Toronto's continuously growth reported crime cases in past years.*

An Analysis of Toronto's reported crime from 2014 to 2022

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This study presents a comprehensive analysis of reported crime data in Toronto, as sourced from Open Data Toronto, to explore the trend of urban criminal patterns in Toronto over the past years. By examining reported incidents from 2014 to 2022, this paper identifies key trends in crime cases across different years and police divisions, highlighting possible key factors that may caused such results. In a word, the paper seeks to provide actionable insights for city planners, law enforcement, and community advocates, aiming to build a safer, more enjoyable urban living environment.

1 Introduction

Public safety, as one of the most important factors to ensure a high quality life for people, is an important aspect that requires continuous evaluation and enforcement. The city of Toronto, as one of the place with most population in Canada, is not an exception to the challenges posed by crimes. This paper takes a deep dive into the extensive reported crime data provided by Open Data Toronto(Gelfand 2020), covering the period from 2014 to 2022. The analysis is grounded in a methodical approach to identify and interpret crime trends across the past years, also within the city's diverse police divisions, offering a detailed chronicle of criminal activity over selected time span. To be more specific, this research analyzed and visualized how crime spreads out across different divisions and how it changes over the years. By dissecting the data year by year, division by division, this study uncovers patterns that could inform future urban planning and law enforcement strategies. The role of population growth, natural diseases and urban development, are considered as potential catalysts influencing these patterns.

*Code and data are available at: https://github.com/iJustinn/Totonto_Reported_Crimes.git

Moreover, the paper aims to a little beyond simply displaying statistics. It endeavors to contextualize the numerical findings within the broader spectrum of Toronto's urban structure. The motivation for this discussion is that changes in crime rates are often associated with changes in other indicators of the city, such as education level(Bell, Costa, and Machin 2022), unemployment rate(Phillips and Land 2012), economic level(Machin and Meghir 2004), and so on. By doing this, the study aims to offer useful advice that can help city officials and the police create plans to make the city safer and better for all residents. Through these ways, the paper is not just an exposition of data, but a roadmap towards a better living environment.

The subsequent sections of this paper are organized to facilitate a comprehensive understanding of the study and its implications. Following this introduction, Section 2 outlines the methodology employed in the analysis, ensuring transparency and replicability. Section 3 presents the findings in detail, charting the trends in reported crimes over time and across Toronto's police divisions. also discusses these findings in other aspects such as: infrastructure construction, structure of the city, etc. Finally, Section 4 concludes the paper, summarizing the key insights and finding in this research.

2 Data

2.1 Data Source

The data used in this paper was collected by the OpenDataToronto Library (Gelfand 2020). The specific data set used in this research is the 'police-annual-statistical-report-reported-crimes' (Data 2023).

Data used in this paper was downloaded, cleaned and analyzed with the programming language R (R Core Team 2022). Also with support of additional packages in R: `tidyverse` (Wickham et al. 2019), `ggplot2` (Wickham 2016), `janitor` (Firke 2023), `dplyr` (Wickham et al. 2023), `readr` (Wickham, Hester, and Bryan 2023), `knitr` (Xie 2014).

2.2 Data Processing

2.2.1 Raw and Cleaned Data

Table 1: Head of Raw Toronto Reported Crimes Data

ID	Reported Year	Division	Category	Sub Type	Total Case	Cleared Case
1	2014	D11	Crimes Against the Person	Other	22	9

ID	Reported Year	Division	Category	Sub Type	Total Case	Cleared Case
2	2014	D11	Crimes Against Property	Theft Over $5000	1	1
3	2014	D11	Crimes Against the Person	Other	1	1
4	2014	D11	Crimes Against the Person	Robbery-Financial	1	1
5	2014	D11	Crimes Against Property	Break & Enter-House	23	13
6	2014	D11	Crimes Against Property	Theft Over $5000	1	1

Table 2: Head of Cleaned Toronto Reported Crimes Data

Reported Year	Division	Total Case
2014	D11	22
2014	D11	1
2014	D11	1
2014	D11	1
2014	D11	23
2014	D11	1

The raw data set, first few lines shown in Table 1, contains more than 30000 reported crime cases of Toronto from 2014 to 2022 in all police divisions, including reported crime types, case status, case id, etc. Since this research does not need that much information, thus the data was cleaned as needed. Now the cleaned data only shows the number of reported crimes cases in corresponding years and the police division each case reported to. The first few lines of the cleaned data was shown in the Table 2.

2.2.2 Further Data Processing

In order to make it easier to draw the data in the future, the cleaned data has been further processed into data with only two variables, which are used to correspond to the x-axis and y-axis when drawing.

Table 3: Head of Toronto Reported Crimes Data by year

Reported Year	Total Cases
2014	113432
2015	117365
2016	122626
2017	129970
2018	143204
2019	144532

As mentioned earlier, this paper will first analyze the trends of reported crimes in different years. Therefore, the first further processed data will add up all data from different policy divisions in each year to form a total number of reported crimes for specific year. The head of these data was shown in Table 3.

