



CAPSTONE PROJECT IN DATA ANALYTICS

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UNCOVERING PATTERNS IN CRIME INCIDENTS IN WASHINGTON DC :

An Exploratory Data Analysis

Analyzing Crime Trends from 2008-2017

INTRODUCTION



- Washington DC is a vibrant city with a diverse population, but historically it also faces significant issues with crime.
- We analyze crime trends in Washington DC from 2008 to 2017 to gain insights into temporal, spatial, and seasonal aspects of crime incidents.
- Our aim is to provide valuable insights to law enforcement agencies, policymakers and the public.
- Our findings can enhance understanding of crime patterns in the city, and inform efforts to prevent and address crime.

CONTENTS



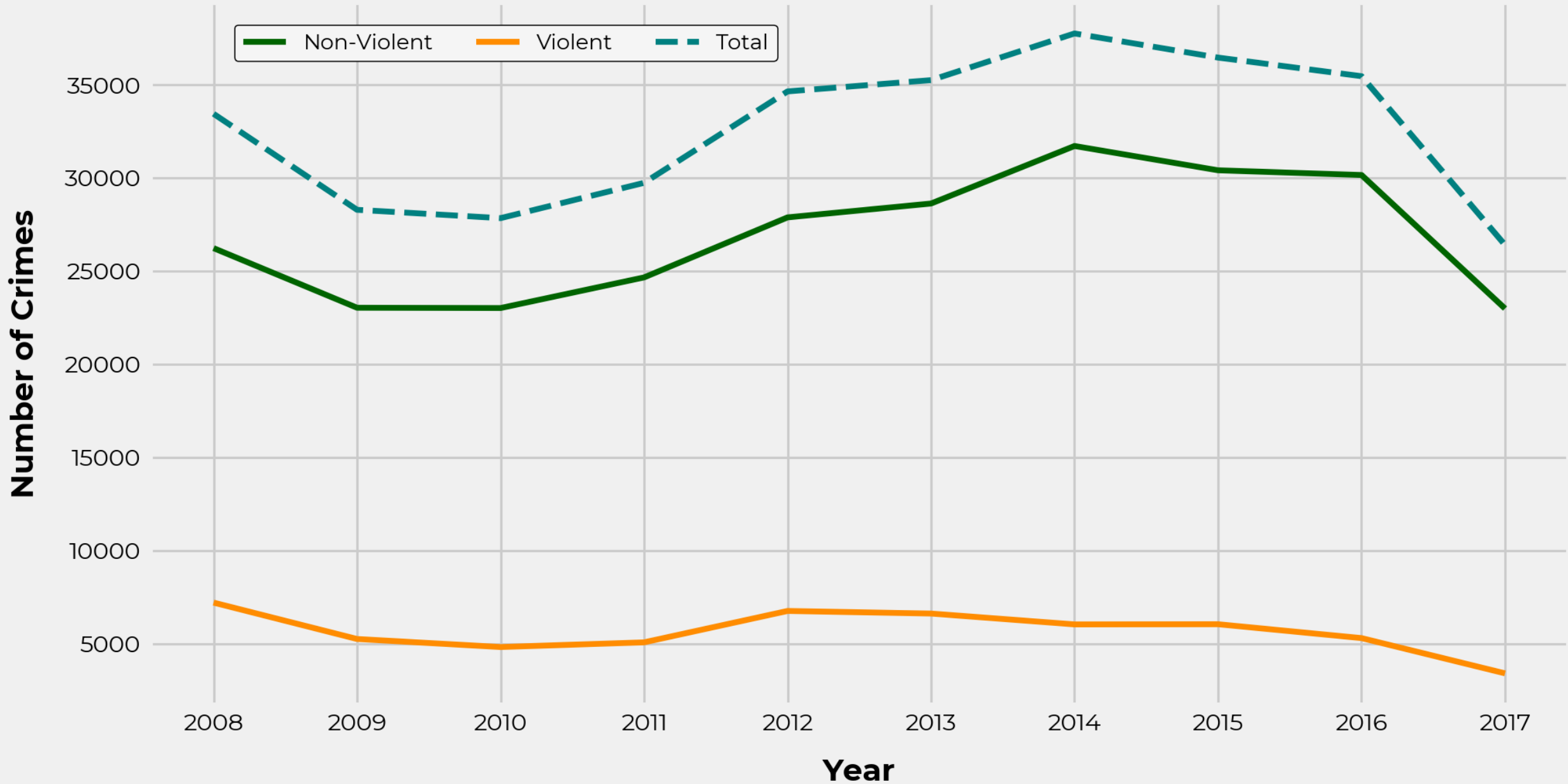
- **METHODOLOGY**
- **KEY HYPOTHESES**
 - Stating the Hypothesis
 - Plot / Chart visualizations
 - Hypothesis findings
- **CONCLUSION**

METHODOLOGY



- Raw data of Washington DC Metro Crime Data was obtained from [kaggle.com](https://www.kaggle.com).
- The final dataset was complete after data cleansing processes such as data munging to remove errors and inaccuracies.
- Exploratory data analysis of this dataset resulted in various visualizations for data distributions and determination of correlation from corresponding dataset columns.
- To create the featured illustrations, the dataset was edited, compiled with Jupyter Notebook and its relevant python libraries.

