Spatial and Temporal Analysis of Traffic Accidents in Greer, SC

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Abstract

Urban sprawl in the recent decades has resulted in an increase in car ownership, commute times, and car incidents. In larger cities and towns, daily occurrences of traffic accidents play a significant role in shaping the daily lives of people living and traveling through there. Increases in traffic incidents not only result in loss of life and destruction of property for those involved, but also have a greater impact on the economic and well being of others in the region or country. This is demonstrated through increased spending on insurance, health care, and continuous infrastructure maintenance. This presents compelling reasons to collect and study traffic incident data with the ultimate goal of decreasing traffic accidents. In order to develop effective methods to prevent car accidents, we need to have a better understanding of the spatial and temporal patterns of the incidents along with other observed data related to each incident. In this study, traffic incidents from 2014-2018 that took place in Greer, South Carolina were analyzed to understand the broader trends. The objective was to determine any specific underlying trends in the data, that correlate with when and where most of the accidents occurred. Utilizing GIS and other data visualization tools, various spatial and temporal analysis were carried out to reveal patterns that otherwise may not have been visible. Study results indicated some intriguing trends. Weekends tend to have minimal incidents, where as Fridays tend to have maximum incidents. During the day, the greatest number of incidents occurred in the afternoon, peaking around 5 pm. Within Greer, the intersection of W Wade Hampton Blvd. and S Buncombe Rd. had that greatest density of incidents. Finally, most accidents occurred on clear days with dry road conditions during day-light hours.

Methods

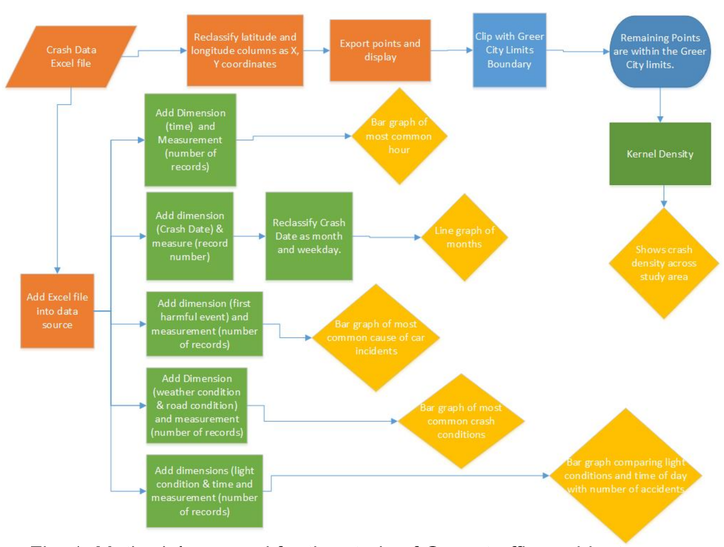


Fig. 1. Methodology used for the study of Greer traffic accidents.

After importing the crash data from the excel file received by the Greer police department into ArcGIS, the latitude and longitude columns were converted into X and Y coordinates and then exported into another file to be displayed in the data view. Due to outlying points, the data layer needed to be clipped by the Greer City Boundary shape file. This then resulted in the crash location points only within the Greer City limits to be displayed. Kernel density analysis was then preformed on the points to determine the concentration of crash locations throughout the study area.

An edited version of the excel data file that contained data separated into different sheets by crash year for complete data years, 2015-2017, and one sheet of all years together was connected to Tableau software. Various analysis were then preformed to determine trends in time, day, month, cause, road and weather condition, and light condition. This was generally done by adding the needed dimensions into the column field and the measurement, number of records, into the row field. The differences were with the symbology and display format of the information.

