Toronto Homicides and Shootings (To be Changed)*

An analysis of police presence across Toronto neighbourhoods in relation to homicide and shooting cases (2018-2023)

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First sentence. Second sentence. Third sentence. Fourth sentence.

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*Code and data are available at: https://github.com/moonsdust/toronto-homicides-shootings.

1 Introduction

The introduction is self-contained and tells a reader everything they need to know including: 1) broader context to motivate (done); 2) some detail about what the paper is about (done); 3) a clear gap that needs to be filled (done); 4) what was done; 5) what was found; 6) why it is important; 7) the structure of the paper (done). A reader should be able to read only the introduction and know what was done, why, and what was found. Likely 3 or 4 paragraphs, or 10 per cent of total.

As a response to the increase in gun violence in 2024 by 74% from 2023, the Toronto Police Services announced on June 27, 2024 at a press conference that they will increase their presence in areas impacted by high levels of gun violence (Fanfair 2024). This concern was expressed because in a CBC article published in December 2023, they mentioned that there was a decrease in gun violence from 2019 to 2023 across Toronto (Balintec 2023). Deputy Chief Rob Johnson in the same conference also raised concerns on the increasing number of youth being perpetrators of gun violence (Freeman 2024). This raises the following questions: Which Toronto neighbourhoods are most impacted by shootings and homicides from 2018 to 2023? Where are police stations located relative to the shootings and homicides across Toronto? According to Statistics Canada, the most frequently used method to commit homicides is through shooting and so in our analysis we chose to analyze homicides alongside shootings (Statistics Canada 2024).

In this paper, we analyzed data provided by Toronto Police Services and City Planning to investigate patterns where shootings and homicides take place and where police stations are located relative to where the crimes occur. Currently there is news coverage about increasing police visibility in areas with high gun violence but it is not known if the location of police stations in Toronto does impact the number of shootings and homicides that have taken place.

In our findings,…..

Our findings can also inform police divisions of neighbourhoods to be more present at based on how many cases has occurred in a neighbourhood.

For the rest of the paper, the data section Section 2 will describe the datasets used and they were retrieved, our variables of interest used in our graphs and tables, and briefly about any variables that were constructed and the data cleaning process. In the results section Section 3, it will describe and show graphs and tables created based on our datasets and in the discussion section Section 4, it will provide an overview of what we did in our results, explain the meaning of our results and the implications it has on the real world, and provide potential areas of improvements of the paper and suggestions of future works.

2 Data

2.1 Methodology

The three datasets used by the paper were simulated, retrieved, cleaned, analyzed, and tested using the R programming language (R Core Team 2024), tidyverse (Wickham et al. 2019), opendatatoronto (Gelfand 2022), knitr (Xie 2014), janitor (Firke 2023), dplyr (Wickham et al. 2023), ggplot2 (Wickham 2016), GeoJSON (Cooley 2022), and sf (Pebesma and Bivand 2023).

2.2 Data Source and Measurements

The data used for the analysis comes from the "cleaned_crime_data" and "cleaned_police_location" datasets. The datasets was constructed by calling the opendatatoronto package (Gelfand 2022), which accesses and download data from the City of Toronto's Open Data Portal. The latest versions of the datasets was scraped on September 24, 2024 at 10:28 pm EDT. We also removed duplicate observations from the original dataset that comes from reading in GeoJSON files for the datasets. Other datasets we considered scraping includes the "Neighbourhoods" dataset to obtain neighbourhood boundaries for the maps but further testing showed that these boundaries were provided by the "cleaned_crime_data" dataset.

2.2.1 Neighbourhood Crime Rates Dataset

The "cleaned_crime_data" dataset was retrieved from the "Neighbourhood Crime Rates" dataset and the last time the dataset was updated on the Open Data Portal was on January 11, 2024. This dataset comprised of crime data by neighbourhood that included the number of cases of assault, robbery, homicide, shootings, auto theft, break and enter, and theft over. The original dataset was published by the Toronto Police Services collected from 2014 to 2023, inclusive and is updated annually. For the cleaned dataset, we decided to filter for homicides and shootings and focus on the cases from 2018 to 2023, inclusive. The 2023 population projection in the dataset was provided by Environics Analytics where they only included the number of residents in the neighbourhood (Toronto Police Services 2024).

Each observation in the dataset represent one of Toronto's 158 neighbourhoods and its shootings and homicides from the years 2018 to 2023, inclusive that was recorded by the Toronto Police Services as crimes occur in Toronto. The original dataset is updated annually by the Toronto Police Services in January of the following year. There are 1896 unique observations in total in the dataset.

