Crime worsened but got slightly better during the pandemic

A comprehensive overview of Toronto's crime landscape from 2014 to 2020

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Abstract

Most Canadians consider Canada to be a safe place to live in, but they consider Toronto to be less safer than the smalls towns and rural areas in Canada. In this paper, we conducted analysis to investigate the Major Crimes in Toronto from 2014 to 2019 to learn about the criminal offence landscape. We found that Toronto's crime worsed from 2014 to 2019 but it got slightly better during the pandemic. This report can also act as a guide for individuals and families to learn about the most/least occurred criminal offences and the safest and the least safest neighborhoods in Toronto.

1 Introduction

In 2019, the Economist Intelligence Unit (EIU) released a Safe Cities Index ranking Toronto the 6th out of 60 cities. (Toronto 2020) The EIU ranked the cities by their digital security, health security, infrastructure safety, and personal safety. Most Canadians considered Canada to be a safe place to live in. However, there were regional variations where people who lived in small towns and rural areas felt safer than people who lived in big cities. In particular, residents who lived in Toronto reported that they felt less safe compared to those who lived in small towns and rural areas. (*Canadians' Perceptions of Personal Safety and Crime* 2017) Canadians think Toronto is more dangerous than the other cities in the rest of the country. In reality, Toronto is actually one of the safest cities in Canada. (*Canadians Think Toronto Is Way More Dangerous Than It Really Is, Thanks to Media Attention* 2017) With the contradiction of Canadians' perception and real-world data of how safe Toronto is, it is crucial that we look more closely at Toronto's safety over the years and explore various aspects of the dangers in Toronto.

In this report, we will dive into the dataset, Major Crime Indicators, from Open Data Toronto to gain a general sense of the criminal offense landscape in Toronto. We will investigate the most/least occurred crime categories in section 3.1 and the locations with the most/least crime occurred in section 3.2. We will also look into crime counts over the years, months, and days of the month in section 3.3 to determine if there is a pattern of the number of criminal offenses over time. We found that even though crime in Toronto has worsened over the years, it got slightly better during the pandemic. We also learned about the offense categories and the safest locations in Toronto. This report will serve as a high-level overview of the crimes and safety in Toronto.

2 Data

2.1 Data Source

This report uses a dataset that includes all Major Crime Indicators (MCI) occurrences reported to the Toronto Police Service in Toronto from the Open Data Toronto Portal (Gelfand 2020). Some of the Major Crime Indicators are Assault, Robbery, Theft, Unlawfully In Dwelling-House. This data is also gathered from the perspective of the victims. One crime occurrence can correspond to multiple rows since multiple incidents or categories can occur in a single occurrence.

2.2 Data Collection & Methodology

This dataset contains all the Major Crime Indicators occurrences that were reported to the Toronto Police services. It includes the MCI occurrences in 140 neighborhoods in Toronto. However, the coordinate fields of some occurrences can be blank since their locations cannot be verified. The dataset also contains some occurrences outside the city of Toronto.

We use R, a Statistical Computing Language, to analyze this dataset (R Core Team 2021). We use tidyverse for data manipulation (Wickham et al. 2019), sf for manipulation of spatial vector data (Pebesma 2018), xtable for exporting tables to Latex (Dahl et al. 2019), kableExtra for constructing tables (Zhu 2021). Graphs are made with ggplot2 (**citeGgplot2?**).

2.3 Data Characteristics

2.4 Key Features

The dataset contains 242879 observations with 28 attributes such as index, offense type, reported year, occurrence year, neighborhood, longitude, and latitude. It includes most crimes including Assault, Robbery, Theft, but it excludes sexual violations. The attributes that we use in this report include offense category, occurrence date, reported date, neighborhoods, etc. There are some variables that are similar and we will discuss that in section 4.

2.5 Limitations

There are also limitations to this dataset. For instance, the locations of the crime occurrences were offset to the nearest road intersection. The Toronto Police Service did this to protect the privacy of the individuals that are involved in the occurrence. Because of this, the numbers by Division and Neighborhood may not reflect the accurate number of occurrences in those regions. Moreover, some crime occurrences do not have a location because the location of the occurrences is unknown. As a result, the coordinate fields of those occurrences might be blank. On the other hand, this dataset does not include all the crime occurrences that are in Toronto since Statistics Canada did not include the crime occurrences if the police investigation did not occur or attempted.