Results

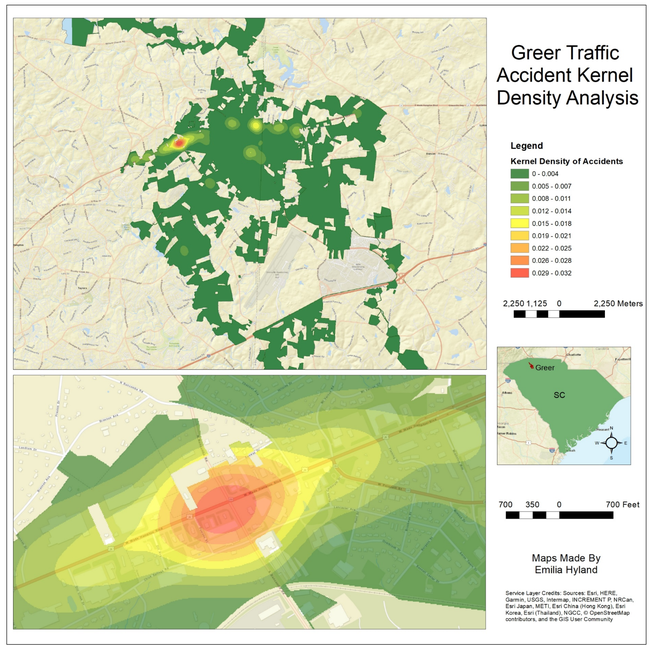


Fig. 2. Spatial density map of traffic accidents in Greer, SC from 2014-2018.

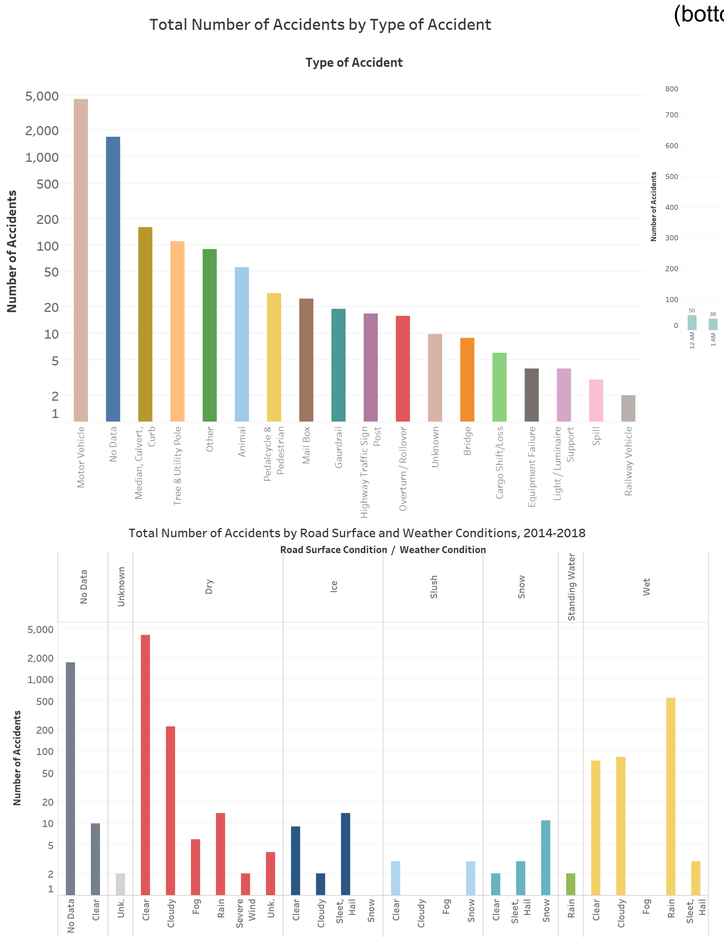
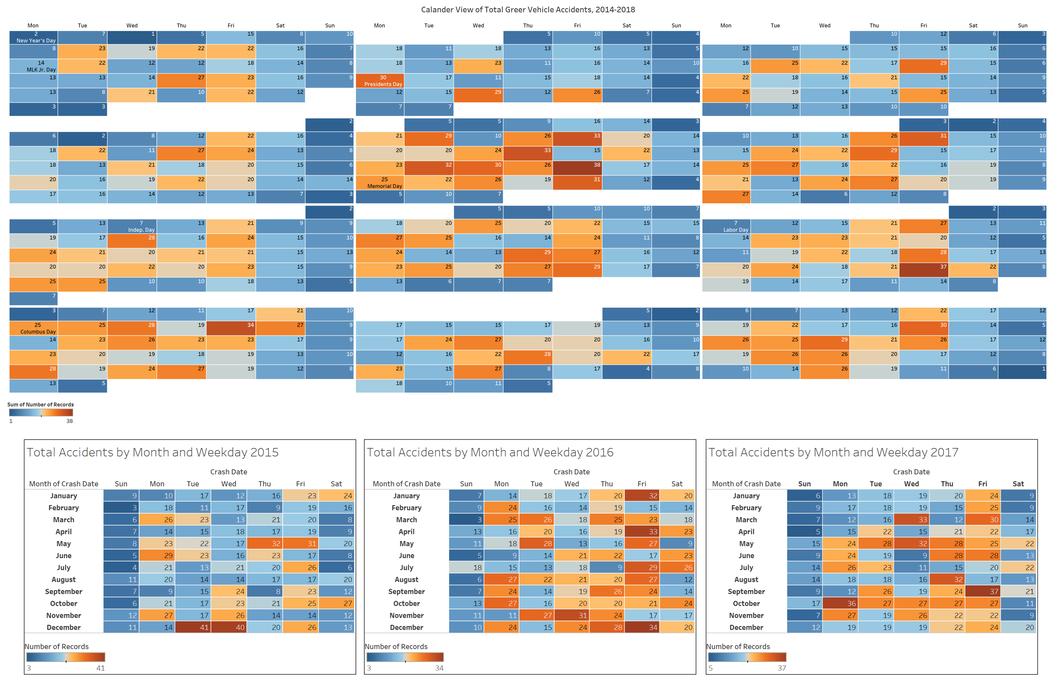