Looking at Table 1, year represents the year the number of homicides and shootings takes place in the neighbourhood and num_of_cases and homicide_or_shooting were constructed based on the columns representing homicide and shootings in the original dataset. homicide_or_shooting indicates what the current crime in the neighbourhood the observation is describing and the num_of_cases indicates the number of cases for the crime indicated by homicide_or_shooting. hood_id is a number between 1 to 174 that represents the ID for the neighbourhood with some neighbourhoods having more than 1 ID. The neighbourhood column contains the name of the neighbourhood.

Not shown in Table 1, the geometry column contains points to create the neighbourhood area the shooting or homicide takes place in and population_2023 represents the population projection for 2023 obtained from Environics Analytics. Other variables constructed from this dataset that is not shown includes num_cases_total, population_of_toronto, num_cases_total_per_neigh_per_crime, num_cases_total_per_neigh_per_crime_prop, num_cases_total_per_neigh, num_cases_total_per_neigh_prop, prop_of_toronto_pop_in_neigh, yearly_num_cases_total, and yearly_num_cases_total_prop. num_cases_total is the total number of shootings and homicides from 2018 to 2023 while population_of_toronto is the population of Toronto in 2023 obtained from summing up the population_2023 column. num_cases_total_per_neigh_per_crime represents the number of cases for either homicides or shootings in a particular neighbourhood while num_cases_total_per_neigh_per_crime_prop is the proportion of num_cases_total_per_neigh_per_crime in relation to num_cases_total. num_cases_total_per_neigh represents the number of cases total for each neighbourhood with num_cases_total_per_neigh_prop representing the proportion of num_cases_total_per_neigh in relation to num_cases_total. prop_of_toronto_pop_in_neigh is the population of the neighbourhood in relation to the population of Toronto in 2023. yearly_num_cases_total represents the total number of cases for each crime yearly across ALL neighbourhood per year and yearly_num_cases_total_prop is the proportion of yearly_num_cases_total in relation to num_cases_total.

Table 1: Preview of dataset on crime rates across Toronto neighbourhoods from 2018 to 2023 provided by Toronto Police Services

year	num_of_cases	hood_id	homicide_or_shooting	neighbourhood
2018	0	174	homicide	South Eglinton-Davisville
2019	1	174	homicide	South Eglinton-Davisville
2020	1	174	homicide	South Eglinton-Davisville
2021	1	174	homicide	South Eglinton-Davisville

Table 1: Preview of dataset on crime rates across Toronto neighbourhoods from 2018 to 2023 provided by Toronto Police Services

year	num_of_cases	hood_id	homicide_or_shooting	neighbourhood
2022	0	174	homicide	South Eglinton-Davisville
2023	0	174	homicide	South Eglinton-Davisville

2.2.2 Police Facility Locations Dataset

The "cleaned_police_location" dataset was obtained from the "Police Facility Locations" dataset on the Open Data Portal. The last time the dataset was updated on January 20, 2023 and is updated as new locations are added. Each observation in the dataset represents a police facility in Toronto and its respective geographical point that is recorded by Toronto Police Services as new locations open. There are 26 unique observations in the dataset and contains two variables of interest facility and geometry. As seen in Table 2, facility represents the name of the police location while geometry represents a geographical point of the location on a map.

Table 2: Preview of dataset on police facility locations provided by Toronto Police Services

facility	geometry
11 Division	POINT (-79.46083 43.67108)
12 Division	POINT (-79.48688 43.69458)
13 Division	POINT (-79.43668 43.69833)
14 Division	POINT (-79.42598 43.65131)
22 Division	POINT (-79.52918 43.64311)
23 Division	POINT (-79.58352 43.74387)

2.3 Variables of Interest

Our variables of interest from the "cleaned_crime_data" dataset are num_of_cases, homicide_or_shooting, hood_id, neighbourhood, and geometry. The variables constructed based on the dataset that are variables of interest includes num_cases_total, num_cases_total_per_neigh_per_crime, num_cases_total_per_neigh_per_crime_prop, num_cases_total_per_neigh, num_cases_total_per_neigh_prop, prop_of_toronto_pop_in_neigh, yearly_num_cases_total, and yearly_num_cases_total_prop. The variables of interest from the "cleaned_police_location" dataset includes facility and geometry.

