Toronto shooting occurence*

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Abstract

Shooting occurence is important in the sense of public safety and protection. We obtain and analyze yearly shooting occurence and region based in Toronto. From analysis, we obtain that shooting has increased over years as well as there exists some specific divisions where shooting occurs more often than others. Therfore, our findings have implications for more dispositions of police and related jobs into the divisions as well as concerns regarding the divisions

1 Introduction

When I have conversations with people who are unfamiliar with N.American culture and life style, the most questions they ask to me is whether Canada is safe from shooting or not. I assume that this is because the U.S legalize the right of the people to keep and bear arms. Since I am not living in the U.S, I am not 100% certain regarding the situation of arms there. However, as far as I know, shooting in Canada especially Toronto is relatively safe from the U.S. Therefore, I decide to conduct analysis of shooting in Toronto. Then, I ask myself that what meanings the analysis will have other than just showing shootings frequency. I figure out that if we analyze with respect to districts, it will be meaningful for people who are engaged in preventing such activity. I conduct simple analysis of frequency of shooting in accordance with division and year. The remainder of this paper is Section 2 explains the data. Section 3 will show the reference.

2 Data

We obtain data from 'opendatatoronto,' City of Toronto open Data portal.(Gelfand 2020) and the statistical programming language R (R Core Team 2021). The data is composed of OccurredYear, GeoDivision and Count_. To be specifically, OccuredYear represents the year when shooting occurs. GeoDivison is the division where shooting occurs. Lastly, Count_ is how many times shooting occurs with respect to division and year. There exists limits to count parts because any veiled events are hard to identify. Other than that, it includes all general shooting occurrences such as firearm discharge, shooting event and person injured. Data is collected by police so it is very trustworthy, on the other hand, it might lack the actual feelings that citizens have. Also, we do not exactly know divisions that police is using, thus it is difficult to find that why specific divisions have more incidents than others. However, our purpose for this project is to find whether shooting occurrences increase over years or not, and what divisions have more incidents than others. Therefore, those limits do not violate much. By using, tidyverse package (Wickham et al. 2019) and knitr package (Xie 2021), we could obtain desired table to explain data.

Table 1 below shows 10 rows of my data with respect to year, division and occurrence. It specifically shows the year 2014 according to division. One thing that we can first notice is that there exists wide range of the occurence in different divisions. For example, D31 has 31 reports of shootings, on the other hand division 11

*Code and data are available at: LINK. https://github.com/SANGWOONG-LEE/toronto-shooting-occurence-

Table 1: First ten rows of a dataset that shows shooting occurence

Occured year	Division	Occurence
2014	D11	2
2014	D12	20
2014	D13	2
2014	D14	7
2014	D22	8
2014	D23	18
2014	D31	31
2014	D32	13
2014	D33	5
2014	D41	15

has only 2 shooting occurrence. Later, I am going to conduct bar graph in order to find whether it is true in general.

For this project, we are interested in the relationship between the division and shootings occurrence as well as year and shootings occurrence. By using ggplot(Wickham 2016), we can obtain clear graph of those.

