A Study on Assault Crime Rates in Toronto Neighborhoods (2014-2023)*

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This paper analyzes trends in assault crimes across various neighborhoods in Toronto from 2014 to 2023. By examining the total assaults over the past decade, this study highlights key patterns in the growth or decline of assault-related incidents. Furthermore, the relationship between population size and assault rates is explored to determine if higher populations correlate with increased assault numbers. Finally, the analysis identifies the top 10 neighborhoods with the highest total assaults, pinpointing crime hotspots within the city. These findings provide insights that could aid urban planners and policymakers in improving public safety and resource allocation.

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*A GitHub Repository containing all data, R code, and other files used in this investigation is located here: https://github.com/Shuhengzhou03/Initial-submission-paper-1.git

1 Introduction

In 2023, as Toronto's urban population continues to grow, assault crimes have become a focal point in public safety discussions. Assault crimes not only pose a direct threat to the daily lives of residents but also reveal deeper issues related to the unequal distribution of urban resources (Luca et al. 2023). In recent years, assault incidents in various neighborhoods across Toronto have shown distinct trends and characteristics, reflecting the economic conditions, population density, and urban planning differences in these areas (Wang, Lee, and Williams 2019).

The related demographic and crime report data come from Toronto's open data catalog. This dataset includes the total number of assaults and population data for each neighborhood from 2014 to 2023. Crime patterns often exhibit locality, with some neighborhoods experiencing higher assault rates due to factors such as population density, economic conditions, and the availability of public services (Onyeneke and Karam 2022).

This study analyzes assault crime data across Toronto neighborhoods from 2014 to 2023, focusing on trends in crime rates, the relationship between assault crimes and population size, and identifying neighborhoods with the highest assault rates. This analysis not only reveals the crime patterns across different years and neighborhoods but also aids urban planners and policymakers in developing more effective resource allocation strategies to better protect residents and improve the quality of life (Cheng and Chen 2021).

Based on the analysis of data from 2014 to 2023, this paper focuses on three key aspects: the overall trend of assault crimes, the relationship between community population size and the total number of assaults, and the top ten neighborhoods with the highest number of assaults. This data-driven analysis will provide important insights for improving public safety in Toronto.

2 Data

2.1 Overview

The dataset used in this analysis comes from the "Neighbourhood Crime Rates" dataset, available through the City of Toronto's Open Data Catalogue. This dataset covers assault crimes and demographic information between 2014 and 2023. Toronto's open datasets provide detailed crime reports, including the types, frequencies, and the number of cases across different neighborhoods. This dataset is updated regularly and contains multiple variables aimed at helping the public and researchers better understand urban crime patterns and public safety dynamics.

The key variables used in this analysis include "Neighborhood Name," which identifies the various neighborhoods in Toronto; "Total Assault Cases," which records the number of assault crimes across neighborhoods from 2014 to 2023; and "Community Population," which is used

to analyze the relationship between population density and assault crime rates. This analysis focuses on the trends in assault crimes across neighborhoods, the correlation between community population and crime rates, and identifying the neighborhoods with the highest crime rates.

Data processing and analysis were conducted using the R programming language (R Core Team 2022), and the tidyverse (Wickham et al. 2019) packages were used for data cleaning, analysis, and visualization. Through systematic analysis of the data, this study provides in-depth insights into crime patterns and related factors in various Toronto neighborhoods, offering valuable reference information for policymakers and urban planners.

2.2 Results

After loading the dataset using the R programming language (R Core Team 2022), the `tidyverse` (Wickham et al. 2019) package was used to generate graphs. In doing so, R code was adapted from Alexander (2023).

