

Shooting Occurrences Across the City of Toronto Increased in the Six-Year Period From 2014 to 2019

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In 2005, the City of Toronto saw unprecedented levels of gun violence Siciliano (2005). More than a decade later, the number of yearly shooting occurrences across Toronto continued to rise. Using data from the City of Toronto Open Data Portal, this paper investigates trends in the number of shooting occurrences in different divisions of Toronto, from 2014 to 2019, inclusive. This paper shows that across the City of Toronto, shooting occurrences steadily increased in the six-year period from 2014 to 2019, with the number of shooting occurrences in Toronto in 2019 being more than triple what it was in 2014.

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1 Introduction

Although Canada's gun violence numbers are not as high as those of the United States, its largest city, Toronto, saw three times more shooting occurrences in 2019 than in 2014. Canada has the fifth-highest rate of gun fatalities in the world among high-income countries, and between 2008 and 2012, firearms caused more deaths in young men ages 18-24 than cancer, falls, drowning, and fires combined Owens (2019). These alarming statistics shed light on Canada's gun violence epidemic. Gun violence must be addressed through research and

fact-based public policy, not cheap political games. This research paper aims to illustrate what the numbers can tell us about the increase in gun violence that Toronto saw in the six-year period from 2014 to 2019.

The code and data that were used for this analysis paper are available via GitHub. ^[1]

^[1] <https://github.com/taliafabs/TorontoDataPaper.git>

2 Data

The data used throughout this paper was obtained through the City of Toronto’s Open Data Portal, OpenDataToronto. Gelfand (2022) OpenDataToronto is a publicly-funded, widely accessible data portal, with data relating to various topics including, but not limited to, social services, public services, elections, public safety, policing, education, and public health. Data was collected, cleaned, and analyzed using statistical programming language R R Core Team (2022). Additionally, tidyverse Wickham et al. (2019), dplyr Wickham et al. (2023), janitor Firke (2023), ggplot2 Wickham (2016), and knitr Xie (2014) were used for the data analysis and visualizations.

The data set used in this paper is titled “Shooting Occurrences (2014-2019).” It includes all shooting-related events reported to Toronto Police Service from 2014 to 2019 Gelfand (2022). The data is divided between Toronto’s police divisions. The data set contains 96 rows; one row for each of Toronto’s geographical divisions for each of the six years from 2014 to 2019 inclusive. Further information about the individual shooting incidents is not provided. More specifically, each row in the data set contains the number of shooting occurrences in each geographical division each year from 2014 to 2019. The precise location, date, time, injury levels, and resulting charges of each shooting are not included in this data set. The data set provides only very high-level data: the general area of where the shootings occurred and how many shootings occurred.

The raw data includes the following column variables: a unique row identifier “__id”, year the shootings occurred “occurred_year”, the geographical division “geo_division”, and “count”, the number of shootings that occurred in the respective geographical division that year. My data cleaning process was very simple and straightforward. Additionally, I used the dplyr package select function, Wickham et al. (2023) to remove columns that are not relevant for the purposes of my data analysis. My cleaned data includes the following column variables: occurred_year, geo_division, category, and count.

Table 1: Sample from the Data

occurred_year	geo_division	category	count
2014	D11	Shooting Occurrence	2
2014	D12	Shooting Occurrence	20
2014	D13	Shooting Occurrence	2

occurred_year	geo_division	category	count
2014	D14	Shooting Occurrence	7
2014	D22	Shooting Occurrence	8
2014	D23	Shooting Occurrence	18

Table 1 shows the first few rows of my cleaned data. The data set is reliable and rows are easily identifiable without the unique row identifier. The unique row identifiers present in the raw data were not necessary because each (occurred_year, geo_division) pair occurs only once in this data set. In the context of the relational model of database design and SQL, (occurred_year, division) would be a super key because it must be unique and cannot be NA.

The relationship between

3 Analysis and Results

The data analysis component of this paper explores the details of shooting occurrence trends across all geographical divisions of the City of Toronto from 2014 to 2019. It examines trends in the number of shooting occurrences across the City of Toronto and within each geographical division from 2014 to 2019. Additionally, variation in the number of shooting occurrences between geographical divisions each year from 2014 to 2019 will be analyzed and illustrated by the visualizations below.

3.1 Annual Shooting Occurrence Trends

Table 2: Total Annual Shooting Occurrences Across Toronto, 2014-2019

Year	Total
2014	177
2015	288
2016	407
2017	392
2018	427
2019	492

The number of shooting occurrences across the City of Toronto increased between 2014 and 2019, inclusive. Figure 1 clearly illustrates this trend. The red bars on the histogram illustrate the total number of shooting occurrences across all geographical divisions in the City of Toronto per year and the blue smoothing line illustrates the trend in the number of annual shooting