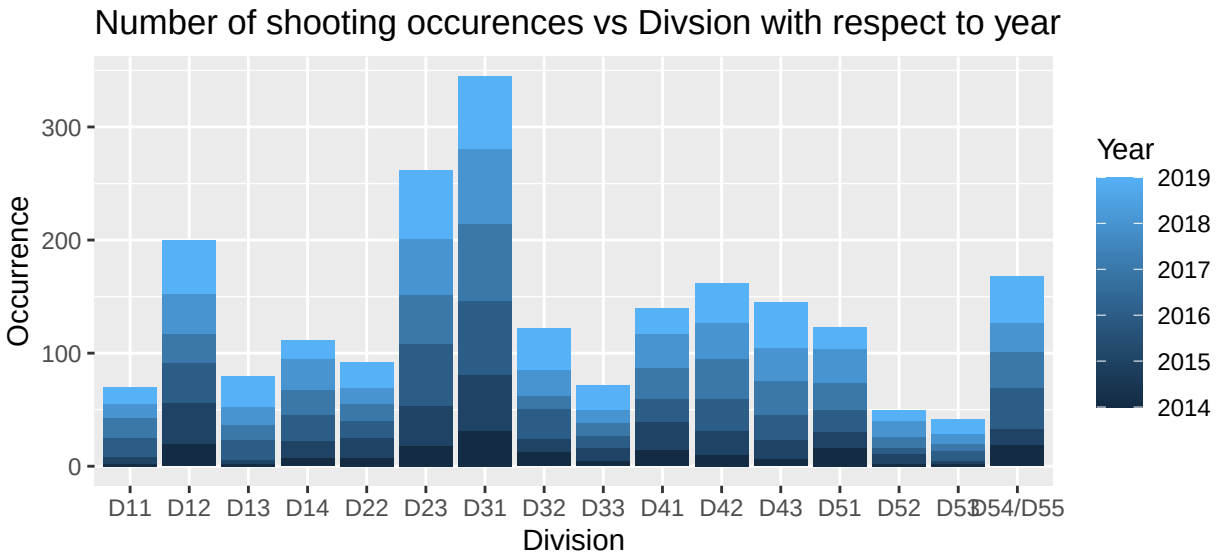


Figure 1: division

Figure 1 shows the distributions of year and division with respect to shooting occurrences. Clearly, as time goes, number of occurrences increase and as we have already seen in table 1, some divisions such as D31 and D23 have more reported cases than others. However, from figure 1, it is bit ambiguous to observe that whether shooting occurrences increase or decrease. Therefore, I conduct separate graph regarding it.

If you take a look at figure 2 below, it is obvious to observe that the incidents are increasing over years. The last thing to notice that is change of shooting occurrence over years. As you have already seen, shooting occurrence increases over times. However, there exists some divisions with decreasing patterns such as D14, D31, D41, and D51. Implication for that is whatever efforts that police or related jobs put into those divisions are working. Last figure below shows the change of occurrences in each divisions.