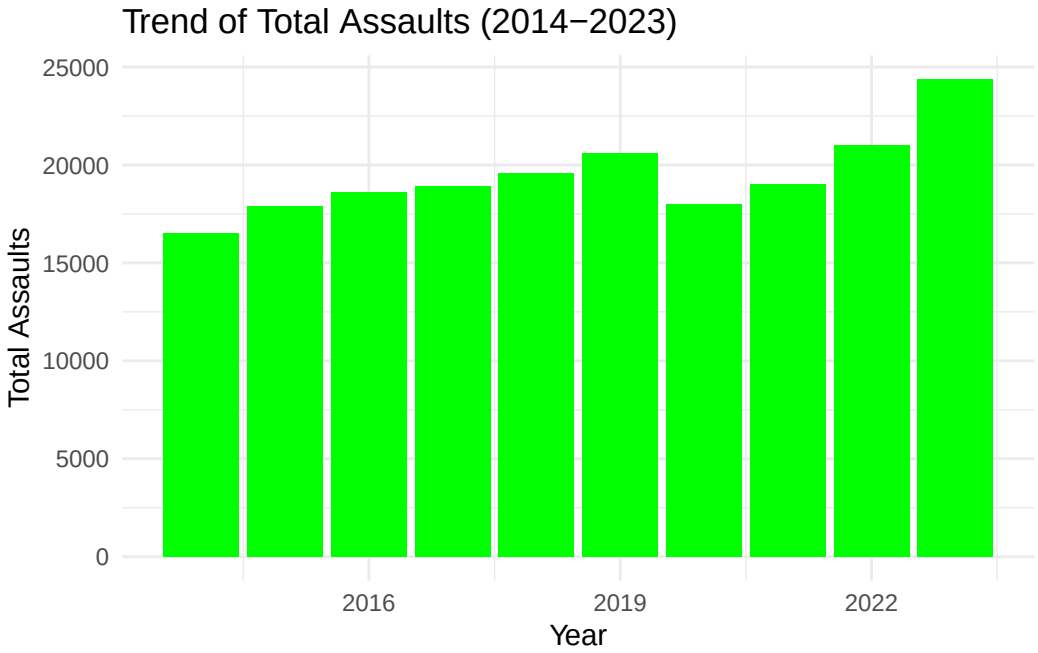

Figure 1: Total Number of Assault Cases in Toronto Neighborhoods (2014-2023)

The chart illustrates the overall trend of assault cases across various neighborhoods in Toronto from 2014 to 2023. As seen in the graph, the total number of assaults fluctuated during this period. In 2014, the number of reported assault cases was around 15,000, and it steadily increased over the next few years, reaching close to 20,000 by 2018. Afterward, there was a slight decline, but from 2021 onward, the number of assaults surged again, peaking at approximately 25,000 cases in 2023—the highest point in the time frame.

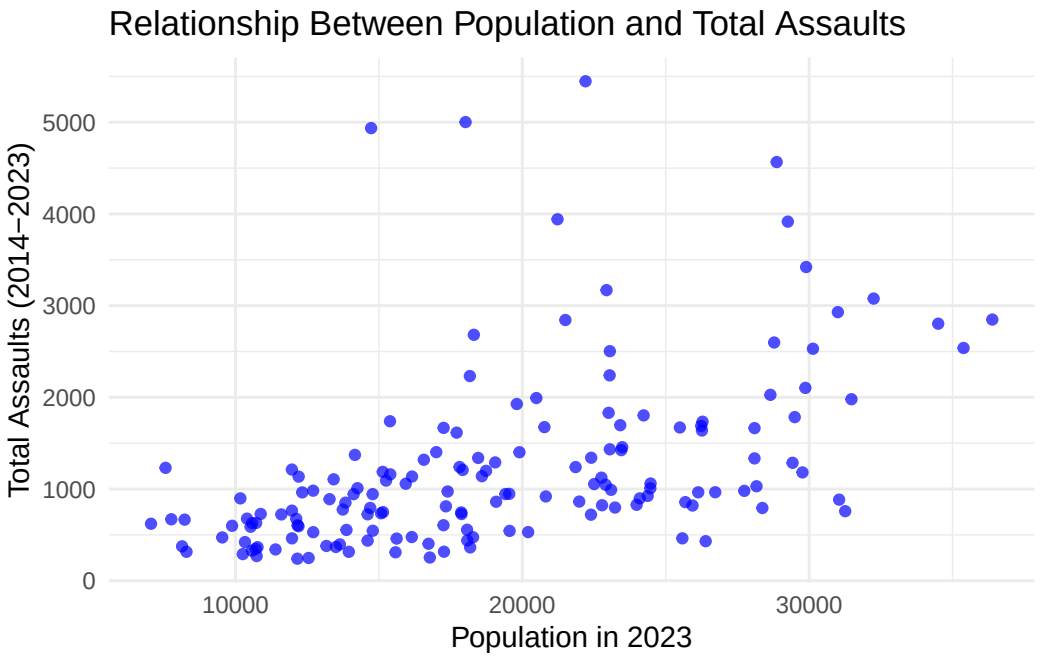

Figure 2: Relationship Between Population Size in 2023 and Total Assaults (2014-2023) in Toronto Neighborhoods

This scatter plot illustrates the relationship between the population of various neighborhoods in 2023 and the total number of assaults from 2014 to 2023. As shown in the plot, the population of most neighborhoods in 2023 is concentrated between 10,000 and 25,000, and the total number of assaults in these neighborhoods generally ranges from 0 to 300. However, there are some notable outliers, indicating that in certain smaller neighborhoods (e.g., those with populations below 15,000), the total number of assaults can exceed 500.

As the population increases, the total number of assaults shows an overall upward trend, particularly in neighborhoods with populations over 25,000 in 2023, where the total number of assaults often exceeds 300. Although the relationship between population and the total number of assaults is not strictly linear, the overall trend suggests that neighborhoods with larger populations tend to report higher numbers of assaults. This indicates that, aside from population size, other factors such as socioeconomic conditions or the availability of public services may influence the crime rate in these neighborhoods.

