

Project Title: Investigating Temporal Effects on Truck Accident Occurrence and Severity Level in New York City

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As one of the major causes of fatalities and injuries in the U.S., motor vehicle crashes and their influential factors have been analyzed extensively in the last few decades. However, most existing studies on crashes primarily focus on passenger vehicles and highway segments. The studies on truck related safety issues in metropolitan areas are largely underexplored. Meanwhile, as part of the effort to relieve congestion in New York City, an off-hour delivery program is being implemented. The purpose of the program is to shift the delivery time of commercial vehicles to the off-hours (7:00 pm – 6:00 am). Intuitively, by shifting truck volume into night hours, the conflicts between trucks, pedestrians, bicycles and other vehicles are reduced, which is expected to improve the safety situation. However, there is also concern that lighting condition and driver fatigue during night hours could worsen the situation. In response to these concerns, this project examines whether shifting truck deliveries to night hours has an impact on crash occurrence and severity level of crashes based on observed data in the New York City. The data, the model and the insights gained from the project can contribute to the understanding of how off-hour delivery may influence the truck related safety condition, and the understanding of other influencing factors of truck crashes.

The investigation is divided into two parts. The first part investigates the temporal effects of single-vehicle and multi-vehicle truck accidents in New York City. The models take into account the time of day effect, the heterogeneous truck weight effect and other respective influencing factors such as accident characteristics, driver and vehicle characteristics, built environment factors and traffic volume variables. The sample is drawn from the state maintained incident data, the publicly available Smart Location Data, and the BEST Practices Model (BPM) data from 2010.

The results show that: 1) There exists substantial difference between factors influencing single-vehicle and multi-vehicle truck accident severity; 2) Heterogeneity does exist in the truck weight, and it behaves differently in single-vehicle and multi-vehicle truck accidents; 3) Most individual crashes are spatially isolated events, especially for multi-vehicle truck accidents and 4) While there's no significant time of day effect in most time slots, accidents occurred in the afternoon had less severe accidents in both single-vehicle and multi-vehicle accidents. The second part analyzes the zip code tabulation area (ZCTA)-based truck crash frequency across four temporal intervals – morning (6:00 – 10:00), mid-day (10:00 – 15:00), afternoon (15:00 – 19:00), and night (19:00 – 6:00) in New York City in 2010, using a multivariate conditional autoregressive count model, which recognizes both spatial and temporal dependences. The results prove the presence of spatial and temporal dependencies for truck crashes that occurred in neighboring areas. Built environment attributes such as various types of business establishment density and traffic volume for different types of vehicles, which are important factors to consider for crashes occurred in an urban setting, are also examined in the study.

Sponsors:

Completion Date:

University: Rensselaer Polytechnic Institute

