This topic is "practice ready." ☐ **Yes** ☒ **No**

Evaluating Driver Braking and Stopping Behavior at Rural Intersections using SHRP 2 Naturalistic Driving Study Data

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Abstract

More than half (53%) of fatal crashes in 2013 occurred in rural areas. Rural intersections account for 30% of total crashes in rural areas with 6% of those crashes being fatal. Rural intersection crashes are particularly problematic as approximately 30% of fatalities are attributed to speeding. Previous research has found that inappropriate gap selection and drivers not recognizing an intersection are two major contributing factors to crashes at rural intersection.

Countermeasures such as flashing beacons and double stop signs are often used at intersections to help address these contributing factors by increasing conspicuity and causing drivers to slow to a complete stop and select an appropriate gap. Understanding how these countermeasures along with driver, environmental and roadway factors interact and affect stopping and braking behavior at rural intersections can provide a better understanding of how they can be used to increase safety at rural intersections. The SHRP 2 Naturalistic Driving Study provides a means to look at driver behavior along with roadway and environmental data to determine the effect on braking and stopping behavior at rural intersections.

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The NDS data used in these analyses included time series data. This included data sampled at 0.1 second intervals and forward video data for each trace, or one trip through one intersection. The RID data used in these analyses included information on the roadway features of the intersection including speed limit, number of lanes, presence of turning lanes as well as countermeasure presence.

Using the time series data, the braking point where the driver reacted to the intersection was extracted for drivers on both the major and minor legs. A linear mixed effects model was developed with the braking distance in meters as the dependent variable. The model found that as the drivers speed increased so did the distance from the intersection where they began braking. It also found that when on pavement markings were present, driver began braking 62 meters earlier. However when advanced stop or advanced intersection warning signs were present, drivers braked 26 meters later. The model was also able to find a relationship between speed limit and stopping versus yielding.

Using the time series data the drivers minimum speed at the intersection was determined and then categorized into one of three stopping types (complete stop = ≤0.5 mph, rolling stop = >0.5 mph and ≤5 mph and no stop = >5mph). Using an ordinal logistic regression a model was developed which found that when the approach is on a grade a driver is 3.7 times more likely to stop and drivers turning right are 10 times less likely to stop than through or left turning vehicles.

Keywords: Rural Intersection—Safety—Naturalistic Driving Study