3 Results

3.1 Number of Homicides and Shootings in Toronto from 2018 to 2023 in Toronto

Looking at Table 3 and Figure 1, we can see that the number of shootings across all Toronto neighbourhoods increased from 427 cases in 2018 to 492 cases in 2019. In 2020, the number of shootings decreased to 462 and it decreased the following years for 2021 with 409 shootings, for 2022 with 380 shootings, and for 2023 with 342 shootings. For homicides, there were 98 cases in 2018, 79 cases in 2019, and 71 cases in 2020. There was an increase in homicides in 2021 to 85 cases and decreases in homicides in 2022 and 2023 to 71 and 72 cases, respectively.

Table 3: Number of Homicide and Shooting Cases in Toronto from 2018 to 2023

Year	Type of crime	Total number of cases yearly	Proportion of cases yearly
2018	shooting	427	0.14
2018	homicide	98	0.03
2019	shooting	492	0.16
2019	homicide	79	0.03
2020	shooting	462	0.15
2020	homicide	71	0.02
2021	shooting	409	0.14
2021	homicide	85	0.03
2022	shooting	380	0.13
2022	homicide	71	0.02
2023	shooting	342	0.11
2023	homicide	72	0.02

Across all Toronto neighbourhoods, Table 4 shows that the mean total number of shootings is about 419 cases from 2018 to 2023 across all neighbourhoods yearly. The median total number of shootings is about 418 cases from 2018 to 2023 across all neighbourhoods yearly. Table 5 shows that the mean number of homicides annually across all Toronto neighbourhoods from 2018 to 2023 is 79 while the median is 76 cases.

Table 4: Minimum, quartiles, median, and maximum of the number of shootings in Toronto from 2018 to 2023

Total number of cases
Min. :342.0
1st Qu.:387.2
Median :418.0

Table 4: Minimum, quartiles, median, and maximum of the number of shootings in Toronto from 2018 to 2023

Total number of cases
Mean :418.7
3rd Qu.:453.2
Max. :492.0

Table 5: Minimum, quartiles, median, and maximum of the number of homicides in Toronto from 2018 to 2023

Total number of cases
Min. :71.00
1st Qu.:71.25
Median :75.50
Mean :79.33
3rd Qu.:83.50
Max. :98.00

3.2 Six Toronto Neighbourhoods with the Highest Cases of Homicides and Shootings from 2018 to 2023

Table 6 shows that Glenfield-Jane Heights has the highest number of shootings from 2018 to 2023 with 133 cases (4% of all shootings and homicides from 2018 to 2023) out of the 6 Toronto neighbourhoods with the highest number of shootings. Following this, Mount Olive-Silverstone-Jamestown has second highest number of shootings with 82 cases (3% of all shootings and homicides from 2018 to 2023). For the rest in descending order, Black Creek has 69 cases (2% of all shootings and homicides), York University Heights has 59 cases (2% of all shootings and homicides), Yorkdale-Glen Park has 58 cases (2% of all shootings and homicides), and Golfdale-Cedarbrae-Woburn has 54 cases (2% of all shootings and homicides).

Table 7 indicates that Moss Park has the highest number of homicides from 2018 to 2023 with 20 cases (1% of all shootings and homicides). Mount Olive-Silverstone-Jamestown is not only in second for the highest number of shootings but also for homicides with 15 cases from 2018 to 2023 (1% of all shootings and homicides). For the other four neighbourhoods, Avondale has 13 cases (< 1 of all shootings and homicides), Glenfield-Jane Heights and York University Heights both have 11 cases (< 1 of all shootings and homicides), and Eglinton East has 10 cases (< 1 of all shootings and homicides).

For both Table 6 and Table 7, the proportion of people living in each of the 12 neighbourhoods are < 1.