3 Data Exploration

3.1 Offence categories

Table 1 shows the top 6 most occurred offense categories and the top 6 least occurred offense categories. We can see that “Assault,” “B&E” (Breaking and Entering), and “Theft Of Motor Vehicle” are the top 3 most occurred offense categories, whereas “Set/Place Trap/Intend Death/Bh,” “Traps Likely Cause Bodily Harm,” and “Theft Of Utilities Over” are the top 3 least occurred offense categories. These two tables give us a sense of the most and least frequent offense in Toronto. However, if we examine the offense categories more closely, we can see that some offenses (e.g. Assault, B&E) have sub-categories in the dataset. This might lead us to overestimate or underestimate the number of offenses in each category. We will discuss more about the consequence of this in Section 4.

3.2 Crime Locations

Table 2 shows the top 6 most occurred locations and the top 6 least occurred locations of crime in Toronto. We can see that “Waterfront Communities-The Islan,” “Church-Yonge Corridor, and”Bay Street Corridor” are the top 3 most occurred locations, whereas “Lambton Baby Poin,” “Yonge-St.Clair,” and “Maple Leaf” are the top 3 least occurred offense locations. These two tables give us a sense of the most and least frequent locations of crime in Toronto. If we look up locations on a map, we can see the neighborhoods in downtown Toronto have more crime compared to other regions in Toronto. For individuals or families that place safety as the top priority, they can get a sense of where in Toronto would be a safe place to live.

Category	Count
Assault	88919
B&E	42464
Theft Of Motor Vehicle	29158
Assault With Weapon	21540
Robbery - Mugging	7500
B&E W'Intent	6279

Category	Count
Set/Place Trap/Intend Death/Bh	1
Traps Likely Cause Bodily Harm	1
Theft Of Utilities Over	4
B&E - M/Veh To Steal Firearm	11
B&E - To Steal Firearm	11
Unlawfully Causing Bodily Harm	13

Table 1: Top 6 Most/Least Occurred Offence Categories

Location	n
Waterfront Communities-The Island	8912
Church-Yonge Corridor	7855
Bay Street Corridor	7237
West Humber-Clairvill	6520
Moss Park	5911
Kensington-Chinatown	4816

Location	n
Lambton Baby Point	374
Yonge-St.Clair	435
Maple Leaf	447
Woodbine-Lumsden	454
Guildwood	472
Markland Wood	515

Table 2: Top 6 Most/Least Occurred Offence Locations

3.3 Crime Counts

3.3.1 By Year

From 2014 to 2019, there is a trend of increasing number of offenses in figure 1. However, there is a dip in 2020. 2020 is the first year since 2014 in which the number of offenses is decreasing. This can be due to the COVID-19 pandemic. Since people are more cautious and most people avoid going out in the public during the pandemic, there are fewer people going out to commit offenses.

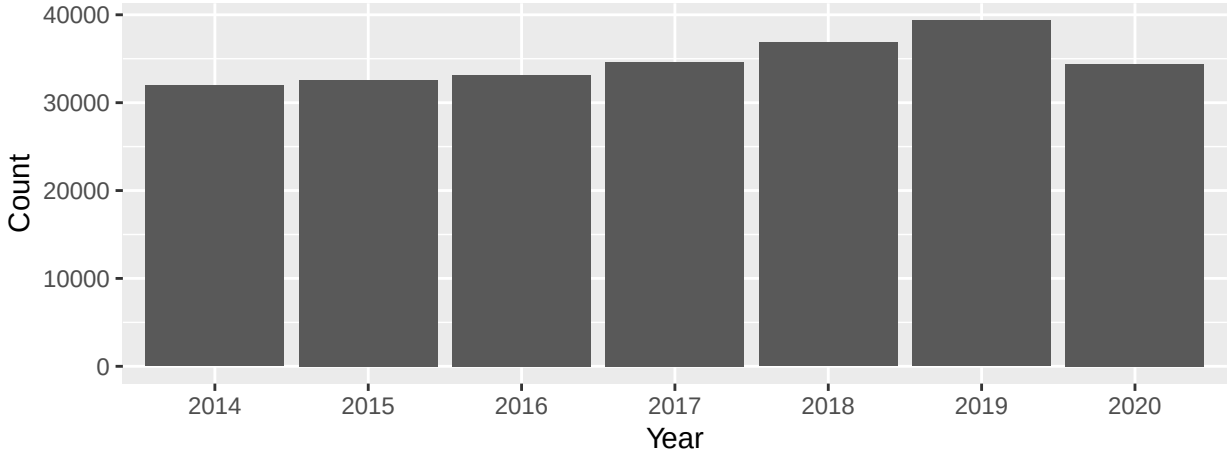

Figure 1: Crime Count By Year

3.3.2 By Month

From figure 2, it is difficult to conclude that there is a trend in the number of offenses by month. We can see that there seems to be an increasing number of crimes from the middle to late months (July to October) of a year.