Number of Crimes by Crime Type per Year

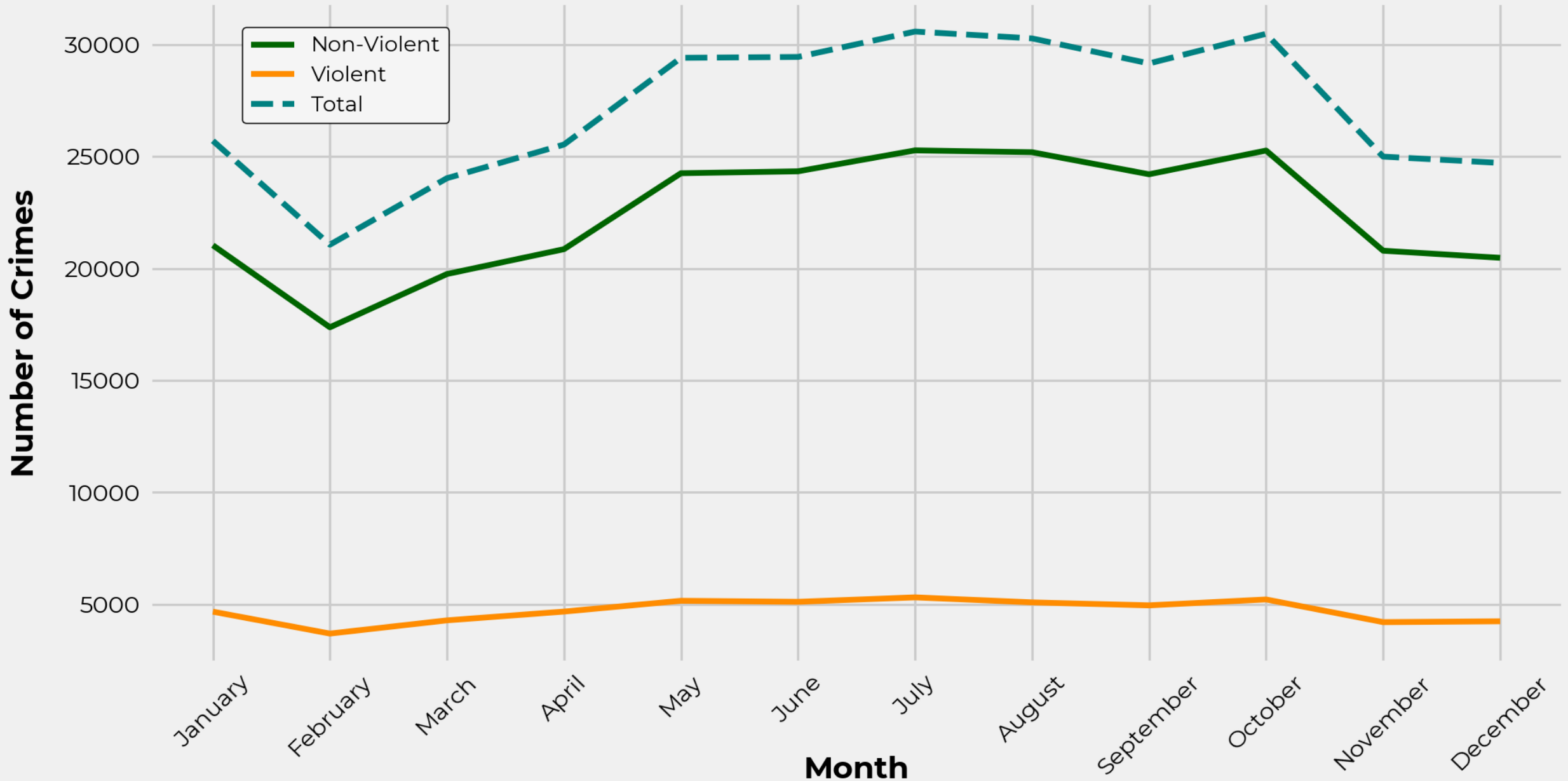


KEY HYPOTHESES

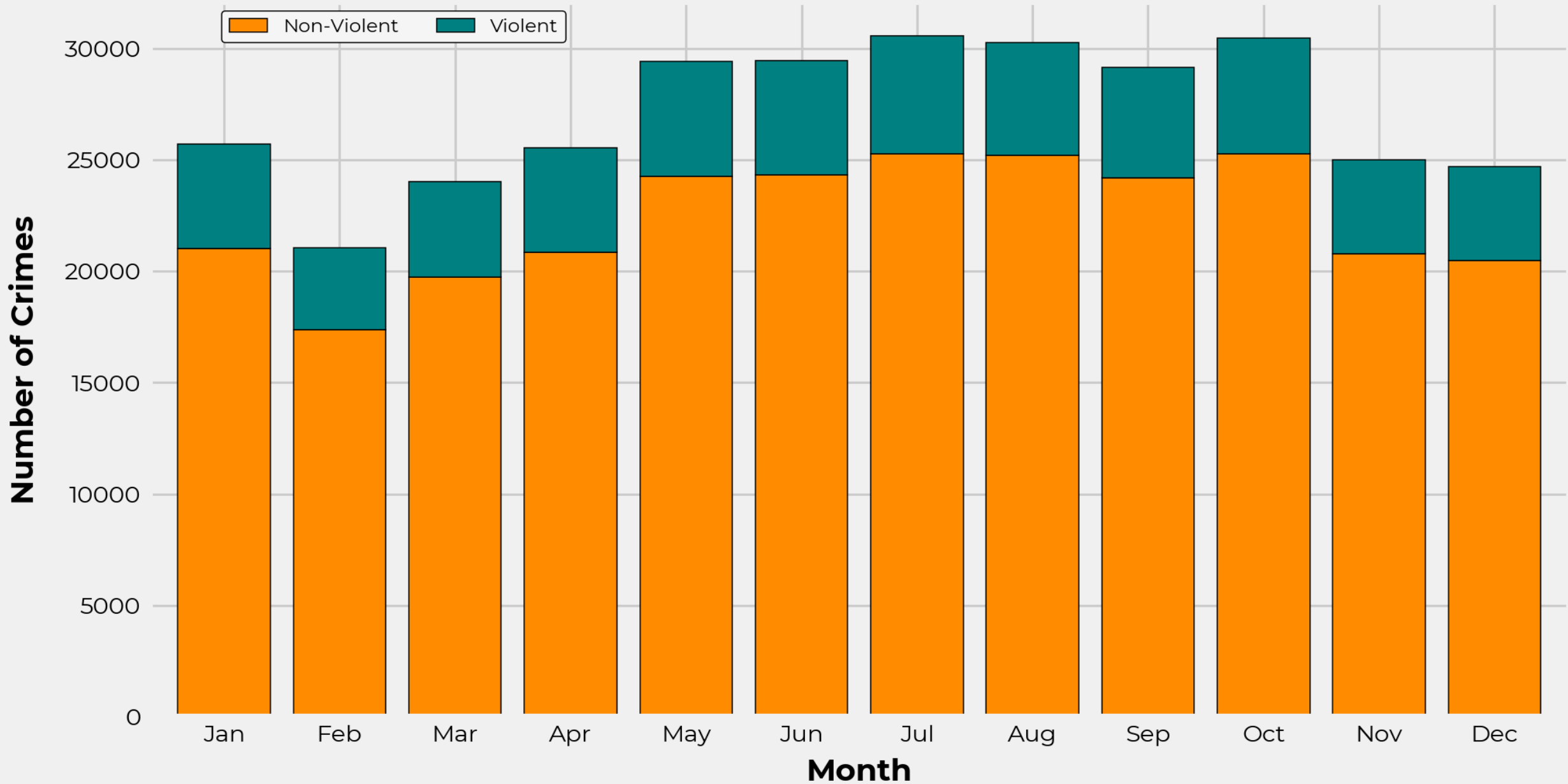
- Hypothesis 1

There is a difference in the distribution of crime types between months, with violent crimes more likely to occur during certain months of the year compared to non-violent crimes.

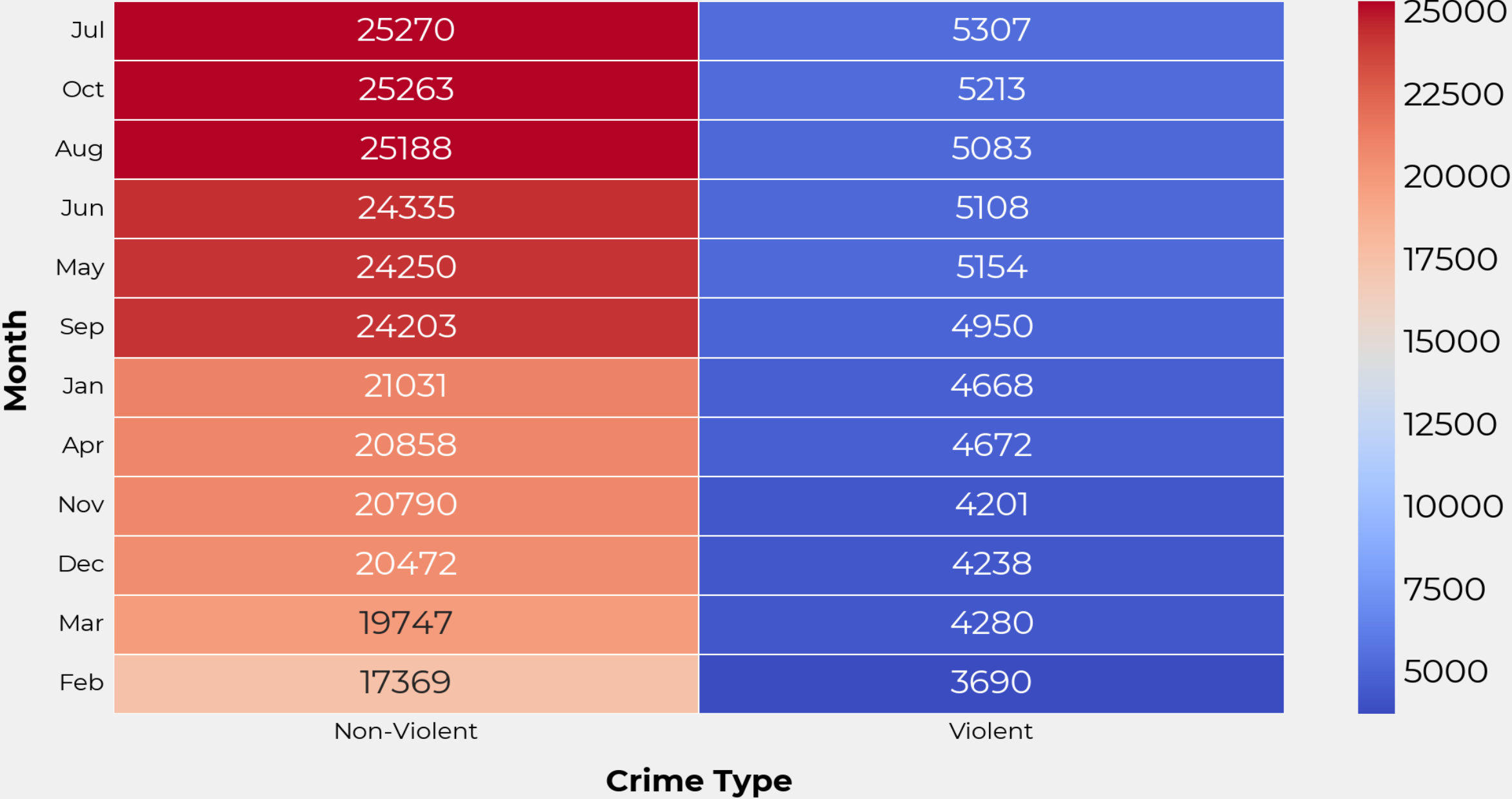
Number of Crimes by Crime Type per Month



