Decoding Toronto's Crime Patterns*

An Analysis of Victims and Trends (2014-2022)

Chay Park

January 25, 2024

In the period from 2014 to 2022, including the global Novel Coronavirus pandemic in 2019, this paper scrutinizes the Toronto Police annual statistical report on victims of crimes. By analyzing trends in the top three crimes across different age groups, the paper conveys a message on the correlation between the pandemic and crime rates. This research contributes to an understanding of societal dynamics, highlighting the potential impact of the pandemic on both crime rates and the reporting of victims of crimes over the years.

Contents

*Code and data are available at: https://github.com/Chay-HyunminPark/Toronto_CrimeVictims.

1 Introduction

According to U.S. News, Canada placed second in the overall ranking for the best countries in 2023. One of the highest-scoring categories, 'Quality of Life,' ranks third, and its attribute, 'Safe,' scored 93.2 out of 100 (Best Countries 2023). Indeed, the Statista Research Department asserts that the overall crime rate in Canada has consistently decreased since 2000, with the 2021 crime rate approximately 30 percent lower than its peak in 2003 (Statista Research Department 2021). However, a surge in violent crime rates in 2021 challenges this claim, suggesting a potential consequence of crime rates rebounding after a decline during the pandemic. This analysis focuses on discerning general trends in victims reporting specific crimes—robbery, assault, and sexual violation—utilizing tables and graphs to visualize these trends from 2014 to 2022. The objective is to identify distinctive patterns within the trend, considering variations across age groups and different crime types. Additionally, an exploration of potential correlations with external factors, such as the global pandemic, will be conducted.

This paper employs R (R Core Team 2020) to analyze a dataset sourced from opendatatoronto (Gelfand 2020), encompassing all identified victims of crimes against persons. The dataset comprises observations on the number of victims reported each year to the Toronto Police from 2014 to 2022. This considers cases that may have been deemed unfounded post-investigation, incidents occurring beyond the City of Toronto limits, or those lacking verified locations (Toronto Police Services 2023). The analysis extracts variables such as report_year, subtype, age_group, and count_, excluding age_cohort, sex, category, and assault_subtype. Omitted are unknown values for age_group, age_cohort, and sex, as they do not contribute explicitly to defining data groups. The dataset lacks details regarding these unknown values. Additionally, the analysis focuses on the top three reported crimes—robbery, assault, and sexual violation. The exclusion of 'other' crimes in the cleaned_data set is attributed to its uncertainty. The data within this paper center on trends related to these three crimes, with age groups classified into three subgroups: adult, youth, and child. The trend indicates a resurgence in reported victims of crimes following a period of decline, 2020-2021.

The paper begins with a general overview of the dataset, presenting a table illustrating the total number of victims across various age groups over the specified period. This overview is complemented by corresponding graphs. The subsequent section delves into bar graphs detailing the reported victims' numbers within distinct age groups, individually addressing sexual violation, assault, and robbery. Finally, a table offers a quantitative measure of the number of victims for each crime across the report years.

2 Data

The dataset can be analyzed in R (R Core Team 2020) using various packages. Notable packages include ggplot2 (Wickham et al. 2016) for creating graphical representations, kableExtra

(Zhu et al. 2021) for enhancing table aesthetics, and lubridate (Grolemund et al. 2021) for handling date-related operations. Additionally, the Tidyverse framework (Wickham et al. 2019) provides a cohesive suite of tools, while Dplyr (Wickham et al. 2021) is specifically useful for data manipulation. Knitr (Xie 2014) plays a crucial role in generating dynamic reports. Leveraging these packages allows for comprehensive data analysis, aiding in the creation of informative tables and figures that contribute to unraveling the narrative of crime victims in Toronto.

2.1 Results

2.1.1 Number of Victims by Age Group

Table 1 above illustrates the trend in the number of victims across distinct age groups. The age categorization is determined by the reporting year, with the "Adult" group encompassing individuals aged 18 or older. The "Youth" group comprises individuals between the ages of 12 and 17, while those below 12 fall into the "Child" group. This presentation aims to provide a comprehensive overview of victim counts within these age cohorts over the years from 2014 to 2022.