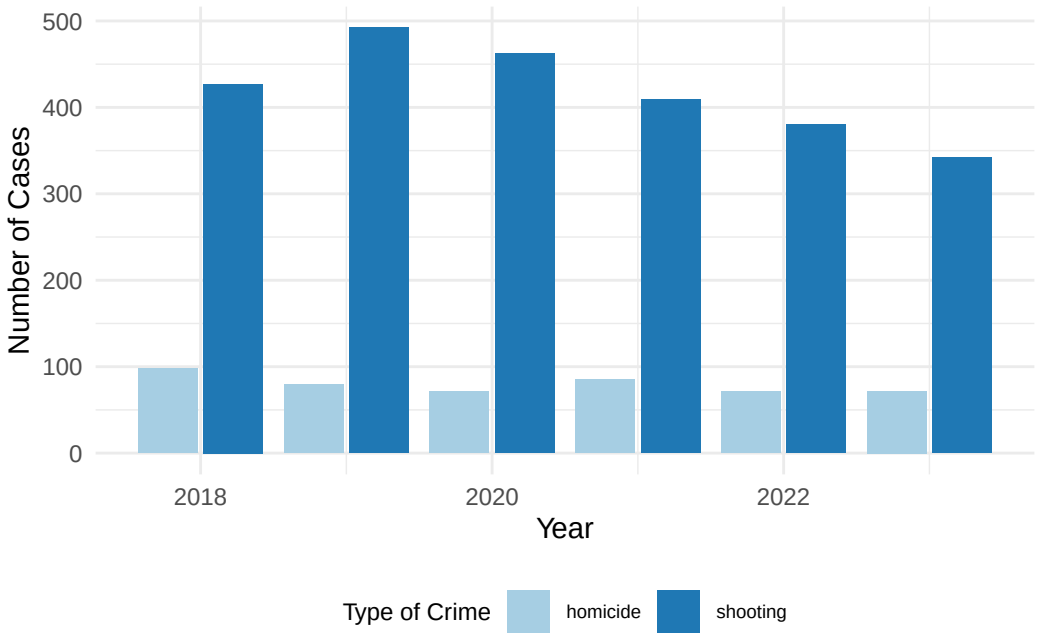

Figure 1: Number of Homicide and Shooting Cases in Toronto from 2018 to 2023

Table 6: Six Toronto Neighbourhoods with the Highest Cases of Shootings from 2018 to 2023

Neighbourhood	Neighbourhood ID	Proportion of Population (2023)	Total number of cases (2018 to 2023)	Proportion of cases (2018 to 2023)
Glenfield-Jane Heights	25	0	133	0.04
Mount Olive-Silverstone-Jamestown	2	0	82	0.03
Black Creek	24	0	69	0.02
York University Heights	27	0	59	0.02
Yorkdale-Glen Park	31	0	58	0.02
Golfdale-Cedarbrae-Woburn	141	0	54	0.02

Table 7: Six Toronto Neighbourhoods with the Highest Cases of Homicides from 2018 to 2023

Neighbourhood	Neighbourhood ID	Proportion of Population (2023)	Total number of cases (2018 to 2023)	Proportion of cases (2018 to 2023)
Moss Park	73	0	20	0.01
Mount Olive-Silverstone-Jamestown	2	0	15	0.01
Avondale	153	0	13	0.00
Glenfield-Jane Heights	25	0	11	0.00
York University Heights	27	0	11	0.00
Eglinton East	138	0	10	0.00

Based on Table 8 and Figure 2, Glenfield-Jane Heights is the neighbourhood with the highest number of homicides and shootings from 2018 to 2023 with 144 cases (5% of all shootings and homicides). Mount Olive-Silverstone-Jamestown has the second highest number of cases with 97 cases (3% of all shootings and homicides). For the rest of four neighbourhoods, Black Creek has 77 cases (3% of shootings and homicides), York University Heights has 70 cases (2% of shootings and homicides), Yorkdale-Glen Park has 64 cases (2% of shootings and homicides), and West Humber-Clairville has 60 cases (2% of shootings and homicides). For all neighbourhoods, the proportion of the people living in each of the neighbourhood is < 1.

Table 8: Six Toronto Neighbourhoods with the Highest Cases of Homicides and Shootings Combined from 2018 to 2023

Neighbourhood	Neighbourhood ID	Proportion of Population (2023)	Total number of cases (2018 to 2023)	Proportion of cases (2018 to 2023)
Glenfield-Jane Heights	25	0	144	0.05
Mount Olive-Silverstone-Jamestown	2	0	97	0.03
Black Creek	24	0	77	0.03
York University Heights	27	0	70	0.02
Yorkdale-Glen Park	31	0	64	0.02

Table 8: Six Toronto Neighbourhoods with the Highest Cases of Homicides and Shootings Combined from 2018 to 2023

Neighbourhood	Neighbourhood ID	Proportion of Population (2023)	Total number of cases (2018 to 2023)	Proportion of cases (2018 to 2023)
West Humber-Clairville	1	0	60	0.02