Distribution of Non-Violent and Violent Crimes by Month



Crime Types by Month



HYOTHESIS 1 FINDINGS – Occurrence of Crime Types during Months

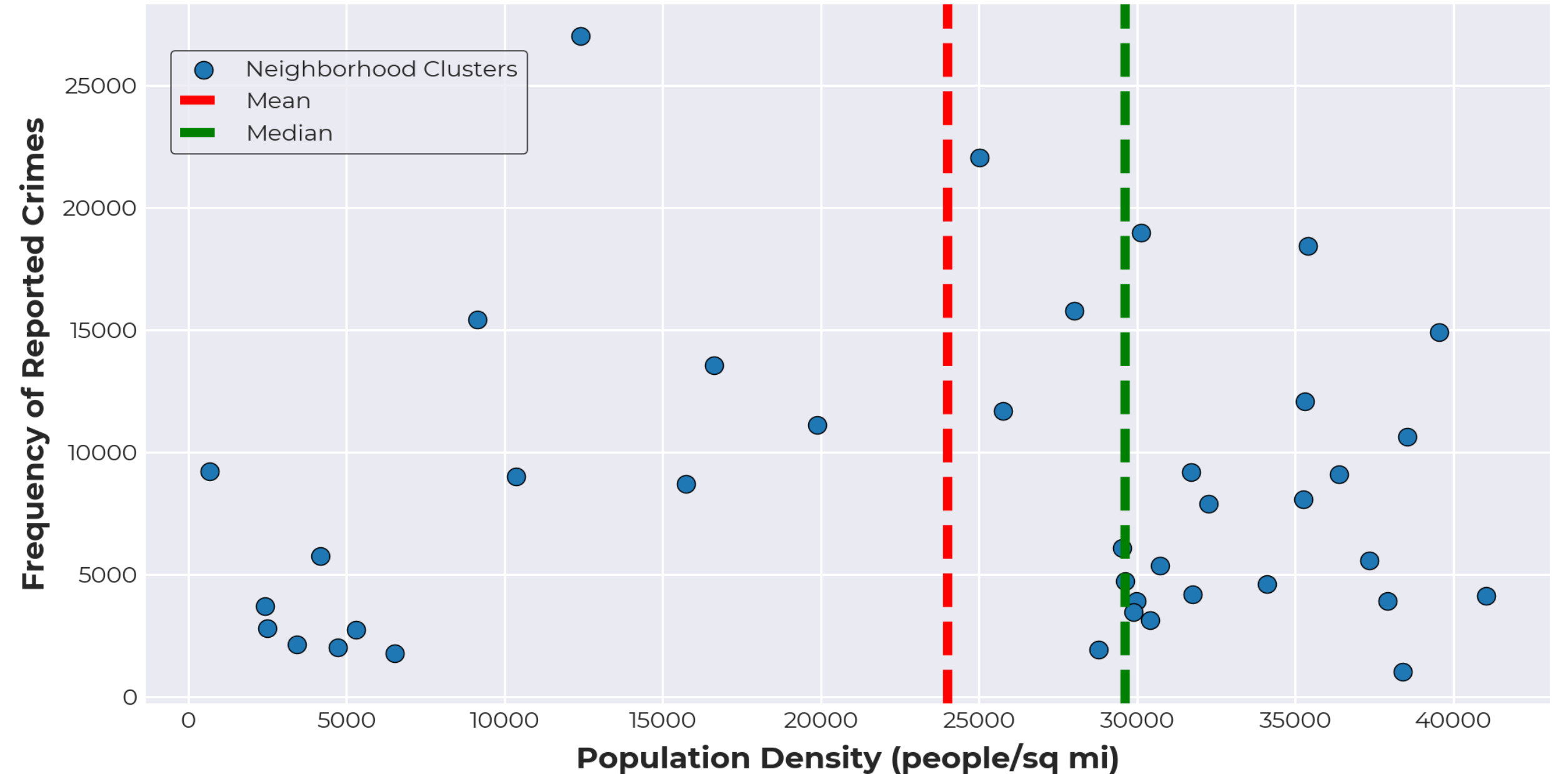
- Conclusion : No significant difference in the distribution of crime types between months for both Non-Violent and Violent Crimes.
- Supporting evidence :
 - Crime trends tend to peak throughout May to October.
 - An overall decrease in crime activity during the winter months of November and December.
- Hypothesis : Violent crimes are more likely to occur during certain months of the year compared to Non-Violent crimes is not supported by the data.