Table 1: Total Sum of Victims in Different Age Groups Throughout the Years

	Victims Count		
REPORT_YEAR	Adult	Youth	Child
2014	16278	2283	1215
2015	17037	2216	1124
2016	17826	2457	1095
2017	18512	2621	1094
2018	19512	2311	1063
2019	20109	2551	1180
2020	17956	1432	792
2021	18409	1661	926
2022	20331	2190	925

Table 1 counts the total number of victims for each age group over the years. It is evident that the "Adult" victim group has consistently reported the highest number of incidents, while the "Child" victim group reports the least. Notably, the year 2020 stands out, revealing a reduction in reported victim counts across all three age groups. This decline is attributed to the impact of COVID-19 and the ensuing lockdown measures, resulting in a seemingly decrease in crime reporting rates.

Figure 1 corresponds to the information presented in Table 1. Visualizing the data by age group across each year reveals that the majority of reported crime victims fall into the "Adult"

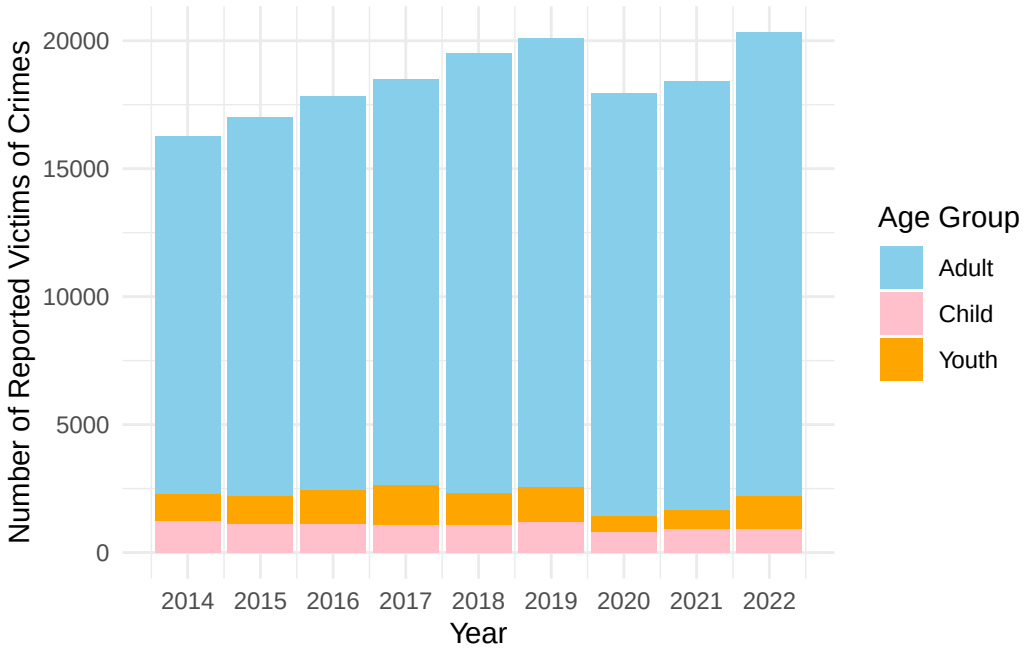

Figure 1: Number of Reported Victims of Crimes in Different Age Groups Over the Years

category. The bars exhibit an ascending trend from 2014 to 2018. However, a conspicuous drop in reported crimes is observed between 2019 and 2020. One plausible explanation for this decline is attributed to the impact of COVID-19, which influenced crime reporting rates during this period.

2.1.2 Reporting Rate on Sexual Violation

From 2014 to 2020, the trend indicates that the adult group is consistently twice the size of the child group Figure 2. Up until 2020, victims of sexual violation were predominantly from the adult age group. However, as of 2021, the youth victim group has surpassed the number of adult victims.

