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Speed Prediction Model in Work Zones on 4-lane Divided Highways Using the SHRP 2 Naturalistic Driving Study Data

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Abstract

About 47,758 injuries were estimated to have occurred in work zone related crashes during 2013. This equates to about 131 work-zone injuries per day. Overall, about 579 people were killed in work-zones all over the country in 2013 which equates to one work-zone fatality every 15 hours and to 1.8% of all roadway fatalities nationally. Work zone crashes are caused by a variety of factors. Driver errors, including distraction and speed, are the main contributors, but the role of speed and distraction in work zones crashes has not been well quantified. The availability of naturalistic driving study data collected by the second Strategic Highway Research Program offers an opportunity for a first-hand observation of work zone safety and, in particular, of actual driver behavior. The study evaluated driver behavior and speed compliance in work zones on 4 lane divided highways with lane closure scenario. Work zones were identified using 511 data and then locations confirmed by requesting and reviewing forward videos for several NDS time series traces through the location of interest. This result suggests that other 511 data can be mined to find Work Zones. Speed data were sampled at various positions upstream and through the work zone. Driver behavior, such as distraction and glance location as well as corresponding work zone characteristics such as presence of a worker, type of traffic control, number of lanes closed were also coded. A linear mixed effects model was utilized to model the impact of driver behavior and work zone features on sampled speed throughout work zones. The final model indicated that speeds decrease as a driver progresses into the work zone but speed becomes reasonably static around 300 m inside the work zone. The results show that when drivers are engaged in a distraction (e.g., using a cell phone, eating), their predicted speed is 3.88 mph higher than when a distraction is not present. Female drivers drove 1.99 mph slower on average than male drivers. Drivers who drive more miles annually have higher speeds in work zones. Drivers traveled on average 17.90 mph slower during nighttime conditions with lighting present than in other lighting conditions. Speeds were lower when cones (6.2 mph) or concrete barriers were present as opposed to other types of channelizing devices. The effects of Dynamic Message Sign could not be isolated in the present model but will be investigated further.

Keywords: Work Zone Safety—Naturalistic Driving Study Data —511 Data—Linear Mixed Effects Model—Speed Prediction

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