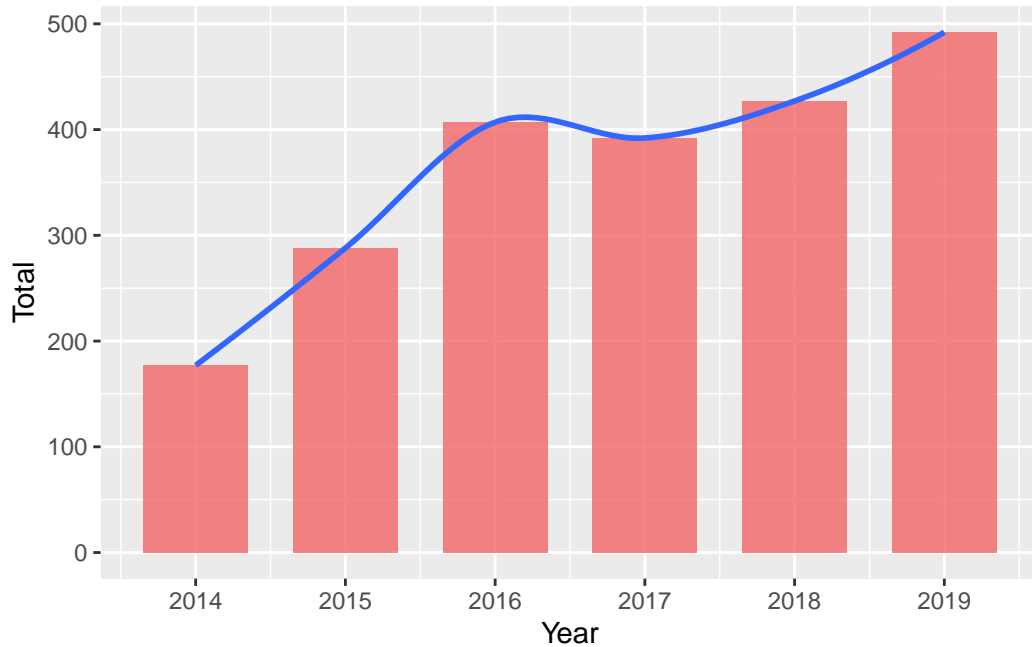


Figure 1: Annual Shooting Occurrences Across Toronto, 2014-2019

occurrences during this time period. The blue smoothing line makes it evident that there was a consistent upward trend in the number of shooting occurrences in the City of Toronto between 2014 and 2019, inclusive. Refer to Table 2 for the exact number of shooting occurrences across the City of Toronto each year.

We can see that the steepest increase was between 177 in 2014 and 407 in 2016, where that number more than doubled (Table 2). The number of shooting occurrences decreased very slightly between 2016 and 2017, and then increased every year from 2017 to 2019, but at a slower rate than the period from 2014 to 2016. Although the rate at which the annual number of shooting occurrences across the City of Toronto increased slowed down after 2016, the trend illustrated by Figure 1 is still extremely concerning. The number of annual shooting occurrences across the city in 2019 (492) was more than triple what it was in 2014 (177).

3.2 Annual Shooting Occurrence Trends and Variation Across Different Geographical Divisions

D12, D23, and D31 consistently had more shooting occurrences than other geographical divisions. On the contrary, D52 and D53 consistently had fewer shooting occurrences than other geographical divisions.



Figure 2: Number of Shooting Occurrences Per Geographical Division, 2014-2019

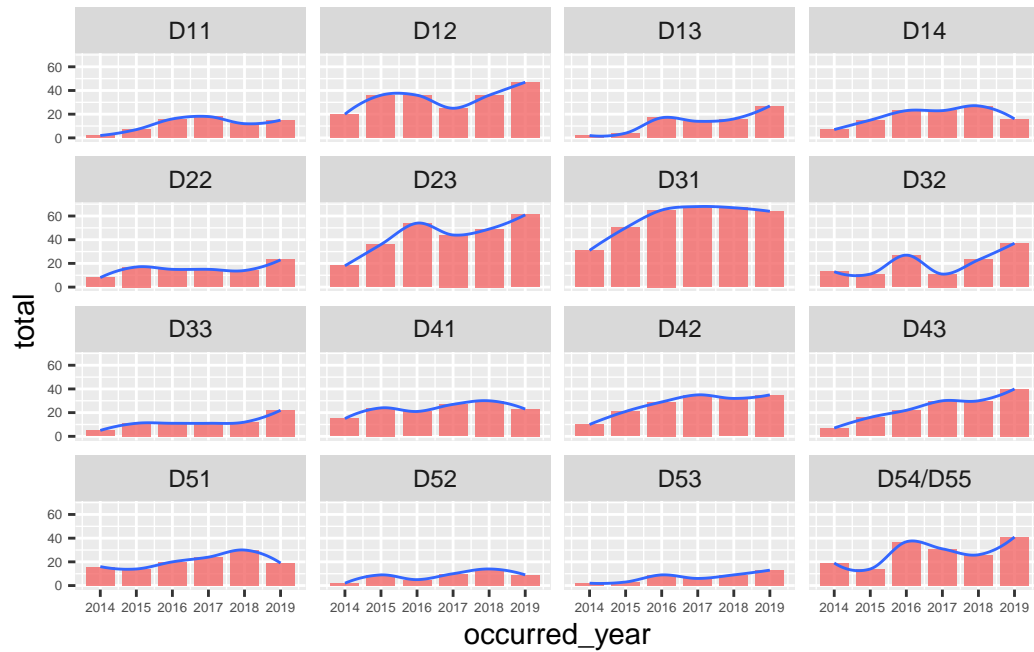


Figure 3: Annual Shooting Occurrences 2014-2019, by Toronto Police Division

4 Conclusion

This paper investigates how patterns in the number of shooting occurrences across Toronto changed between 2014 and 2019. The data clearly showed that while the overall total number of shooting occurrences across the City of Toronto increased year-over-year between 2014 and 2019, this pattern varied between divisions. Further research and investigation will be required to gain a deeper understanding of *why* gun violence widely varies across Toronto’s different geographical divisions.

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