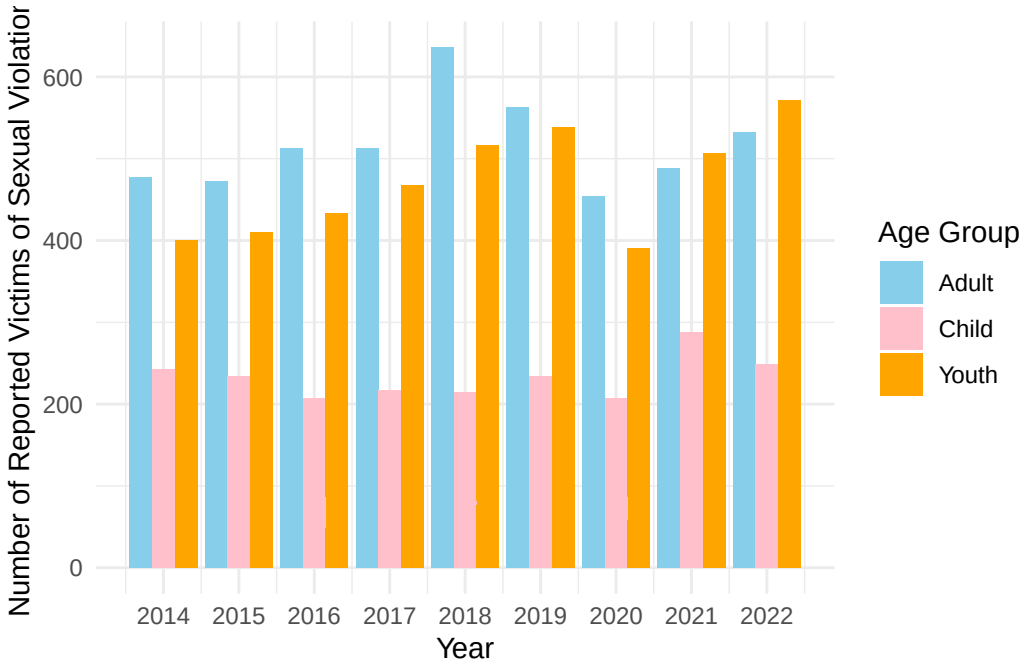

Figure 2: Victims Count of Sexual Violation by Age Group

2.1.3 Reporting Rate on Assault

Figure 3 illustrates an ascending trend in the number of assault victims in the city of Toronto from 2014 to 2022. COVID does not appear to be a factor influencing the trend, although the sizes of both child and youth victim groups have decreased. The youth victim group has experienced a faster growth compared to the child victim group.

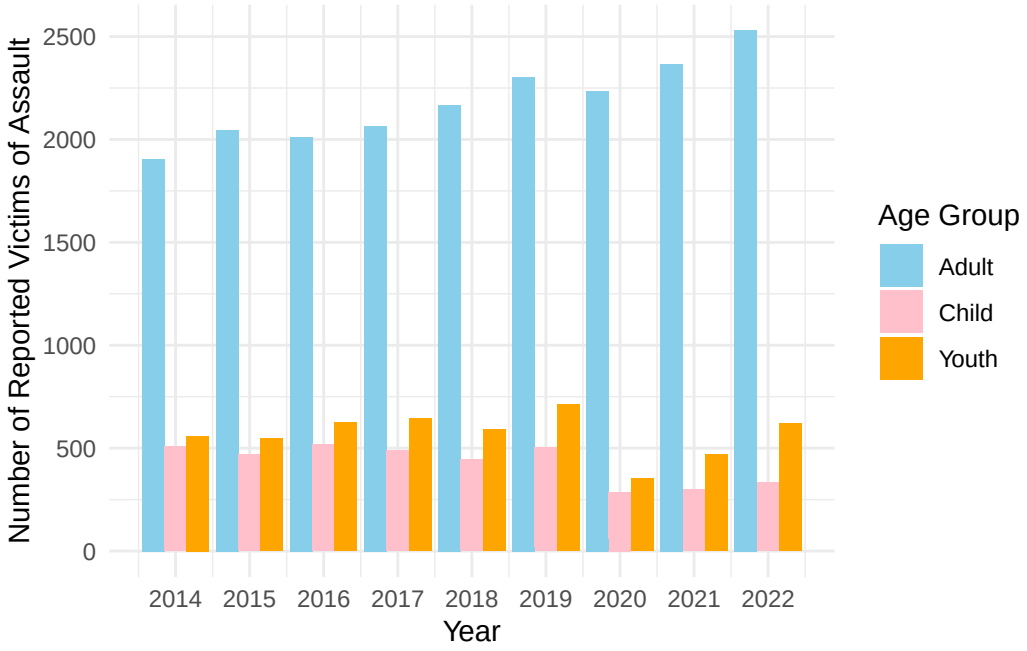

Figure 3: Victims Count of Assault by Age Group

2.1.4 Reporting Rate on Robbery

Figure 4 depicts that as of 2018, the number of robbery victims in the youth group diminished and has remained at a lower level. The COVID-19 pandemic is a factor influencing the bar graphs depicting the number of robbery victims in different age groups over the years. In 2020, victims of robbery in every age group decreased, indicating a possible impact of lockdown mandates on the decrease in victims.