KEY HYPOTHESES

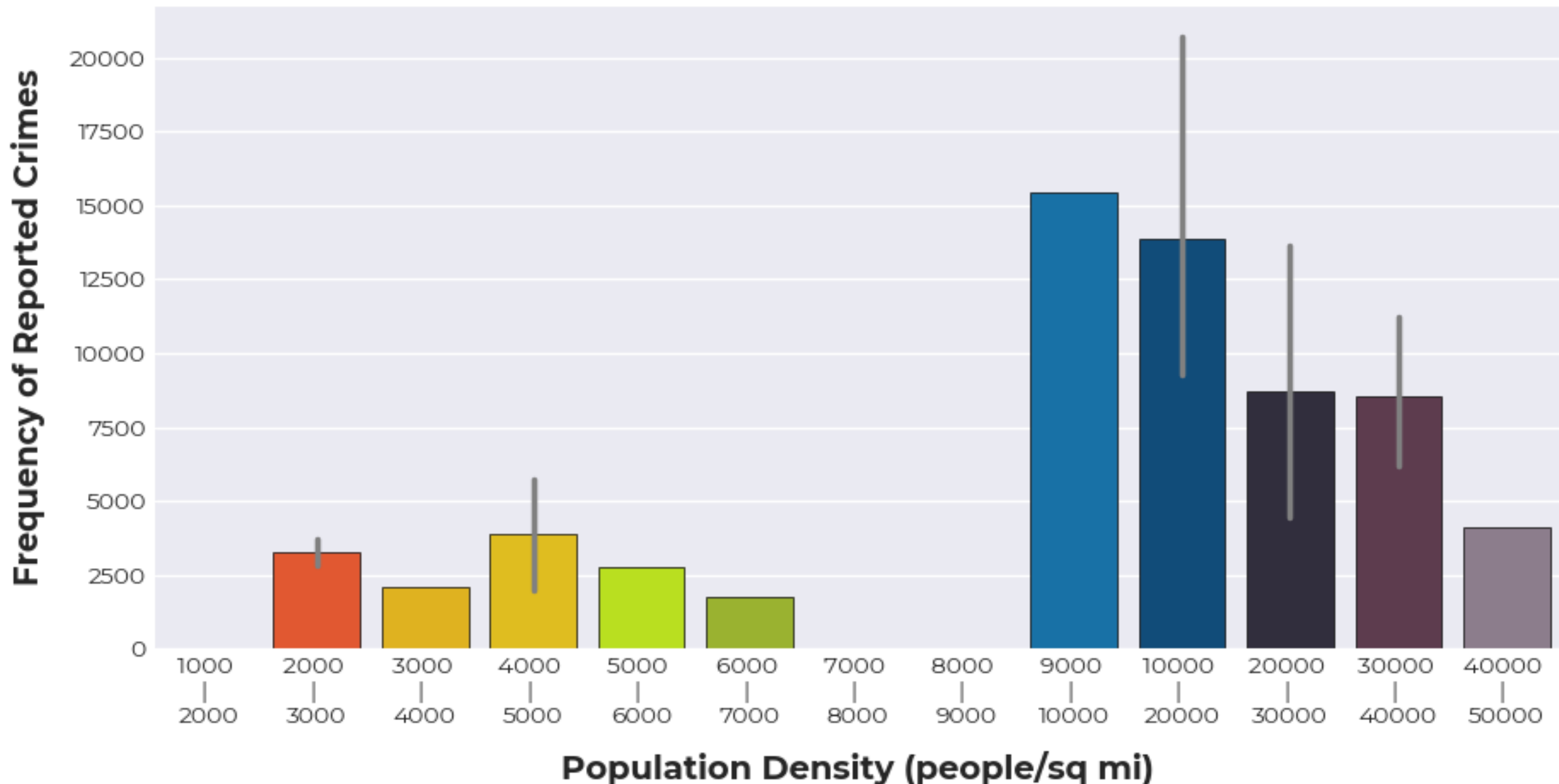
- Hypothesis 2

Neighborhoods with a higher population density will have a higher frequency of reported crimes.

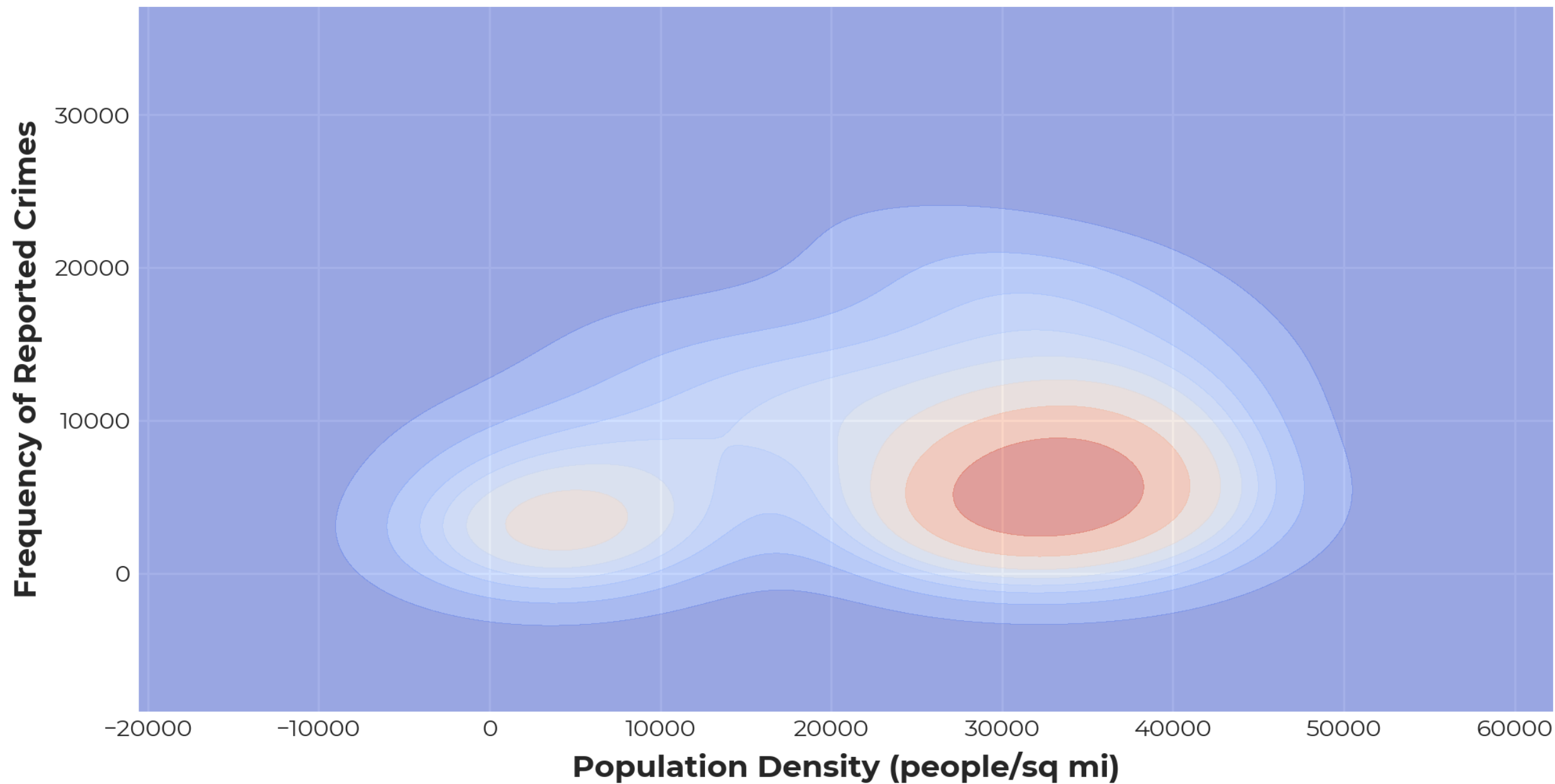
Neighborhood Crime Frequency vs Population Density



Neighborhood Crime Frequency vs Population Density



Neighborhood Crime Frequency vs Population Density



HYOTHESIS 2 FINDINGS – Relationship Between Population Density and Crime Frequency

- Conclusion : Neighborhoods with higher population densities have a higher frequency of reported crimes.
- Supporting evidence :
 - Scatter plot and 2D Kernel Density Estimate plot show a positive relationship between population density and crime frequency.
 - 2D KDE plot reveals higher intensity of colors in densely populated areas.
 - Bar plot also supports the relationship, with an increase in crime frequency as population density increases.
 - Highest density bin shows a slight decrease in frequency.