Table 4: Head of Toronto Reported Crimes Data by police division

Division	Total Cases
D11	52546
D12	43158
D13	38712
D14	88678
D22	72300
D23	56343

Then, this paper will analyze the total number of reported crimes received for different policy divisions disregard of the year. Therefore, the process of this data ignore the year and add up all the data received by each policy division in the cleaned data set to form the data set shown in Table 4.

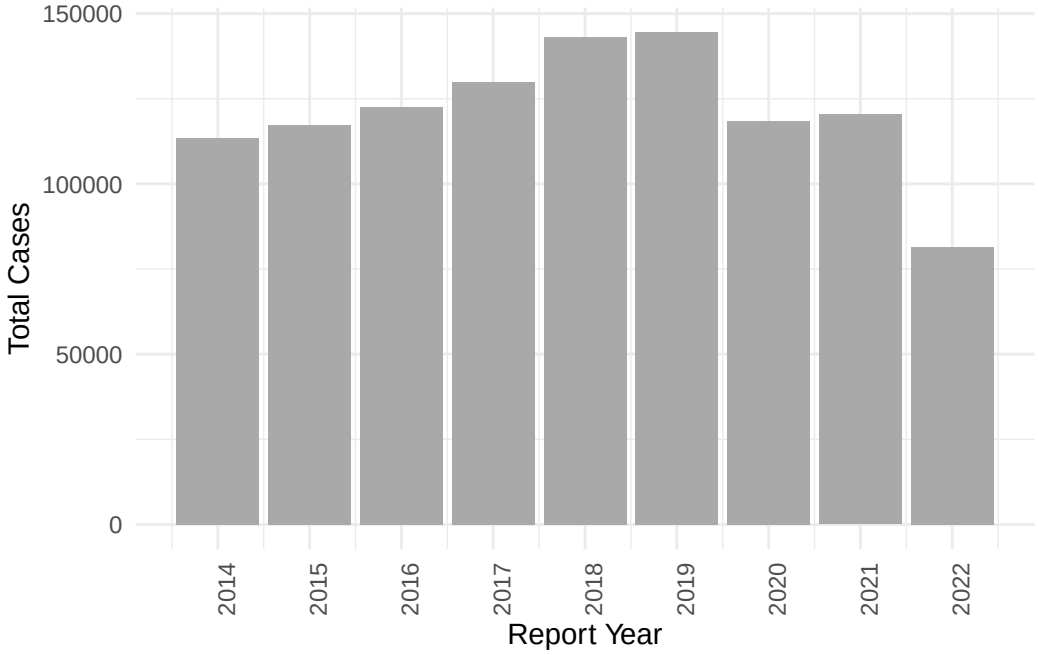

Figure 1: 2014 to 2022 Toronto Total Reported Crime Cases by Year

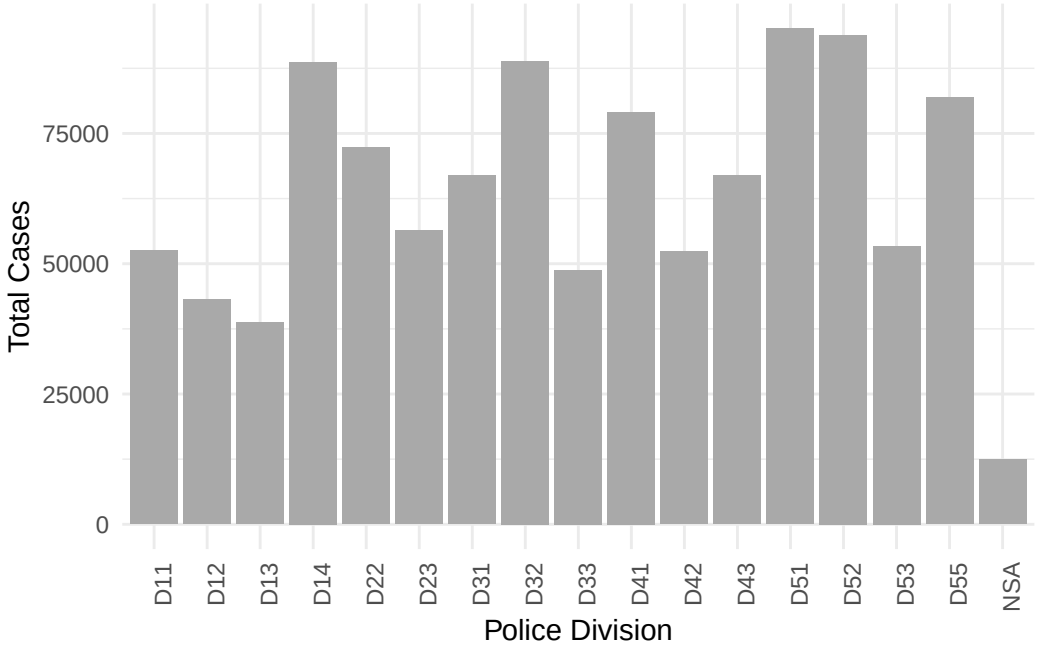

Figure 2: 2014 to 2022 Toronto Total Reported Crime Cases by Division

3 Discussion

3.1 Across years

3.2 Across divisions

4 Conclusion

4.1 General

Other aspects

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