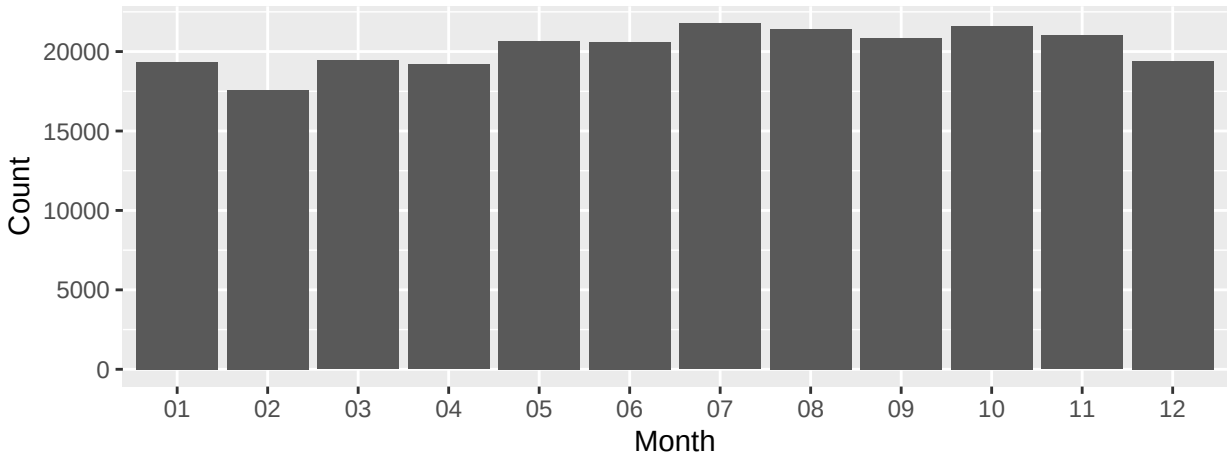

Figure 2: Crime Count By Month

3.3.3 By Day of the Month

The number of offenses does not seem to change by the day of the month from figure 3. We can see that offenses seem to occur the most from the 15th to the 20th of the month. There are also fewer offenses towards the end of the month (29th - 31st). However, we can tell that this is due to around half of the month does not have a 31st day, and February's do not have the 30th and the 31st, and some 29th.

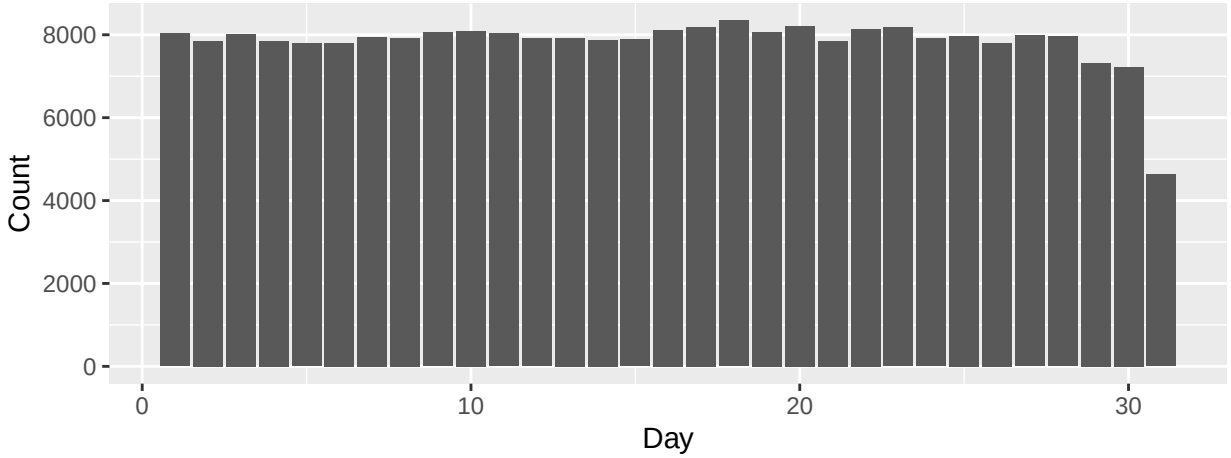

Figure 3: Crime Count By Day

3.4 Speed of Reporting offences

The speed of reporting offenses can determine how soon polices respond to the situation and how soon the police can start the investigation. From 2014 to 2017, figure 4 shows that the means of days between the time of the offense occurred and the time of reporting the offense has shortened throughout the years. However, the mean days started increasing in 2017. There is another increasing trend from 2019 to 2020. Between 2019 to 2020, the increasing mean days can be due to the COVID-19 pandemic with police being less responsive because of the inconvenience COVID-19 brought.

