# My title*

My subtitle if needed

Pascal Lee Slew

06 February 2022

**Abstract**

Homicide is the crime of killing with intent. It affects people on all walks of life and is an indication of safety/psychology of the population. We obtain the number of homicides in Toronto from the City of Toronto open portal and analyzed it using a graph. We found that homicide rate ... Our findings have implications for ... Second sentence. Third sentence. Fourth sentence.

## 1 Introduction

The remaining of this paper is: Section2 explains the data. Section2 includes the references used in this paper.

You can and should cross-reference sections and sub-sections. For instance, Section 2. R Markdown automatically makes the sections lower case and adds a dash to spaces to generate labels, for instance, Section ??.

## 2 Data

This report used data obtained from the Toronto's Police Service's Annual Statistical Report (ASR). ( *Toronto Police Service* 2022) The ASR is annual overview of police operations, covering different subjects from police budget, traffic collisions to crimes including homicides. The Toronto Police Service has made datasets open to the public in 2019. They are publicly available and can be obtained from the Toronto Police Service Public Safety Data Portal ot the City of Toronto Open Data Portal. The goal is to increase transparency and public understanding of police data.

The homicides dataset was obtained using the R package opendatatoronto (Gelfand 2020). The R packages tidyverse (Wickham et al. 2019), dplyr (Wickham et al. 2021), knitr (Xie 2014), kableExtra (Zhu 2021) and janitor (Firke 2021) were used to wrangle, extract and analyze the data in R (R Core Team 2020). The dataset was last updated on March 23rd, 2021.

The dataset comprised of all types of homicides reported to the Toronto Police Service (TPS) from 2004 to 2020. Homicides can be reported through diverse means namely e-mail, phone call and fax. The TPS has a special division for investigation of homicides. The TPS also encourages anyone who holds any information that may help with the investigations to come forward. The homicides dataset only contains temporal and spacial information. Information on the victims were omitted to record unbiased information and protect the privacy of the victims. Another consideration made was recording the occurrences to the nearest road intersection node. This imply that the number of homicides for the 140 neighbourhoods may

*Code and data are available at: https://github.com/Pascal-304/Toronto-homicides/tree/main/starter%20folder.

Table 1: First ten rows of a dataset of homicides ... in Toronto

| Occurrence year | Division | Homicide type | Occurrence date | Neighbourhood | C |
|---|---|---|---|---|---|
| 2004 | D53 | Other | 2004-01-03 | Yonge-St.Clair (97) | c(-79.392 |
| 2004 | D42 | Shooting | 2004-01-08 | Woburn (137) | c(-79.2338 |
| 2004 | D42 | Shooting | 2004-01-08 | Malvern (132) | c(-79.2068 |
| 2004 | D13 | Shooting | 2004-01-25 | Dovercourt-Wallace Emerson-Junction (93) | c(-79.4343 |
| 2004 | D42 | Shooting | 2004-01-25 | Rouge (131) | c(-79.2038 |
| 2004 | D31 | Stabbing | 2004-02-20 | Downsview-Roding-CFB (26) | c(-79.5085 |
| 2004 | D31 | Shooting | 2004-02-21 | Downsview-Roding-CFB (26) | c(-79.5089 |
| 2004 | D23 | Other | 2004-02-21 | Mount Olive-Silverstone-Jamestown (2) | c(-79.5928 |
| 2004 | D42 | Shooting | 2004-03-03 | Malvern (132) | c(-79.2275 |
| 2004 | D41 | Shooting | 2004-03-04 | Clairlea-Birchmount (120) | c(-79.2866 |

not be accurate. The time of occurrence may also not be accurate since there is bias in which people may hesitate to immediately report. Additionally, it is unknown if the homicide occurrences were all case resolved or include cold cases.

The Toronto homicides dataset contains information on all homicides in Toronto from 2004 to 2020. It contains 1166 observations of 10 variables. Of the 10 variables, I kept only 6 of them. The variables id, event_unique_id and object_id were removed since they are identifiers of the homicide occurrences and do not provide details on the occurrence. While hood_id was removed because it represented similar information to neighbourhood but neighbourhood gives more easily understood information.

The table (Table 1) below shows an extract of the dataset:

First, we look at the homicide trend from 2004 to 2020. From (Figure 1), the number of homicides has an increasing trend overall for years 2004 to 2007. From 2008 to 2011, a decreasing trend can be observed. For years 2012 to 2015, the number of homicides has remained steady. The city of Toronto has recorded the highest occurrence of homicides in 2018. From 2018 onwards, the number of homicides has been decreasing. While it is important to keep the homicide rate low, understanding the reasons for the such trends is critical.

The TPS has classified homicides into 3 categories: Shooting, Stabbing and Other. Investigating how people were killed is essential to figure out how public policy or police operations can be improved to prevent possible homicides. In (Figure 2), several observations can be made. It is clear that perpetrators preferred shooting over any other means of killing. This indicates a possible flaw in Canada firearms control. Homicides by shooting has been driving the trend in general while stabbing and other means of killing have been fluctuating; they remained in the 5 to 26 range over the years.