KEY HYPOTHESES

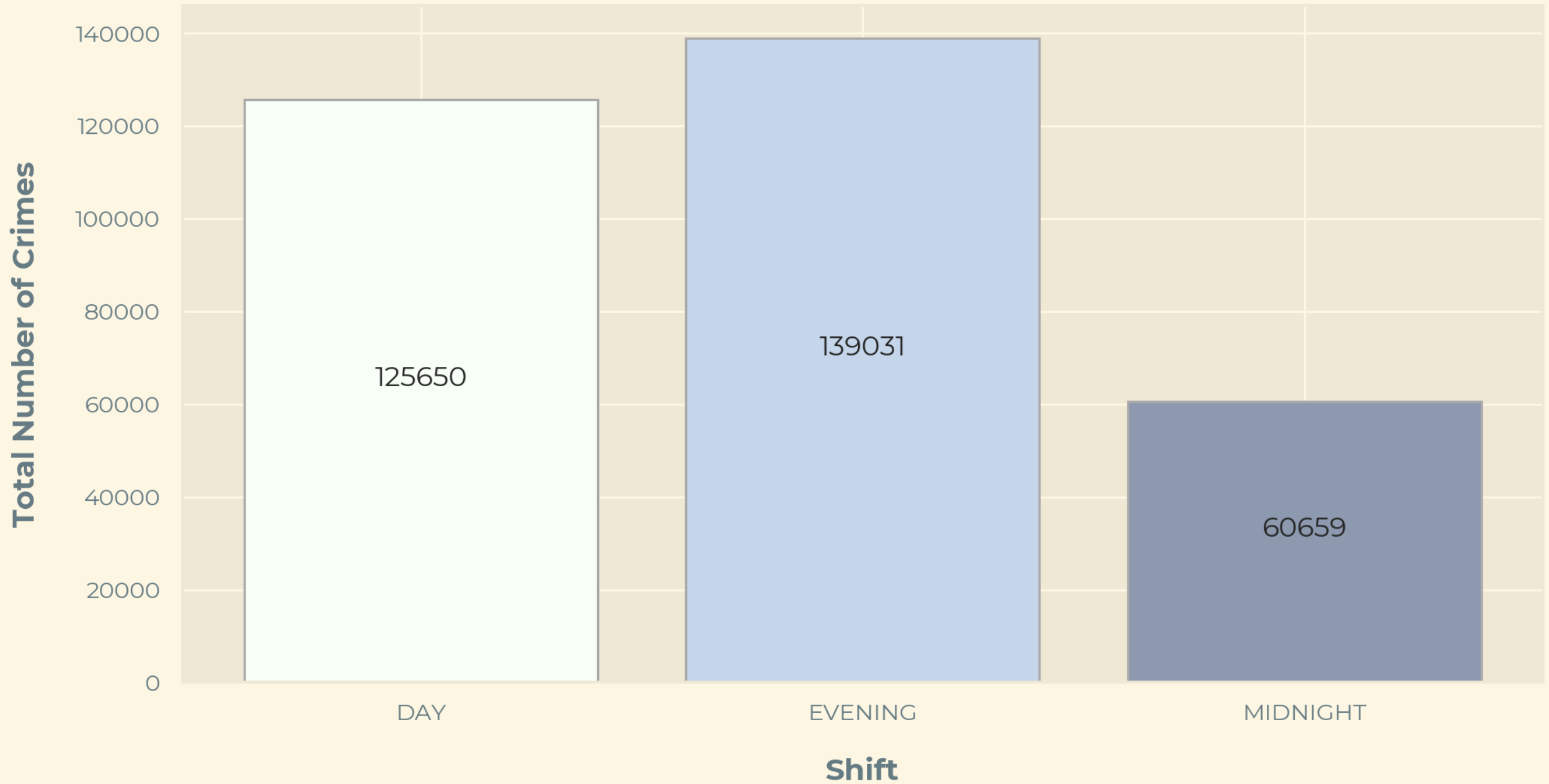
- Hypothesis 3

Crime rates in general tend to be higher during the evening and midnight shifts compared to the day shift. Furthermore, within the evening and midnight shifts, there may be a higher proportion of violent crimes compared to non-violent crimes.

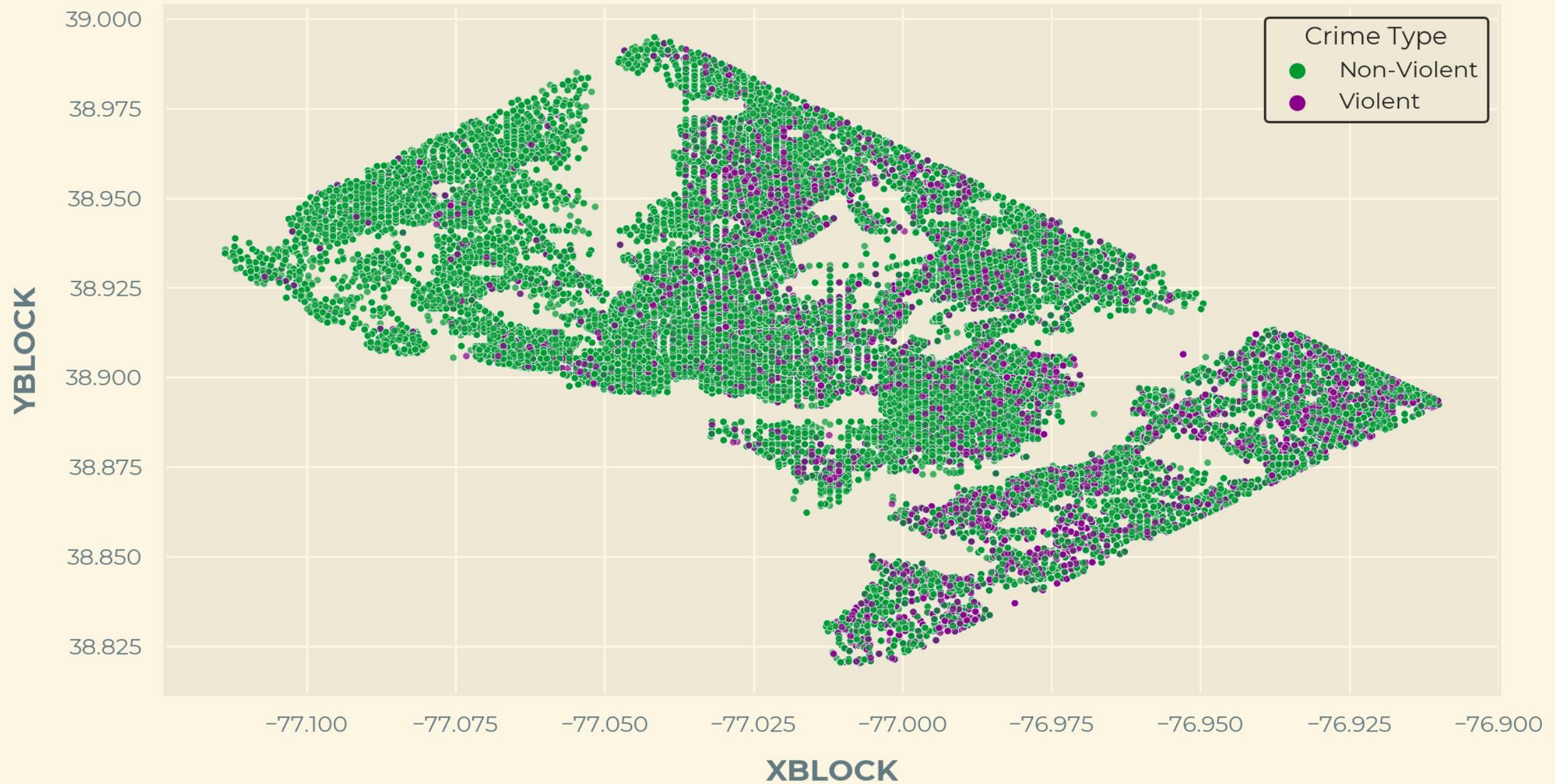
DEFINITION of TYPES of SHIFT

- DAY shift - 0700 and 1500
- EVENING shift - 1500 and 2300
- MIDNIGHT shift - 2300 and 0700

