I Incorporating Demographic Proportions into Crash Count Models by Quasi-Induced-Exposure Method

Quasi-induced exposure (QIE) is an effective technique for estimating a specific driving or vehicle population exposure when real exposure data are not available. Typically crash prediction models are carried out at the site level, i.e., segment or intersection. Driving population characteristics are generally not available at this level, and thus omitted from count models. Due to the sparsity of traffic crashes, estimating driving population distributions at the site level using crash data at individual sites is challenging. This study proposes a technique to obtain demographic proportions to incorporate in the count models as an exposure at each site by aggregating similar adjacent sites until significant demographic proportions are obtained. Driver gender, age and vehicle type information are obtained by QIE using five years (2010-2014) of crash data; and road inventories are obtained for 1264 urban four-lane divided highway segments in California. Count models including only site level factors were compared with models including both crash level and site level factors. The latter outperformed the former in terms of mean prediction bias (MPB) and mean absolute deviation (MAD) statistics on hold out sample predictions. Results indicate that teen drivers are more crash prone in total and fatal plus injury severity crashes where senior driver crash risk increases with the increase in severity level. Presence of vehicles other than passenger cars and trucks reduces total and property damage only crash counts. Female drivers exhibit an increase in total and fatal plus injury crash counts.

Bio:
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AND

The Impact of Demographics of all Drivers on the Highest Driver Injury Severity in Multi-Vehicle Crashes of Rural Two-Lane Roads in California

The injury severity of a driver in the crash is significantly dependent on characteristics of the crash such as driver’s age, gender and vehicle characteristics. Most previous studies have used the information of a single driver to explain the severity of the crash. However, the demographic information of all other drivers involved in the crash can also be significantly important for predicting the severity of the crash. To identify the impact of all drivers in a crash, this study uses demographic information of all drivers involved in a multi-vehicle crash to predict the injury severity of the most severely injured driver. Three different discrete outcome models-Multinomial Logit (MNL), Ordered Logit (OL), and Partial Proportional Odds (PPO) were used to estimate the effect of different factors on injury severity. Models incorporating demographic information and vehicle characteristics of all drivers involved in a crash were compared with the models only considering information about the most severely injured driver in terms of significance of factors and prediction accuracy. The results from all three models consistently indicate that although young drivers are likely to have lower levels of injury severity compared to working age drivers, injury severity increases if the number of young driver increases in a multi-vehicle crash. Drivers indicated to be not at fault frequently were more severely injured than drivers at fault. Finally, the inclusion of all drivers’ demographic information shows an improvement in the prediction accuracy of crash severity of the most severely injured driver.

Brief bio:
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