The number of homicides has been volatile over the years, on the decrease in 2019 and 2020. In (Figure 3), we look at the cumulative homicide count across the year. We found that July has been the deadliest month. July, August and September have recorded the higher occurrences in general while cumulative homicide count are similar for the other months. From this graph, it is difficult to establish any relationship between months and homicide.

Toronto consists of 140 neighbourhoods. From (Table 2), Moss Park neighbourhood has recorded the highest homicide count with 31 occurrences over 17 years. Out of the 140 neighbourhoods, 39 of them recorded more than 10 homicides during the period 2004 to 2020.

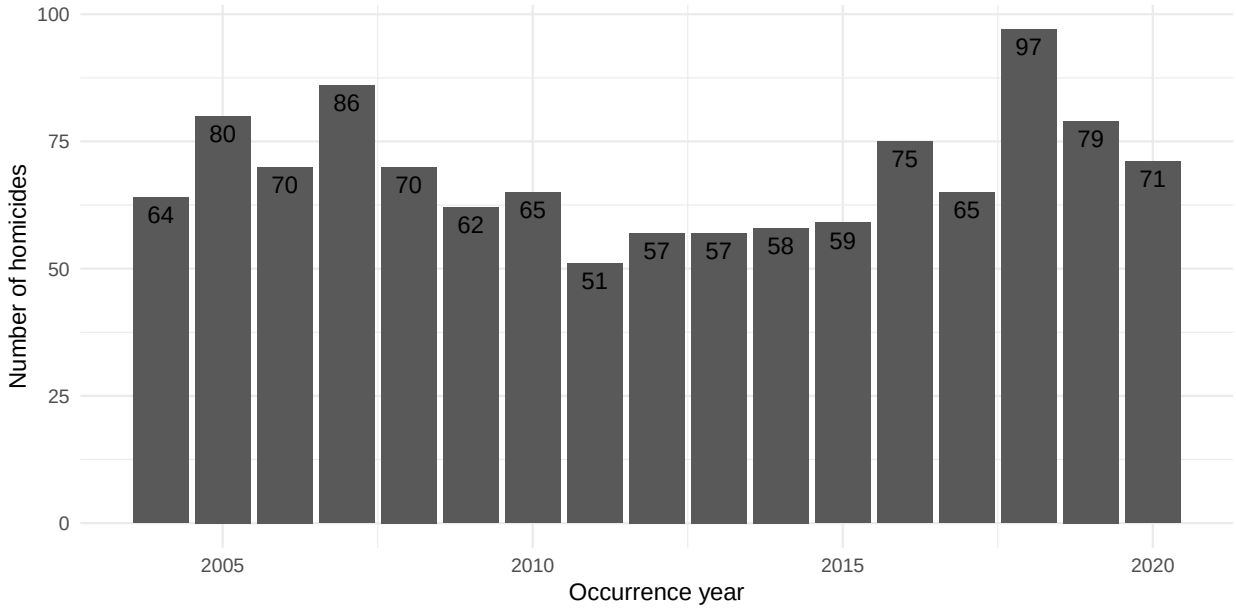


Figure 1: General homicide trend from 2004 to 2020

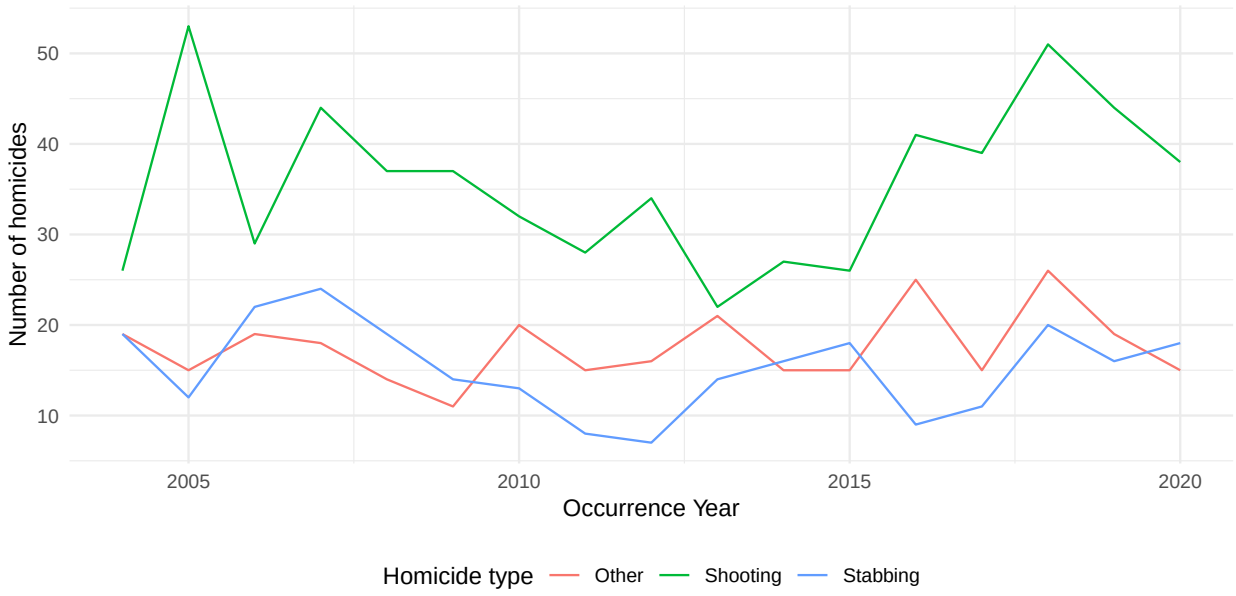


Figure 2: Distribution of homicide types in Toronto from 2014 to 2020

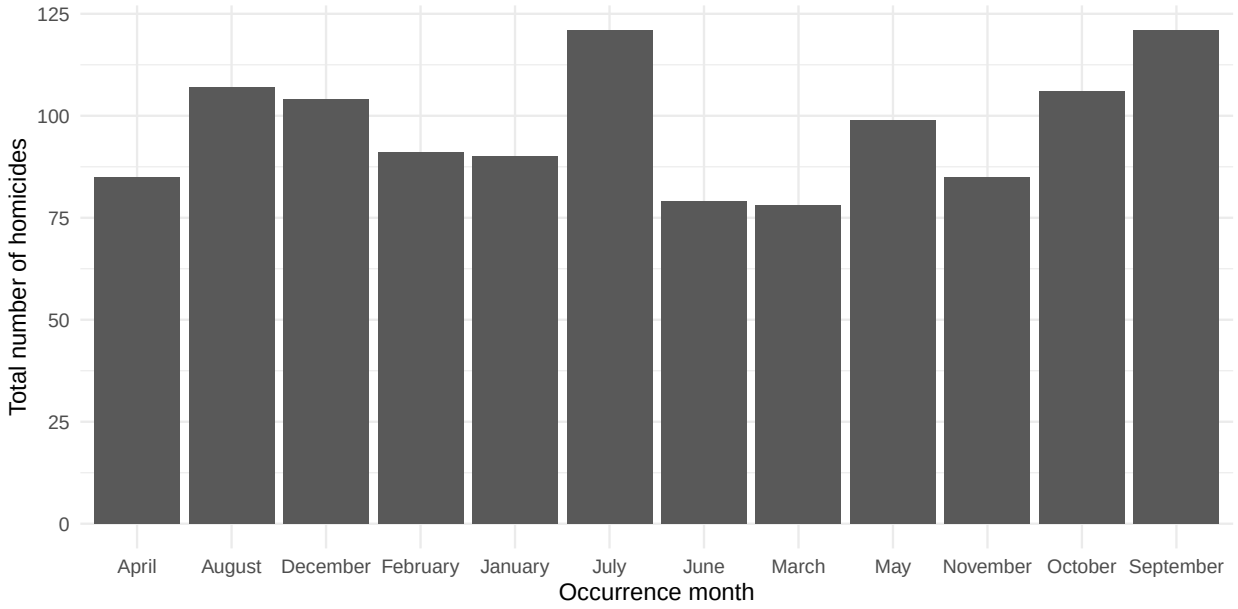


Figure 3: Cumulative homicide count for calendar months

Table 2: Top ten neighbourhoods with highest number of homicides from 2004 to 2020

| neighbourhood | Homicide count |
|---|---|
| Moss Park (73) | 31 |
| Glenfield-Jane Heights (25) | 30 |
| Malvern (132) | 30 |
| Downsview-Roding-CFB (26) | 29 |
| Mount Olive-Silverstone-Jamestown (2) | 28 |
| West Humber-Clairville (1) | 27 |