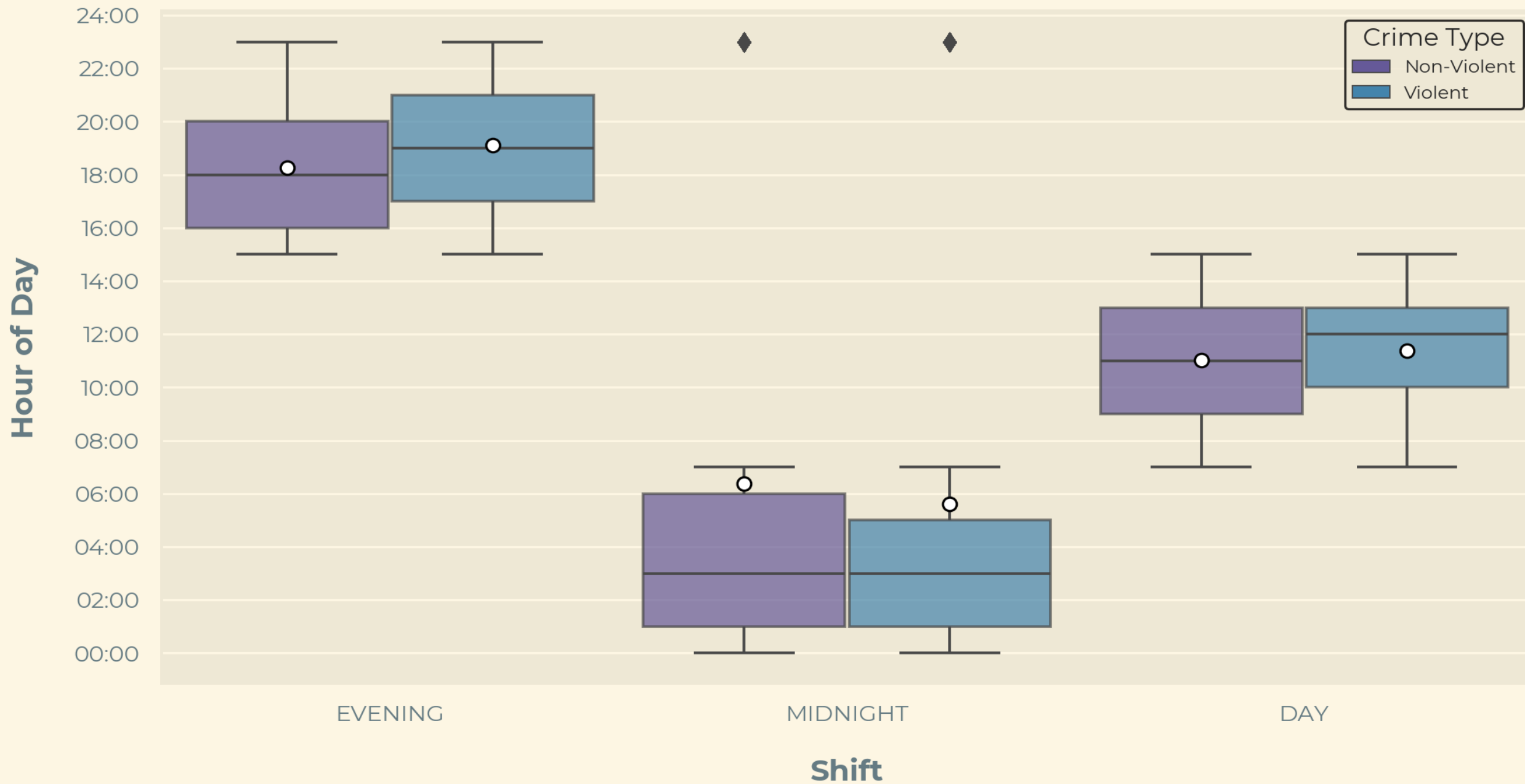
Total Number of Crimes by Shift



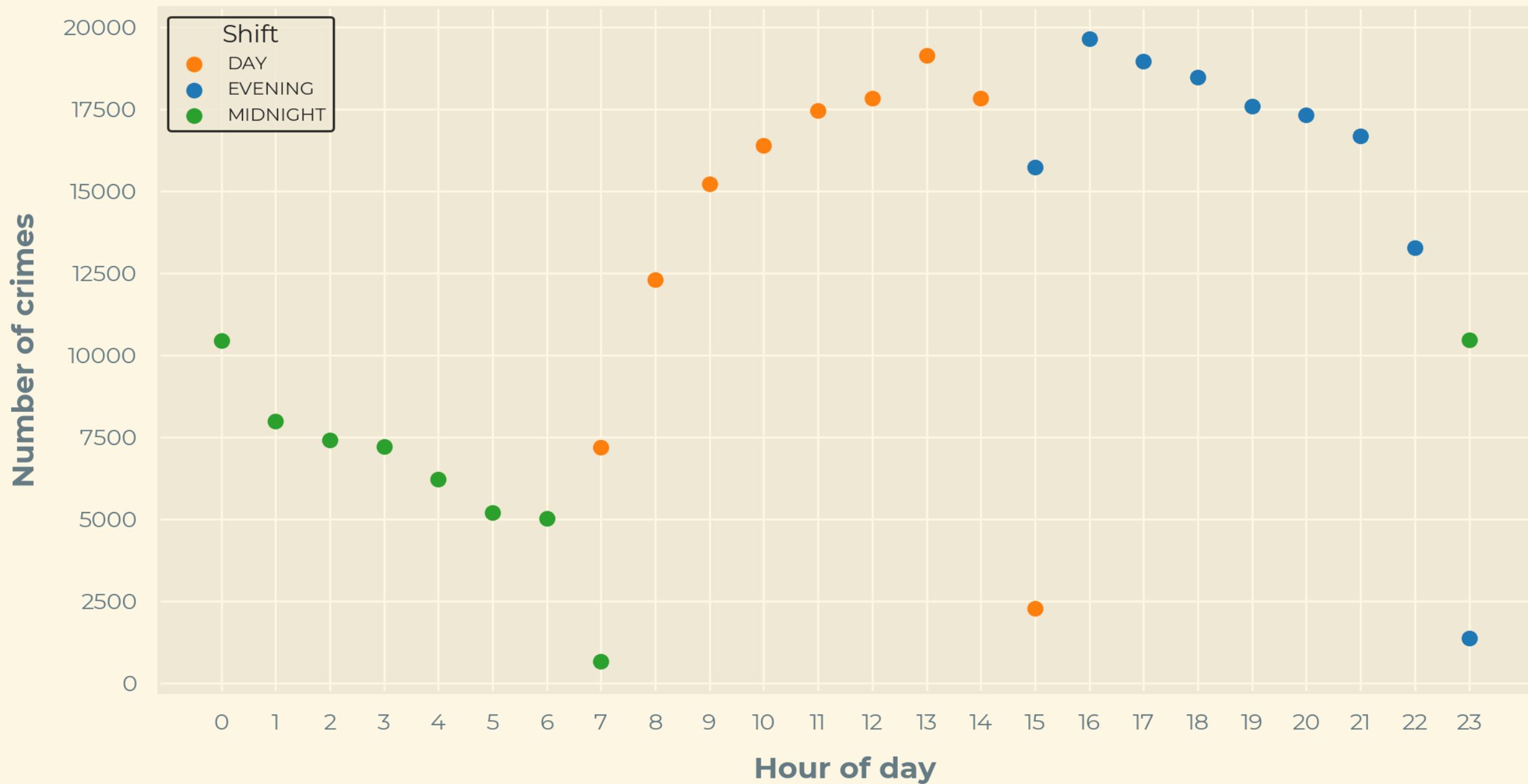
Crime Incidents by Crime Type



Distribution of Hour of Day by Shift and Crime Type



Hourly Crime Counts by Shift

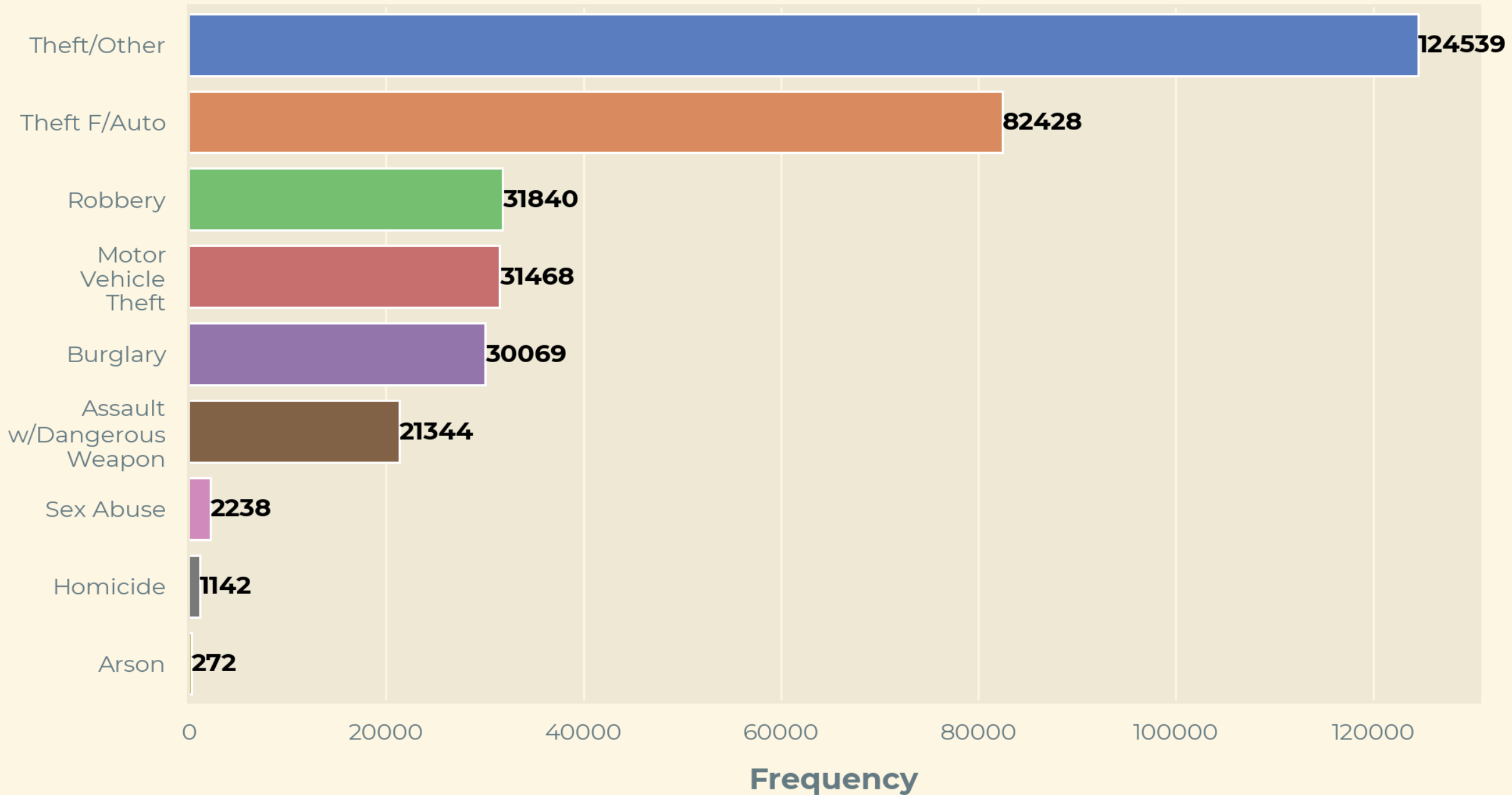