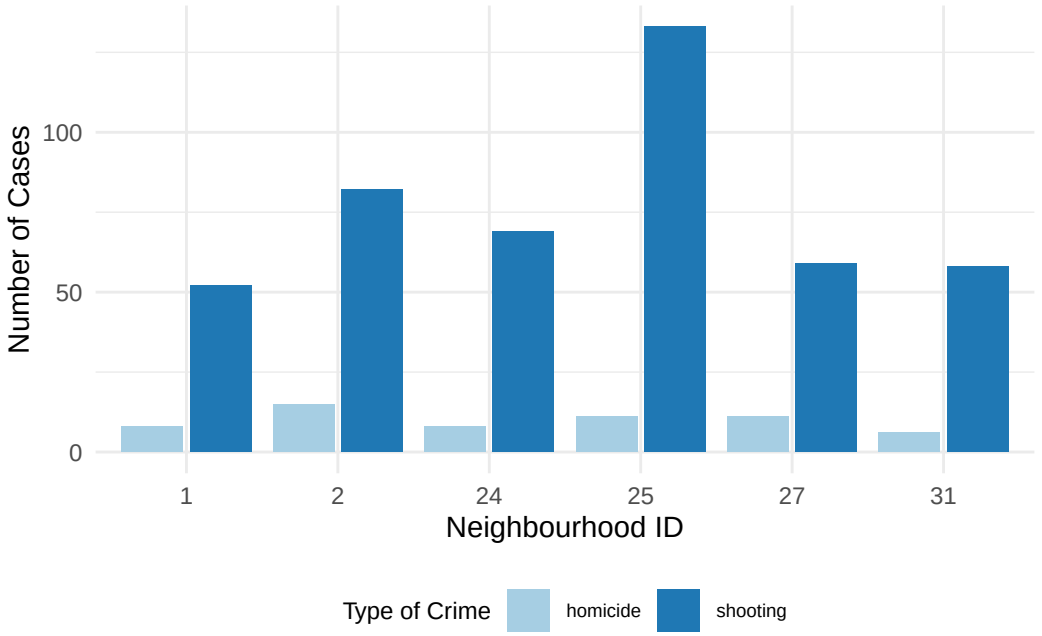

Figure 2: Six Toronto Neighbourhoods with the Highest Cases of Homicides and Shootings from 2018 to 2023

3.3 Police Facility Locations in relation to the Number of Homicides and Shootings from 2018 to 2023 across Toronto Neighbourhoods

Figure 3 shows that there are a greater density of police locations closer to the downtown area of Toronto. We can see that neighbourhood 73 also known as Moss Park, which had the number of cases of homicides according to Table 7 has a police location situated along its border. Mount Olive-Silverstone-Jamestown (neighbourhood 2) has a police station located in the neighbourhood. However with other neighbourhoods with a high number of homicides such

as West Humber-Clairville (1), Avondale (153), Glenfield-Jane Heights (25), York University Heights (27), and Eglinton East (138) has no police facilities in their neighbourhoods.

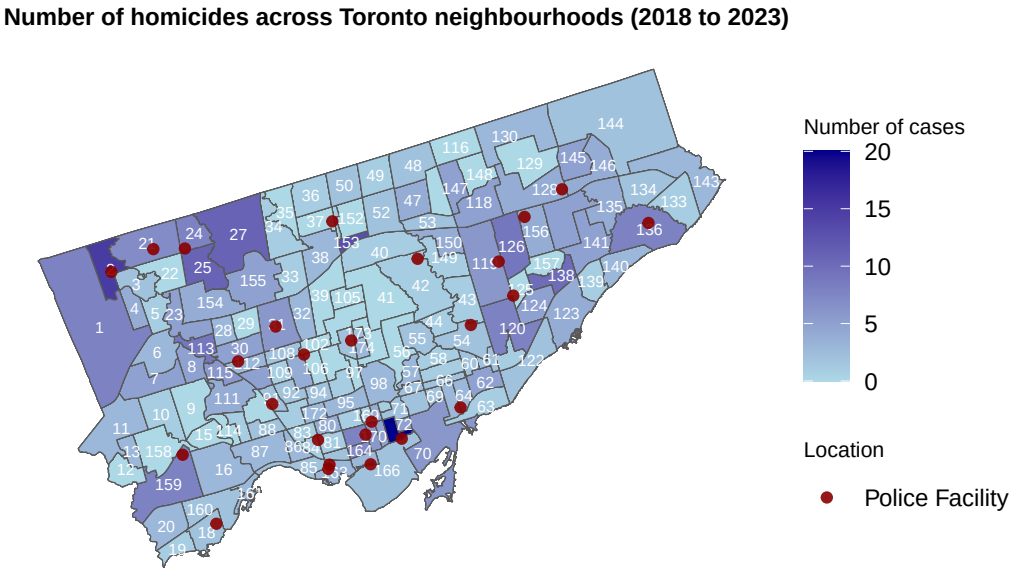

Figure 3: Location of police facilities in relation to the number of homicides across Toronto neighbourhoods from 2018 to 2023.