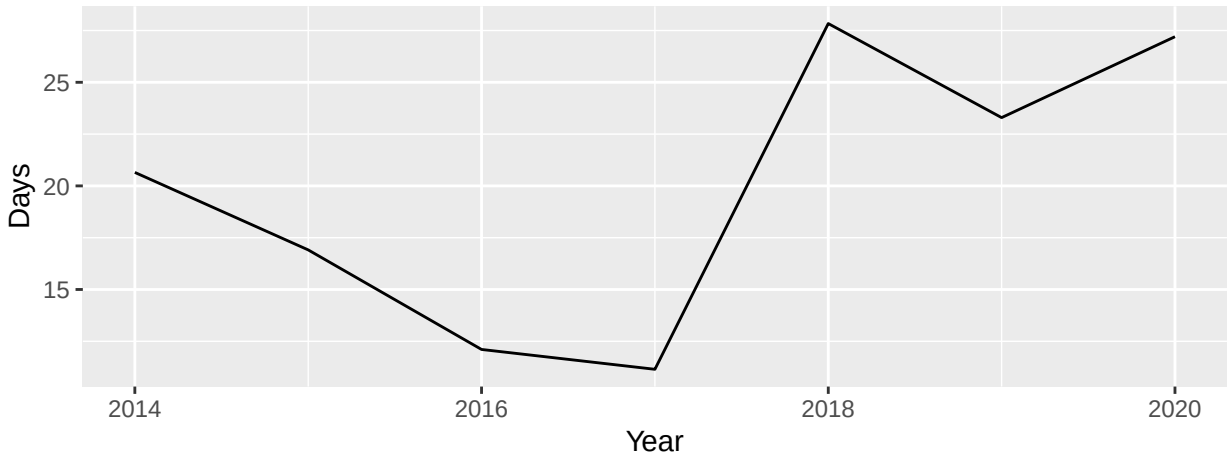

Figure 4: Mean Days between Reported Time and Occurence Time

4 Discussion

From the analysis above, we have a rough understanding of the major crime in Canada. This section will focus on the limitations identified when doing data exploration and analysis.

4.1 Offence Names

The "offense" column shows the offense categories categorized by Toronto Police. Using the column gives us a sense of the most and least occurred criminal offenses in Toronto. However, we can see that there can be sub-categories for each category. For example, the category "Assault" can have sub-categories "Assault - Force/Thrt/Impede" and "Assault Peace Officer Wpn/Cbh." It can be difficult for the people who analyze the data to deal with this situation because they are not experts of criminal offenses and they would not know if it is appropriate to put all these similar categories as one category. It can pose a challenge for the data analyst to consider what to do with these similar categories. In this report, we did not combine these categories together. However, if we want to dive deeper into this attribute, we will have to consult with an expert in criminal offense to learn about what to do with these data.

4.2 Data Collection

As mentioned in section 2.5, the location of the criminal offense was classified to the nearest road intersection. As a result, the division and the neighborhood of each offense might not reflect the actual location where the offense occurred. In addition, the coordinate attributes, 'Long' and 'Lat' can be blank as a result of missing information of the location. Offense data is also not gathered for those that the police investigation never occurred or attempted. Thus, the data does not reflect an accurate picture of the major crimes in Toronto but it does give us a general sense of the criminal offense landscape.

5 Conclusion

In conclusion, this paper gave us a general sense of the criminal offense landscape in Toronto from 2014 to 2020. criminal offense has a trend of worsening from 2014 to 2019. However, the number of criminal offenses decreased in 2020 which is also the year when the pandemic started. The number of criminal offenses does not seem to change much throughout the months of the year and the days of the month. The paper also mentioned the most/least occurred criminal offenses and the locations where there are the most/least criminal offenses over the years. This can be helpful information to the individuals and families that put safety as their top priority so they can make well-informed decisions to choose a safe neighborhood to live in.

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