Classification of Offense by Crime Type : Violent and Non-Violent

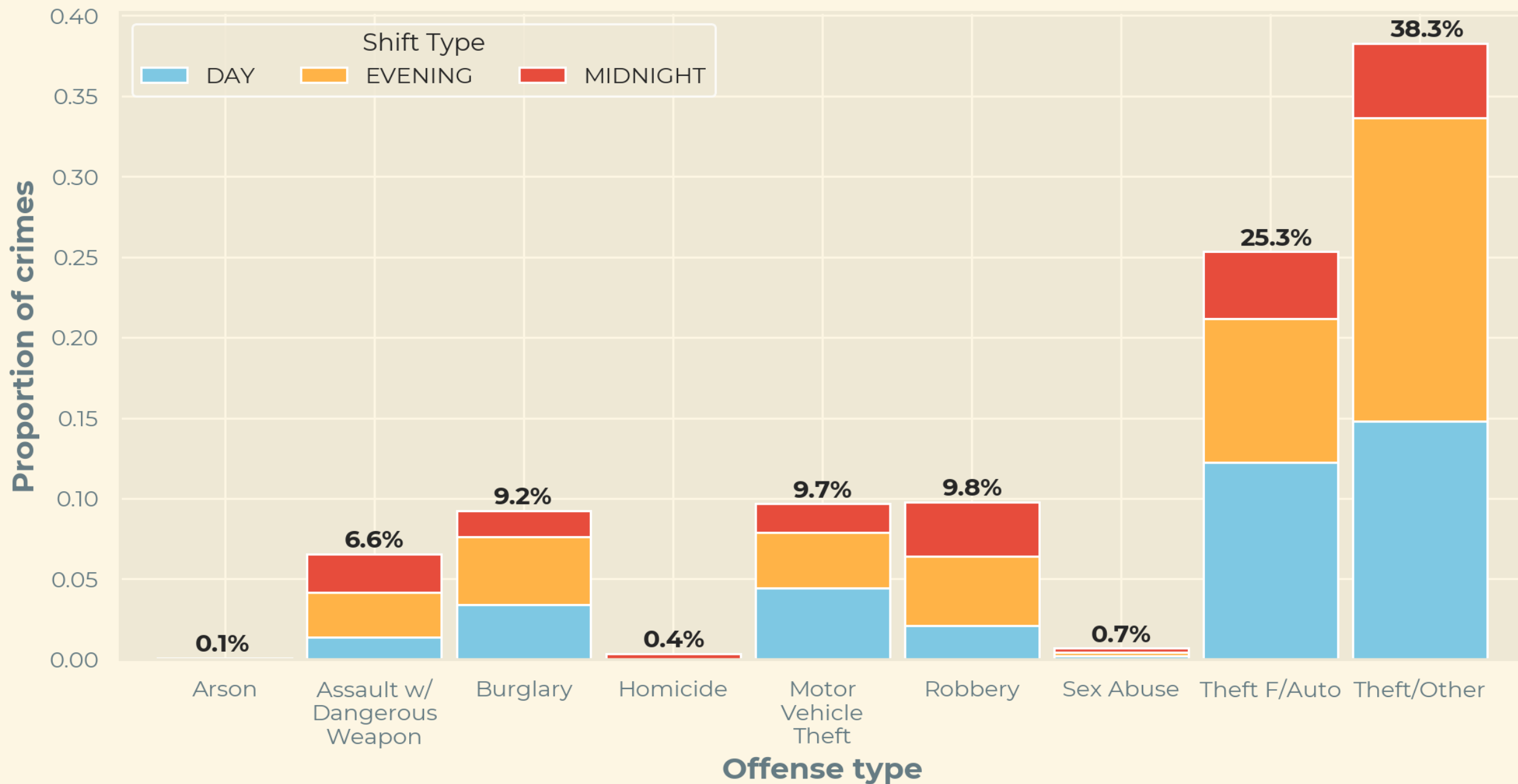
- Violent crimes :
 - Robbery
 - Assault w/Dangerous Weapon
 - Sex Abuse
 - Homicide
- Non-Violent crimes :
 - Theft / Other
 - Motor Vehicle Theft
 - Burglary
 - Theft F / Auto
 - Arson

