

Johns Hopkins East Baltimore Campus: Crime Analysis and Visualization

Shannon Wongvibulsin

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1 Introduction

Baltimore City consistently ranks as one of the most dangerous cities in America. As a result, discussion about safety concerns at Johns Hopkins is common. To promote a safe and secure environment, the Hopkins Corporate Security provides the University and Hospital communities proactive security and law enforcement practices. Corporate Security maintains a record of the campus crime and provides annual crime statistics.

The Hopkins Corporate Security Crime Log represents a rich source of crime data that can be analyzed for crime patterns. A recent article in PLOS|ONE reported that most crimes exhibit seasonal oscillations (Dong, PLOS|ONE, 2017). The Hopkins Security crime log can be used to determine whether certain types of crime occur more frequently at certain locations, times of day, days of the week, or times of the year at the Hopkins East Baltimore Medical Campus. Furthermore, understanding these patterns can help with crime projections to increase campus safety through crime prevention activities (Andresen, Applied Geography, 2013). For example, increased security personnel can be strategically positioned based upon crime patterns. Additionally, although Corporate Security notifies Hopkins of reported crimes that present a “serious or continuing threat” through “Security Alert” emails, detailed analysis of crime patterns can allow Corporate Security to inform the community about general crime “forecasts” as well as general safety precaution recommendations. To present this analysis in a useful and interactive format, this project involves not only the analysis of the Hopkins crime data but also the development of a Shiny App for interactive analysis and visualization.

Overall, the goal of the project is to provide a better understanding of the crime patterns at the Hopkins East Baltimore Campus through the analysis of trends in crime and the development of an application for interactive analysis and visualization.

2 Methods

The 2015, 2016, and 2017 Hopkins Crime Logs were obtained from the Johns Hopkins University Clery Compliance Administrator. The data logs were provided in tables in the PDF format. The tables were converted into the Excel spreadsheet using PDFTables (<https://pdftables.com/>). Afterwards, the spreadsheets were saved in CSV formats and loaded into R for further analysis.

Interactive histograms are plotted using R to visually compare the frequency of different types of crimes using the ggplot2 and plotly libraries. The data will be analyzed by month, season, day of week, and time of day to determine if there are temporal variations in crime patterns. For the analysis with time of day, the lubridate library is used. Times are classified into "Night" ("00:00" - "6:00"), "Morning" ("6:01" - "12:00"), "Afternoon" ("12:01" - "18:00"), and "Evening" ("18:01" - "23:59").

For interactive analysis and visualization, a Johns Hopkins East Baltimore Crime Shiny Application is built using R. The googleVis and ggmap libraries are used for plotting the interactive crime maps. The building locations are geocoded using the geocode function and the building addresses. Prior to analysis of crime patterns, crime locations are grouped by buildings and general areas. For instance, rather than considering "Bloomberg Childrens Center 10th floor" and "Bloomberg Childrens Center 9th floor" as two different locations, all floors in the Bloomberg Childrens Center are considered as the same location. Additionally, crime patterns are analyzed after categorizing crime locations as "inside" or "outside" crimes ("inside" meaning that the crime occurred inside a building). Crimes are labeled as "outside" if the word "block" is in the location name. For example, "1500 block Orleans St" is categorized as an "outside" crime location and "933 N. Wolfe Street" is categorized as an "inside" crime location. Interactive visualizations of the crime data is supported by the Shiny Application.



