

## ABSTRACT

Suburban arterial roadways serve a dual function by facilitating efficient traffic movement while providing access to adjacent land development elements. This dual function creates an inherent trade-off between mobility and accessibility. One commonly implemented strategy to manage this balance is the use of non-traversable medians in conjunction with median openings. While these medians improve mobility and safety by controlling turning movements and separating opposing traffic flows, the median openings - required to maintain a desired level of accessibility - introduce potential conflict points that influence crash occurrence. In suburban corridors characterized by evolving land development, median openings and intersections with minor roads and driveways create safety challenges that may vary across different roadway segments.

This research investigates the effects of these access control features on crash frequency and severity. Since these features do not vary over time, historical crash data was temporally aggregated to create a cross-sectional dataset. To address the specific statistical challenges of the data, the study evaluated two modeling alternatives:

- (1) Random Effect Negative Binomial (RENB) model was initially applied to account for potential unobserved spatial heterogeneity among segments belonging to the same arterial. Because the corridor-level random effect was found to be statistically insignificant, standard Negative Binomial models were utilized.
- (2) Seemingly Unrelated Regression (SUR) model to account for the correlated error terms across crash severity-specific equations.

For each model, K-fold validation was used to derive metrics such as Mean Prediction Bias (MPB), Root Mean Square Error (RMSE), etc. These metrics showed that the SUR model provided the best predictions among the three models. The findings indicate that higher access density is associated with increased crash frequencies. The particularly strong effect of minor road density and median opening density was observed on the frequency of property-damage-only crashes. The average marginal effects and elasticities were used to quantify the safety impact of adding or removing driveways, minor roads, and median openings. Ultimately, these results provided a data-

driven analytical framework that improves the accuracy of a benefit-cost analysis of access control features on suburban arterial road segments.