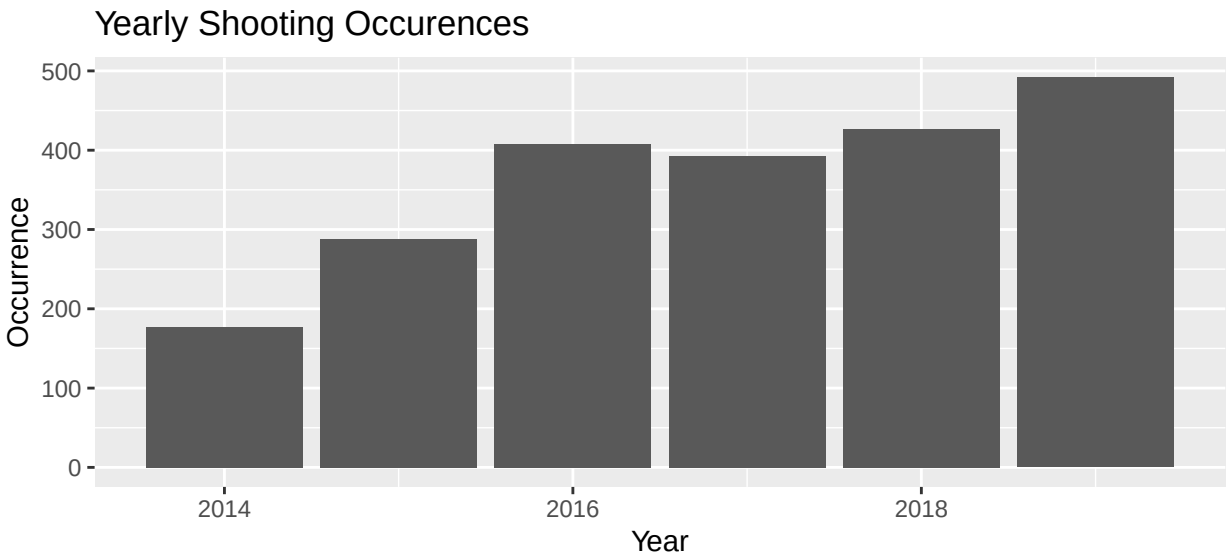
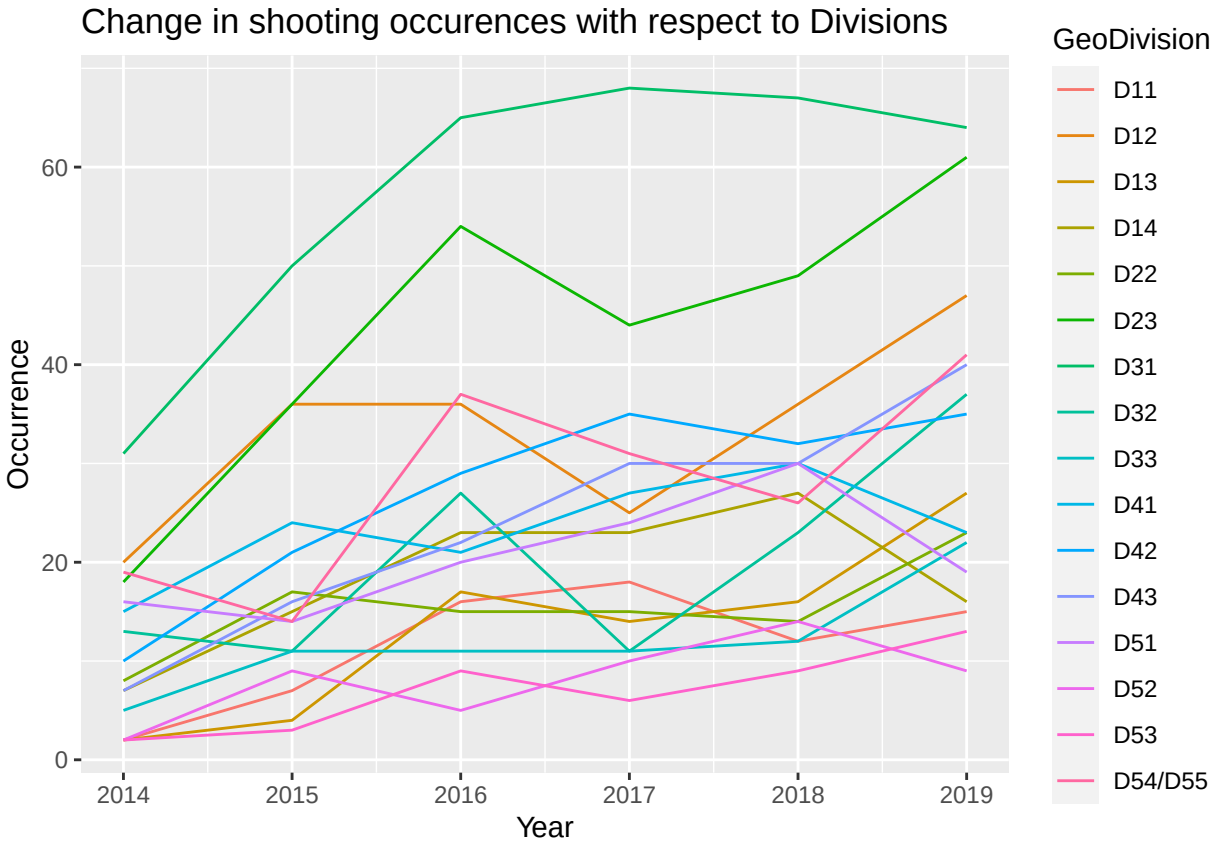


Figure 2: year



It is a bit difficult to observe that which division corresponds to line since there are many lines. Let's put that besides, what we want from this project is observing decreasing patterns so we can learn successful strategies we have done in that specific region and year. Clearly from the graph, there seems many things that we can learn from what we have done in the corresponding divisions.

3 References

This section shows all references I have used throughout this project. Also, I also need one extra reference to dplyr (Wickham et al. 2021).

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

R Core Team. 2021. *R: A Language and Environment for Statistical Computing.* Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis.* Springer-Verlag New York. https://ggplot2.tidyverse.org.

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. 2021. *Knitr: A General-Purpose Package for Dynamic Report Generation in r.* https://yihui.org/knitr/.