Figure 1: Crime Locations and Number of Incidents in 2015

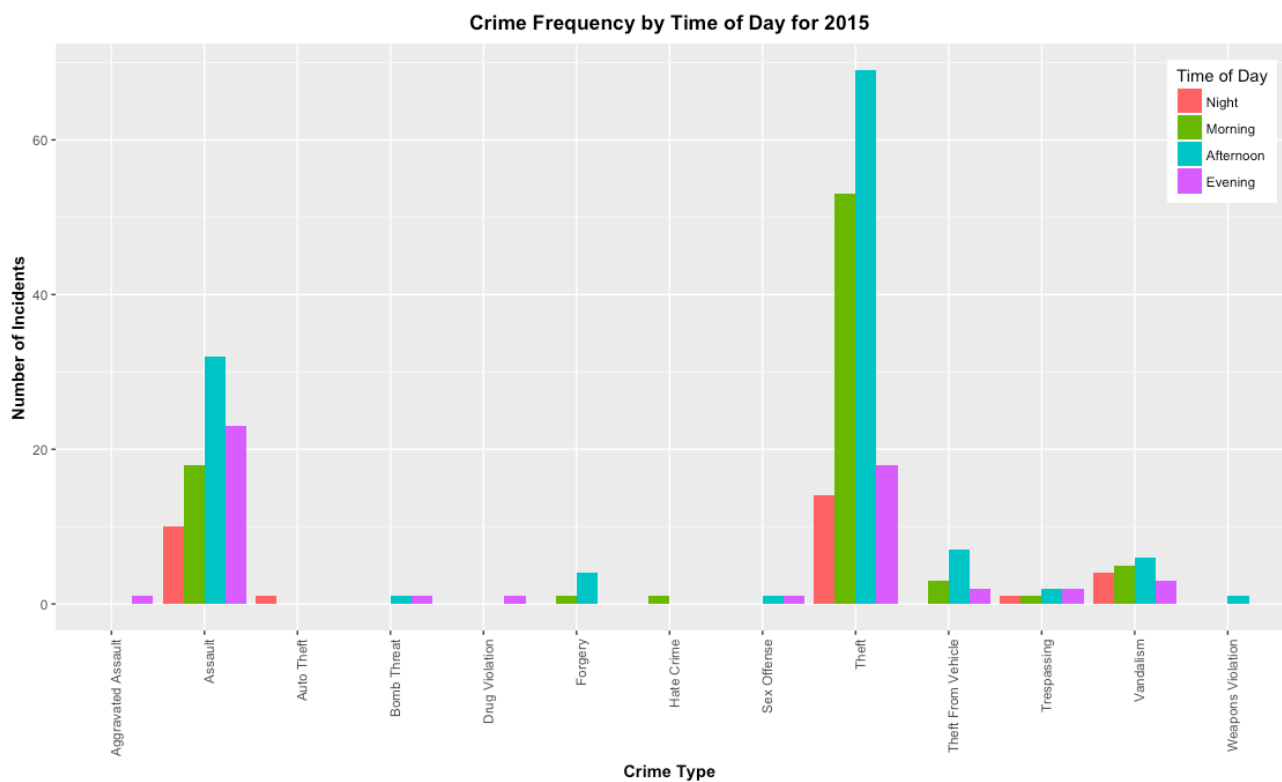


Figure 2: 2015 Crime Frequency by Time of Day

