Crash frequency analysis is a pivotal tool to investigate traffic safety problems. Since traffic continually fluctuates over time and this affects the potential of crash occurrence, shorter time periods and less aggregated traffic factors (shorter intervals than AADT) need to be used. In this dissertation, several methodologies have been conducted to elevate the accuracy of crash prediction.

The performance of using less aggregated traffic data in modeling crash frequency was explored for weekdays and weekends. Four-time periods for weekdays and two-time periods for weekends, with four intervals (5, 15, 30, and 60 minutes). The comparison between AADT based models and short-term period models showed that short-term period models perform better.

Two difficulties were noticed when we considered shorter time segments of time. First, the number of zero observations increased. Second, the repeated measured data. To reduce the number of zero observations, only segments with one or more crashes were used. To eliminate the effect of the repetition in the data, random effect was applied. The results recommend adopting the suggested method, as it gives a more valid prediction and less error.

Zero-inflated negative binomial (ZINB) and hurdle negative binomial (HNB) models were examined in addition to the negative binomial for both weekdays and weekends. Different implementations of random effect were applied. Using the random effect either on the count part, on the zero part, or a pair of uncorrelated (or correlated) random effects for both parts of the model. Additionally, the adaptive Gaussian Quadrature, with 5 quadrature points, was used to increase accuracy. The results reveal that the model which considered the random effect in both parts performed better than other models; and ZINB performed better than HNB and was the best model. Different time periods show different significant variables, generally, volume and segment length are the most common variables.

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The public is welcome to attend.