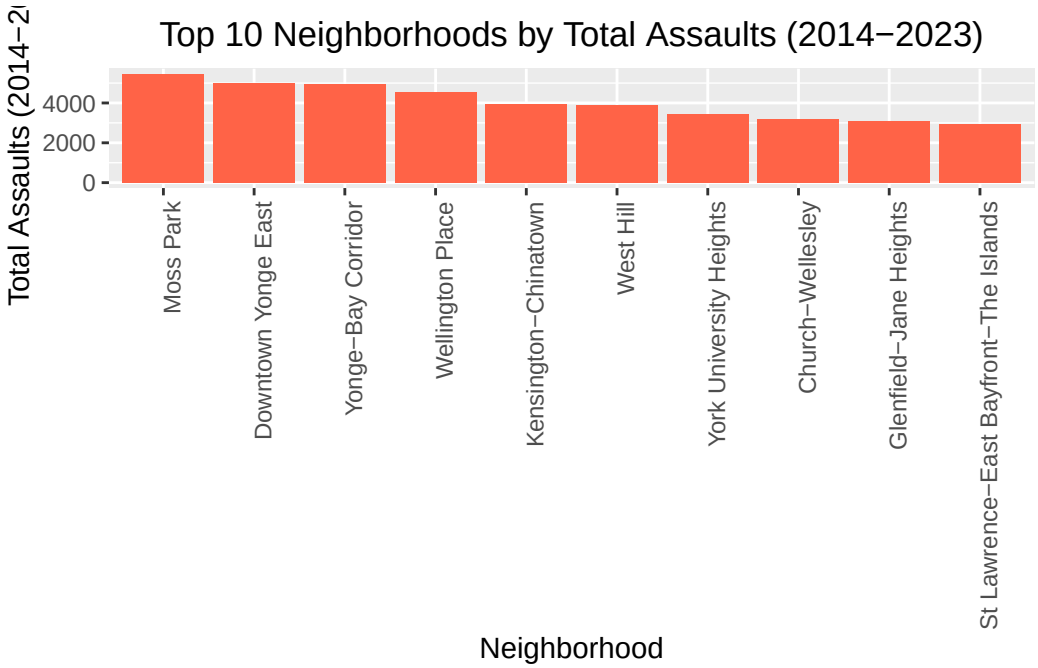

Figure 3: Top 10 Neighborhoods by Total Assaults in Toronto (2014-2023)

This chart displays the top ten neighborhoods in Toronto with the highest total number of assaults from 2014 to 2023. The neighborhood names are shown on the x-axis, while the y-axis represents the total number of assaults, ranging from 3,000 to over 5,000. "Moss Park" has the highest number of assaults, with over 5,000 cases, followed by "Downtown Yonge East" with approximately 4,500 cases, and "Yonge-Bay Corridor" with around 4,000 cases. Other neighborhoods, such as "St. James Town" with approximately 3,800 cases, "Bay Street Corridor" with about 3,600 cases, and "Waterfront Communities-The Island" with approximately 3,400 cases, also rank high.

3 Discussion

In this analysis, we found that the number of assault cases in certain neighborhoods in Toronto is significantly higher than in others. The concentrated distribution of assault cases reflects the population size, socioeconomic status, and uneven distribution of resources in specific communities. This phenomenon suggests that areas with higher population density and poorer economic conditions are more likely to become crime hotspots, especially in places where resources are scarce and public services are limited, making this trend even more pronounced.

Notably, this study revealed a positive correlation between population size and the total number of assault crimes, particularly in neighborhoods with populations exceeding 25,000, where the number of assault cases increased significantly. This may be related to factors such as

the mobility of residents, social class differences, and higher stress levels in these communities. Additionally, the concentration of assault cases in specific neighborhoods may be linked to the lack of law enforcement resources and social service distribution (Bones and Hope 2015). In high-crime areas, the appropriate allocation of resources and more effective crime prevention measures could have a positive impact on reducing crime rates.

However, this study has certain limitations. First, the study only considered reported assault cases and did not include unreported crimes, which may lead to an underestimation of the total number of assault cases. Secondly, while this study analyzed the relationship between assault cases and population size, it did not fully examine other factors influencing crime rates, such as the economic conditions of the community, education levels, and social support networks (Gokmenoglu, Yıldız, and Kaakeh 2020). Future research should further explore the impact of these variables on assault crime rates to gain a more comprehensive understanding of crime patterns in Toronto neighborhoods.

Furthermore, this study emphasizes that policymakers should prioritize resource allocation in high-crime neighborhoods. Strengthening law enforcement efforts, improving community infrastructure, and providing more social services in these areas could effectively reduce the occurrence of assault cases (Lanni 2022). Future policies should focus more on densely populated and economically disadvantaged neighborhoods, developing targeted crime prevention strategies to enhance public safety levels.

In conclusion, this study provides important insights into the understanding of assault crimes in Toronto neighborhoods and offers a basis for urban planners and policymakers to develop more effective resource allocation strategies and crime prevention measures.

A Appendix

A.1 Dataset and Graph Sketches

Sketches depicting both the desired dataset and the graphs generated in this analysis are available in the GitHub Repository.

A.2 Data Cleaning

The data cleaning process involved filtering out some of the columns from the raw dataset and renaming some of the data entries for clarity and simplicity.

A.3 Attribution Statement

"Contains information licensed under the Open Government Licence – Toronto" (City of Toronto, n.d.).

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