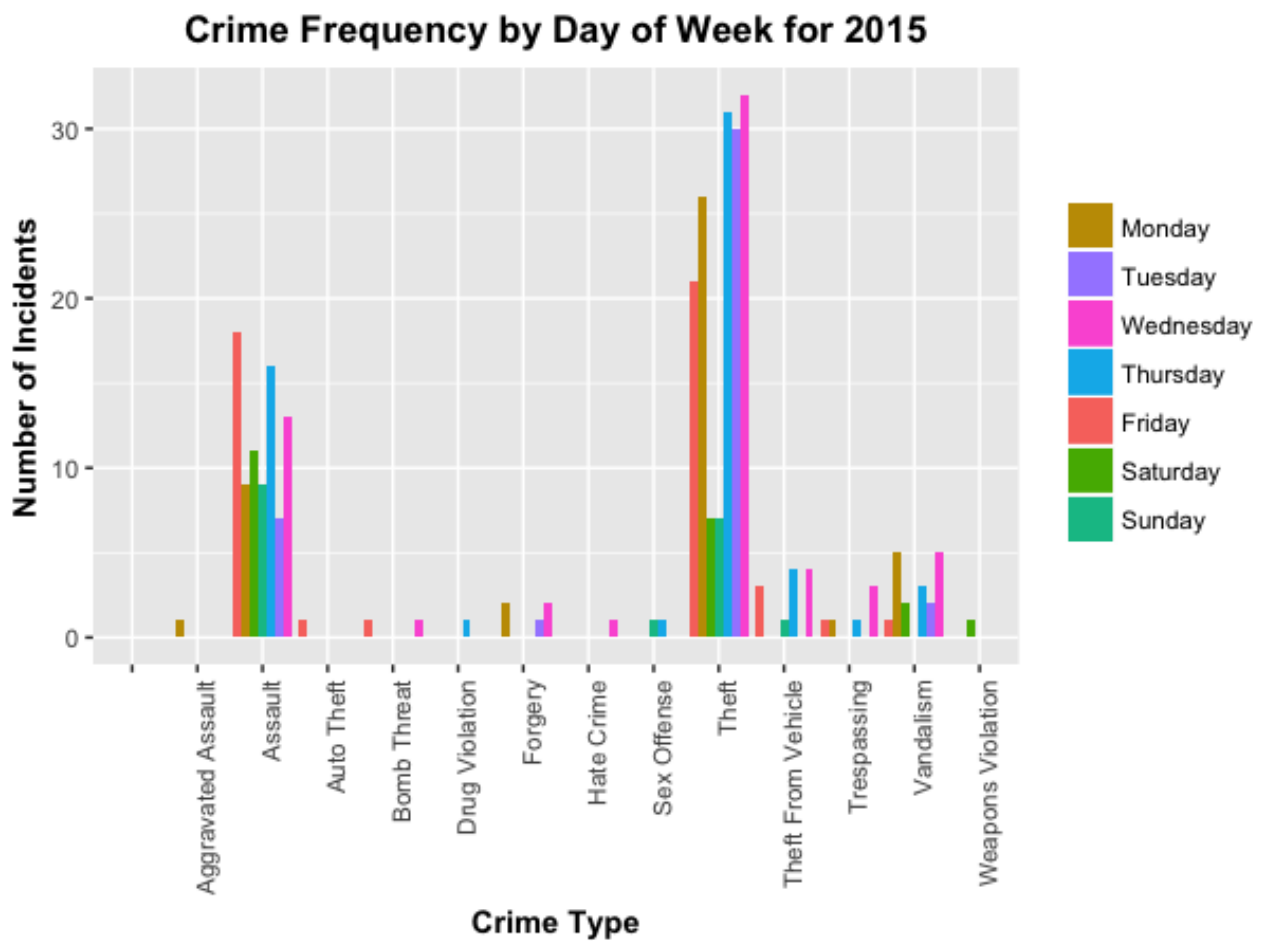


Figure 3: 2015 Crime Frequency by Day of Week

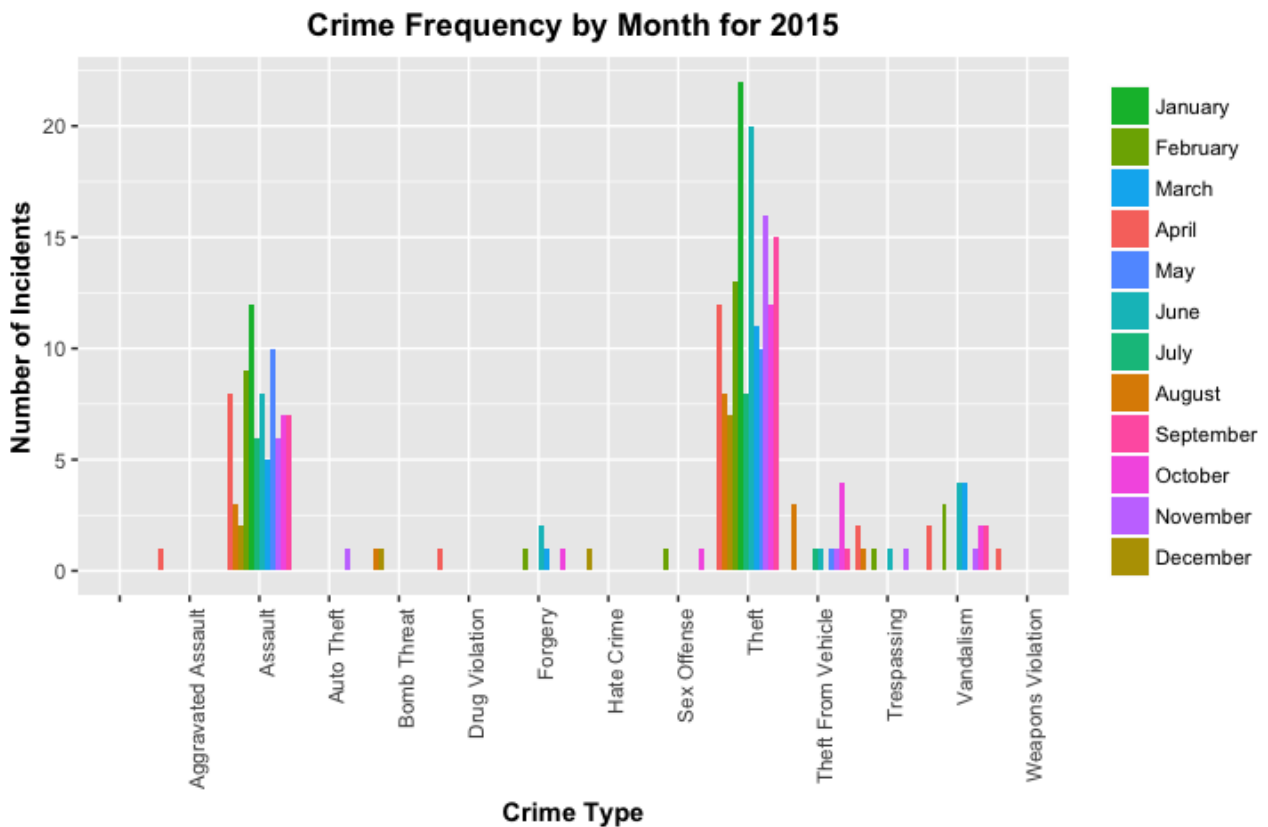