Fig. 3. Number of accidents plotted by the (top) type of traffic incident and (bottom) road and weather condition during entire study period, 2014-2018.



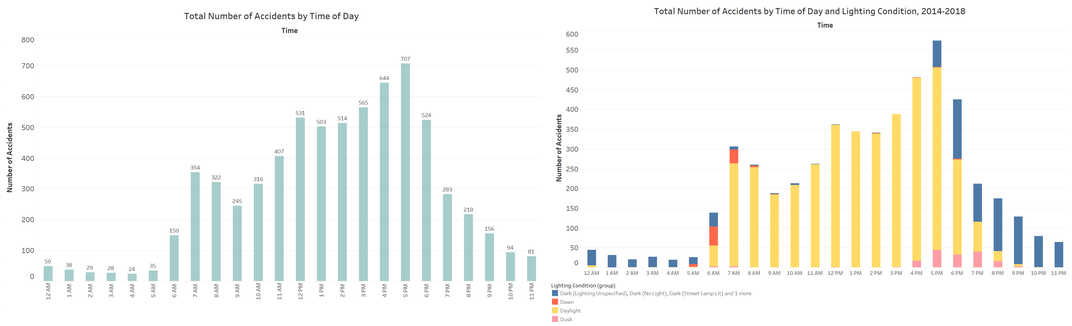


Fig. 4. (top) Calendar visualization of the culminative traffic accidents through the study period; (bottom panels) Visualization of the number of traffic accidents during complete data years

Fig. 5. Number of accidents by the (left) time of day and (right) lighting condition for the entire study period, 2014-2018.

Conclusion &Recommendations

Results of the kernel density analysis show that the intersection of W Wade Hampton Blvd. and S Buncombe Rd. has the greatest number of accidents over the study period and will need the most attention in regard to preventative measures. Based on the Tableau visualizations, the day with the most accidents during the complete data years, is Friday (18.4% of all) with Sunday (7.1% of all) being the day of the least reported incidents. It was also determined that most of the accidents occur around 5 pm (10.4% of all) through the study period, 2014-2018, and peak during times of day with high traffic, corresponding to the workday schedule of start time, lunch, and end time. In regard to other variables, a significant number of accidents occurred during day-light hours with clear skies and no harsh weather conditions, indicating potential human error as the cause of the accident.

Utilizing the results from this study, the Greer police department can develop strategies to minimize incidents during peak hours. Strategies can include increased “presence” of police cars during high traffic hours and stricter speed limit enforcement. They may also implement safety measures such as signs, reduced speed limit, or longer traffic lights. A GIS based visibility analysis of traffic lights from the roads as well as myriad of other variables involved in car accidents can also help develop better strategies for addressing traffic accidents.

Acknowledgements

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