Frequency of Crime Offenses from 2008 - 2017

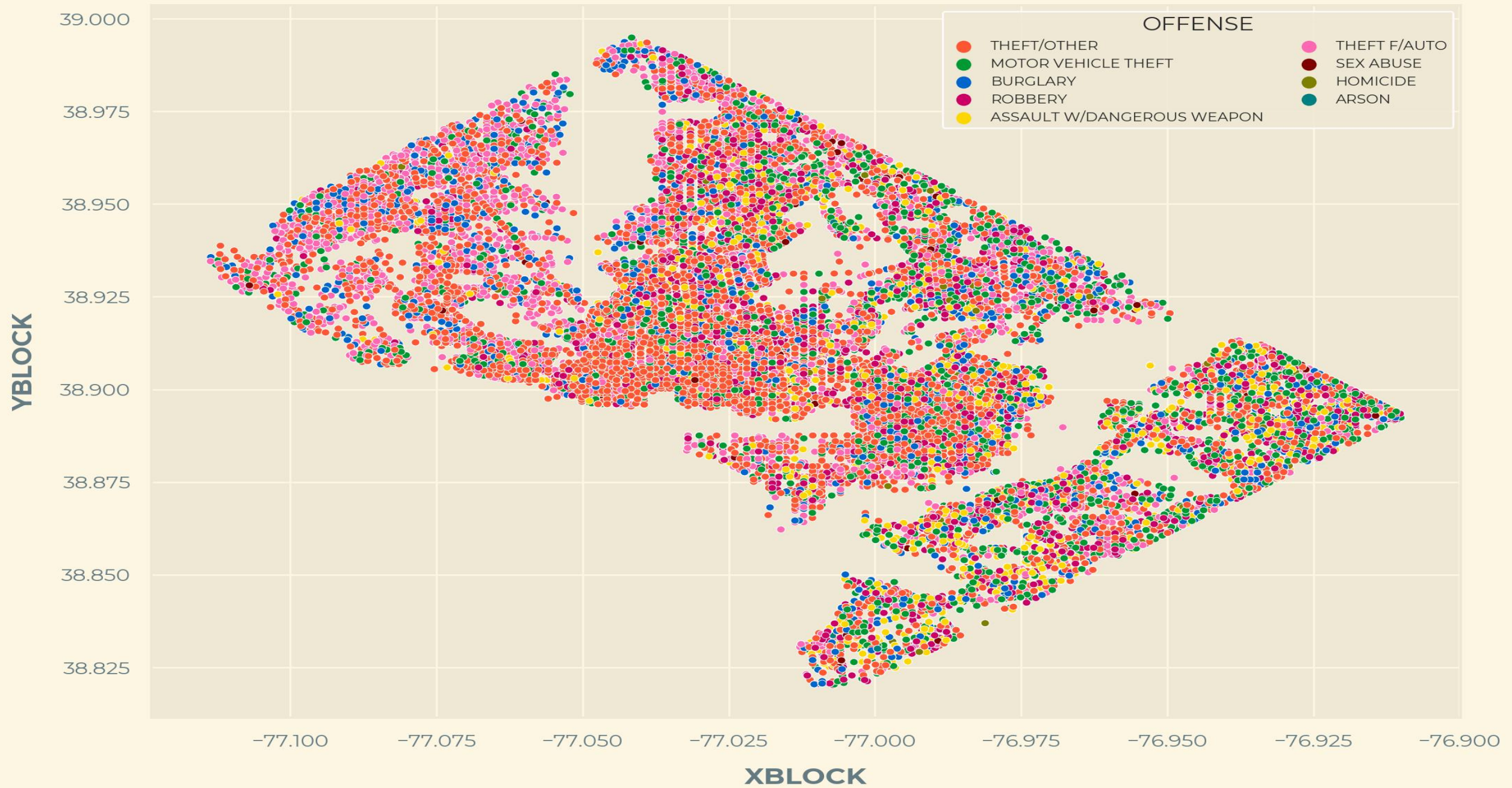
Crime Offense



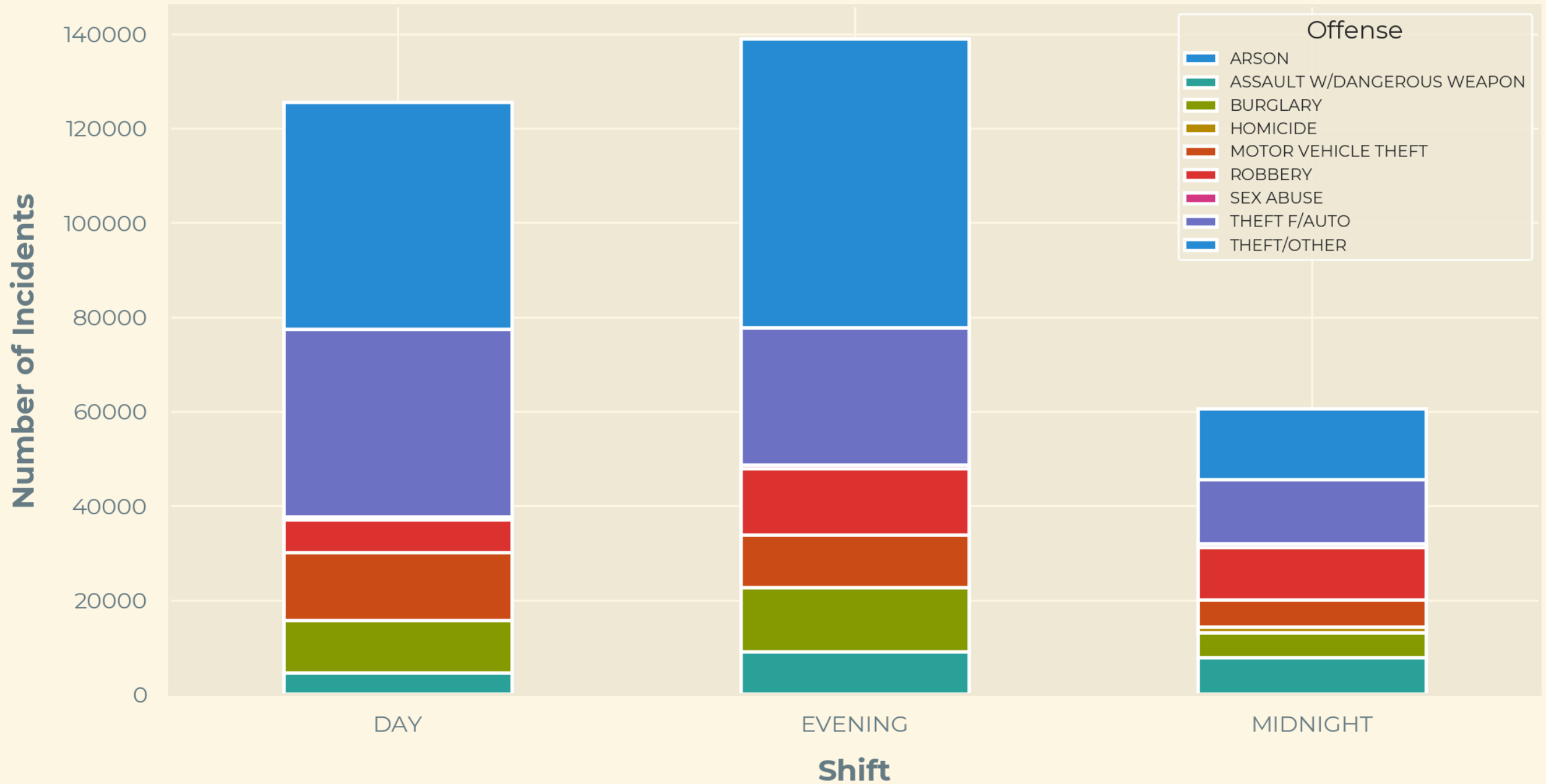
Proportion of Crimes by Offense and Shift



Crime Incidents by Offense



Offense Types by Shift



HYOTHESIS 3 FINDINGS – Crime Rates by Time of Day

- Conclusion : Crime rates are generally higher during evening and midnight shifts compared to the day shift.
- Supporting evidence :
 - 199,690 crimes occurred during evening and midnight shifts, compared to 125,650 during the day shift.
 - Box plot means show that violent crimes are more prevalent during evening and midnight shifts.
 - Proportions indicate a higher proportion of crimes occur during evening and midnight shifts, suggesting more crimes are committed during hours of darkness.
- Hypothesis : The findings support the claim that crime rates are higher during evening and midnight shifts, and that violent crimes are more likely to occur during those shifts.

CONCLUSION



- This exploratory data analysis provided clear insights into crime patterns and trends in the city.
- Hypothesis 2 was supported, suggesting that neighborhoods with higher population densities have a higher frequency of reported crimes.
- Hypothesis 3 was also supported, indicating that crime rates are generally higher during evening and midnight shifts, with a higher proportion of violent crimes compared to non-violent crimes within those shifts.

CONCLUSION



- Hypothesis 1 was not supported, indicating no difference in the distribution of crime types between months.
- Policymakers and law enforcement in DC could use this information to allocate resources and plan interventions to reduce crime in high-risk areas and times.
- This analysis provides a foundation for future research in this area and highlights the importance of data-driven decision making in addressing crime in urban areas.

Q & A : GERMAINE

Washington DC.

What does DC stand for?

Da Capital



That's all folks...

kthxbye