Figure 4: 2015 Crime Frequency by Month

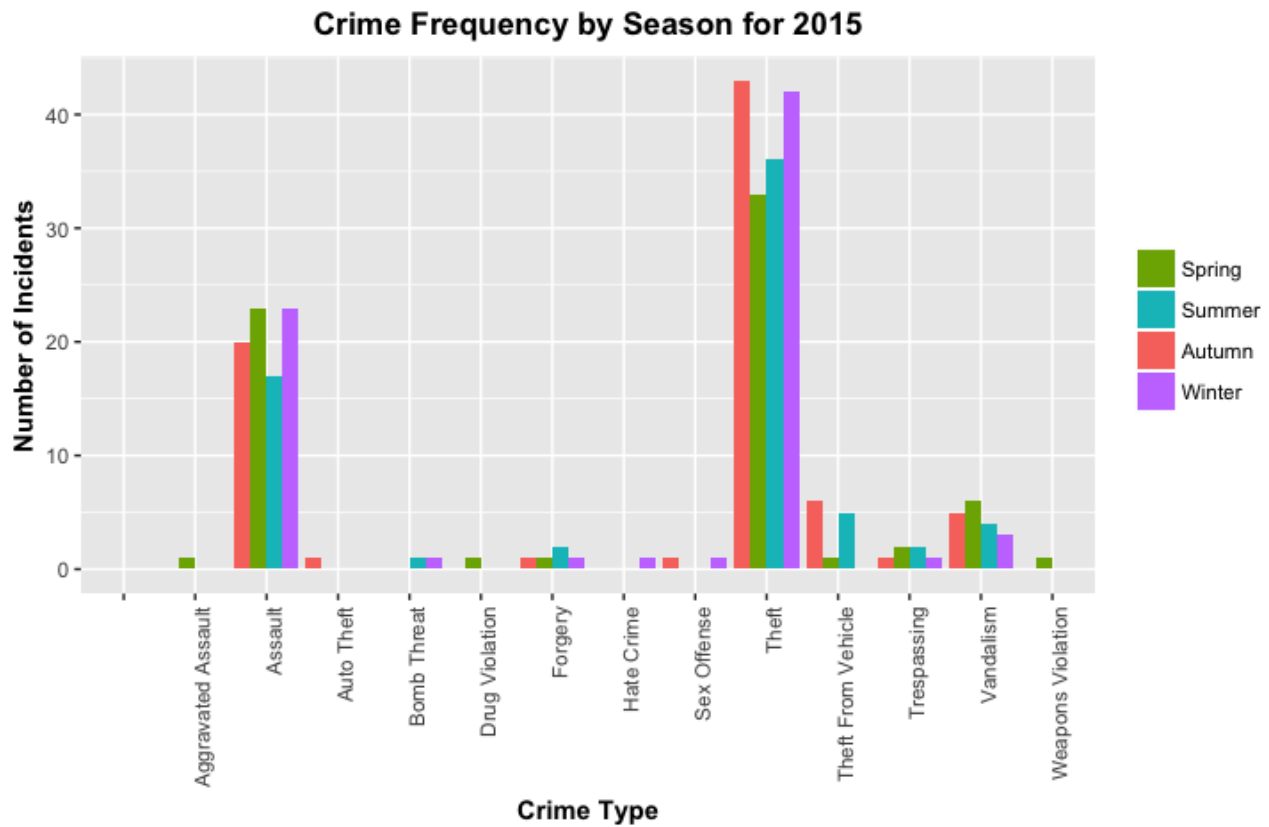


Figure 5: 2015 Crime Frequency by Season

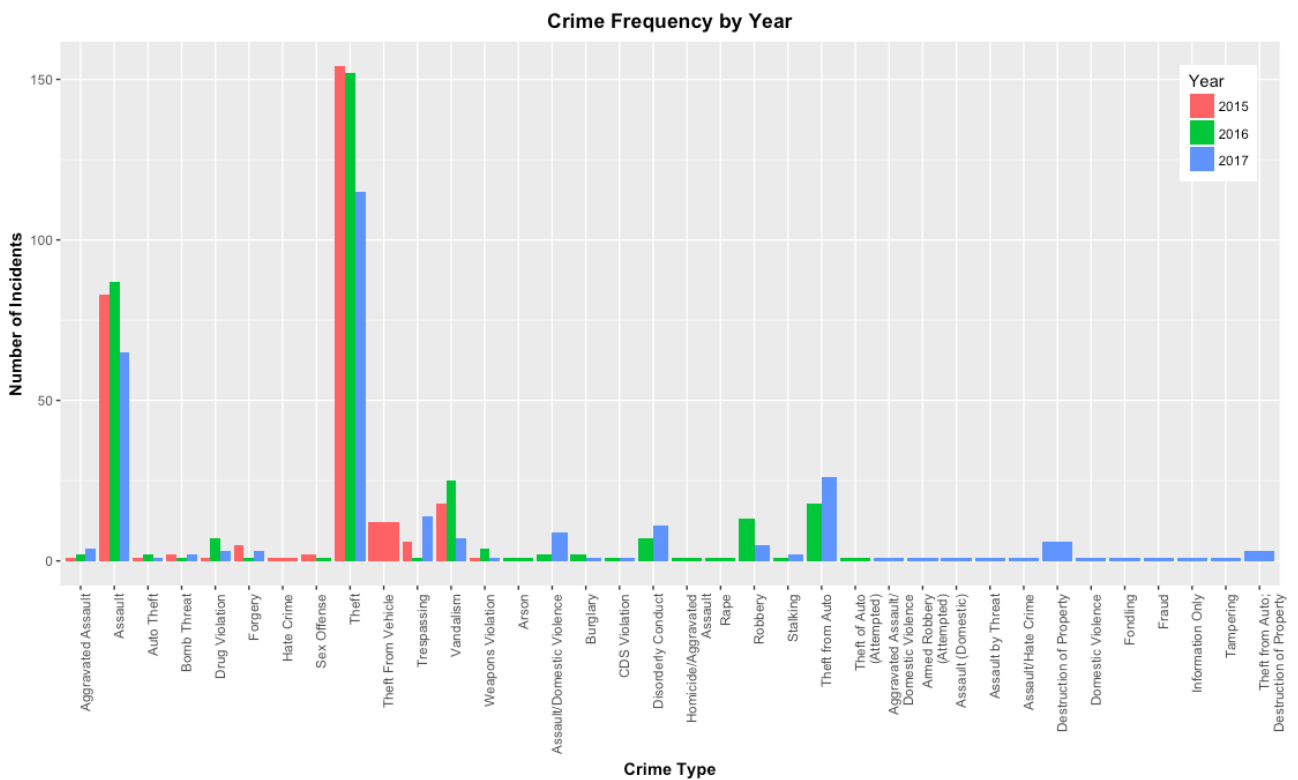


Figure 6: Hopkins East Baltimore Campus Crime Types and Frequency by Year

- 3 Results
- 4 Discussion and Conclusion
- 5 References