| South Riverdale (70) | 25 |
| Weston (113) | 25 |
| Woburn (137) | 25 |
| Bay Street Corridor (76) | 24 |

# References


Firke, Sam. 2021. *Janitor: Simple Tools for Examining and Cleaning Dirty Data.* https://CRAN.R-project.org/package=janitor.

Gelfand, Sharla. 2020. *Opendatatoronto: Access the City of Toronto Open Data Portal.* https://CRAN.R-project.org/package=opendatatoronto.

R Core Team. 2020. *R: A Language and Environment for Statistical Computing.* Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

*Toronto Police Service*. 2022. https://data.torontopolice.on.ca/pages/annualstatisticalreport.

Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, et al. 2019. "Welcome to the tidyverse." *Journal of Open Source Software* 4 (43): 1686. https://doi.org/10.21105/joss.01686.

Wickham, Hadley, Romain François, Lionel Henry, and Kirill Müller. 2021. *Dplyr: A Grammar of Data Manipulation.* https://CRAN.R-project.org/package=dplyr.

Xie, Yihui. 2014. "Knitr: A Comprehensive Tool for Reproducible Research in R." In *Implementing Reproducible Computational Research*, edited by Victoria Stodden, Friedrich Leisch, and Roger D. Peng. Chapman; Hall/CRC. http://www.crcpress.com/product/isbn/9781466561595.

Zhu, Hao. 2021. *kableExtra: Construct Complex Table with 'Kable' and Pipe Syntax.* https://CRAN.R-project.org/package=kableExtra.