introduced on local streets in Montreal (previous speed limit: 50 km/h). This paper proposes a methodology to efficiently estimate the effect of such reduction on speeding behaviors. We employ a full Bayes before–after approach, which overcomes the limitations of the empirical Bayes method. The proposed methodology allows for the analysis of speed data using hourly observations. Therefore, the entire daily profile of speed is considered. Furthermore, it accounts for the entire distribution of speed in contrast to the traditional approach of considering only a point estimate such as 85th percentile speed. Different reference speeds were used to examine variations in the treatment effectiveness in terms of speeding rate and frequency. In addition to comparing rates of vehicles exceeding reference speeds of 40 km/h and 50 km/h (speeding), we verified how the implemented treatment affected “excessive speeding” behaviors (exceeding 80 km/h). To model operating speeds, two Bayesian generalized mixed linear models were utilized. These models have the advantage of addressing the heterogeneity problem in observations and efficiently capturing potential intra-site correlations. A variety of site characteristics, temporal variables, and environmental factors were considered. The analyses indicated that variables such as lane width and night hour had an increasing effect on speeding. Conversely, roadside parking had a decreasing effect on speeding. One-way and lane width had an increasing effect on excessive speeding, whereas evening hour had a decreasing effect.
This study concluded that although the treatment was effective with respect to speed references of 40 km/h and 50 km/h, its effectiveness was not significant with respect to excessive speeding-which carries a great risk to pedestrians and cyclists in urban areas. Therefore, caution must be taken in drawing conclusions about the effectiveness of speed limit reduction. This study also points out the importance of using a comparison group to capture underlying trends caused by unknown factors. Full text available upon request; https://www.sciencedirect.com/science/article/pii/S0001457514002693

8) Title: The Impact of Lowered Residential Speed Limits on Vehicle Speed Behavior
Abstract: In 2010, the City of Edmonton reduced the posted speed limit (PSL) in six residential communities from 50 to 40 km/h. This study investigates the impact of the reduced PSL on vehicle speeds using a before-and-after experimental design with a control group adjustment. Continuous speed and traffic flow data was collected at 65 locations over a period of 7 months, with the first month representing the before period and the following 6 months representing the after period. Speed evaluation was performed on several levels, ranging from individual speed survey locations to an overall aggregate analysis. Several performance indicators, such as mean free-flow speed, speed variance, level of compliance, and percentile speed profile, were considered. The results revealed a statistically significant reduction in mean free-flow speed and speed variances for all combinations of time-of-day and day-of-week classifications. Though absolute compliance to the reduced PSL was low, compliance to a 15 km/h threshold above the PSL was significantly high. Moreover, the analysis showed that the effectiveness of the reduced PSL improved with time. Full text available upon request; http://www.sciencedirect.com/science/article/pii/S0925753513002312