Based on Figure 4, the neighbourhood with the highest number of shootings, Glenfield-Jane Heights (25) has no police facility located in the neighbourhood. However, Mount Olive-Silverstone-Jamestown (2) and Black Creek (24) have police facilities located in their neighbourhoods. For the other three neighbourhoods, York University Heights (27) and Golfdale-Cedarbrae-Woburn (141) have no police facilities located in the neighbourhood while Yorkdale-Glen Park (31) does.

4 Discussion

In Section 3, we focused on cases from 2018 to 2023 and looked at the number of homicides and shootings yearly and the six Toronto neighbourhoods that had the highest number of homicides and shootings using tables and graphs. Finally, we mapped where police facilities are located in Toronto alongside the number of homicides and shootings for each neighbourhood.

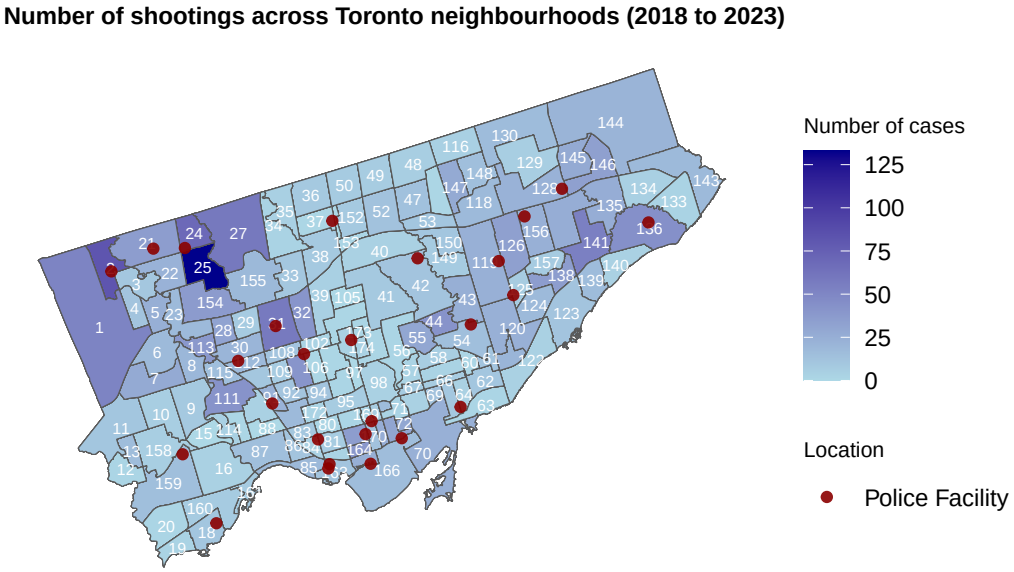

Figure 4: Location of police facilities in relation to the number of shootings across Toronto neighbourhoods from 2018 to 2023.

4.1 First discussion point

If my paper were 10 pages, then should be be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

Neighbourhoods with the highest number of shootings and homicides - Glenfield-Jane Heights
- Mount Olive-Silverstone-Jamestown - Black Creek
- York University Heights
- Yorkdale-Glen Park - West Humber-Clairville

https://www.npr.org/sections/money/2021/04/20/988769793/when-you-add-more-police-to-a-city-what-happens

https://www.mcgilldaily.com/2023/02/more-policing-does-not-address-the-rise-of-violent-crime-in-canada/#:~:text=The%20NBER%20research%20found%20that,deeply%20harmful%20to%20marginal

4.2 Second discussion point

4.3 Third discussion point

4.4 Areas of improvement

We faced several limitations while conducting our analysis. We do not have information about when police facility were opened.

4.5 Next steps

A Appendix

A.1 Acknowledgments

We would like the acknowledge Alexander (2023) for some R code that was used to produce the tables and graphs.

A.2 Note on Reproducing

To reproduce the results in the paper, first run the scripts found in the scripts folder of the GitHub repository corresponding to the paper starting with the script, 00-install_packages.R to install the necessary packages.

A.3 Code styling

Code written in the scripts was checked and styled with lintr (Hester et al. 2024) and styler (Müller and Walthert 2024).

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