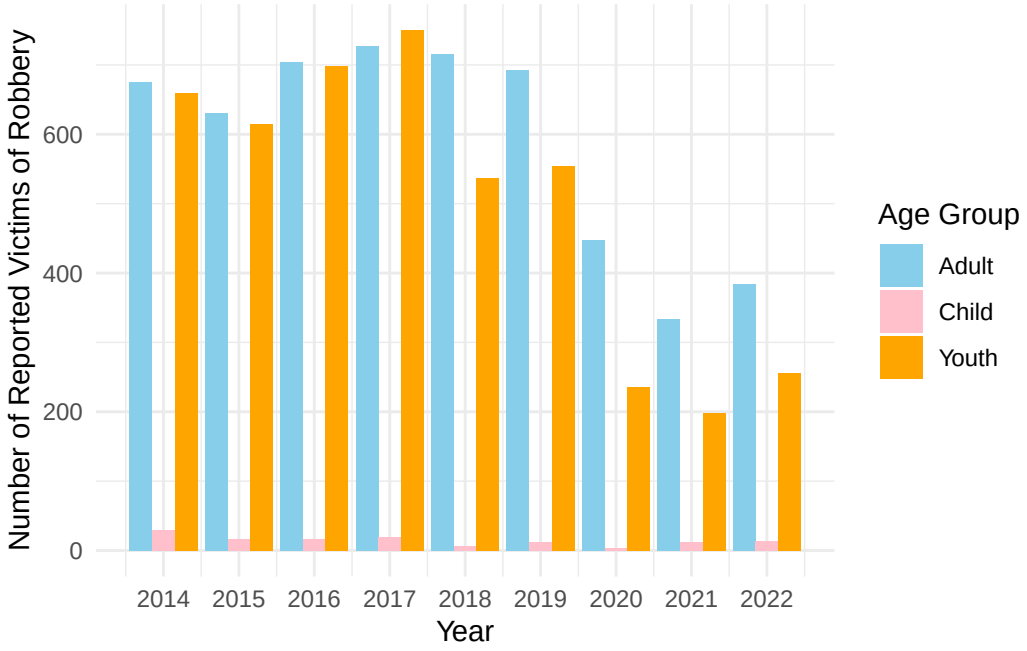

Figure 4: Victims Count of Robbery by Age Group

2.1.5 Number of Victims for each crime

Table 2: Total Number of Victims Counted for Each Crime from the Year 2014 to 2022

	Victims Count		
REPORT_YEAR	Assault	Robbery	Sexual Violation
2014	14380	3327	2069
2015	15095	3157	2125
2016	15808	3392	2178
2017	16278	3643	2306
2018	16925	3281	2680
2019	17959	3195	2686
2020	15656	2339	2185
2021	16636	1825	2535
2022	18222	2392	2832

The onset of the COVID-19 pandemic in late 2019 introduced a noticeable factor that impacted crime trends throughout the subsequent years, especially in 2020 and extending up to 2022. One reasonable explanation is the reduction in physical interactions among individuals, potentially leading to a decline in contact-based offenses such as sexual violence and robbery. However, it is crucial not to overlook the possibility of an increase in domestic violence during this period. Domestic settings may contribute to instances of sexual violence, presenting a contrasting outcome.

3 Analysis

The analysis reveals trends in victims of crimes in Toronto from 2014 to 2022. While the overall pattern suggests a decline in reported crimes, the impact of the COVID-19 pandemic is evident in specific crime subtypes and age groups. Sexual violation cases, for instance, witnessed a shift in the dominant age group from adults to youth in 2021. Assault incidents displayed a consistent upward trend, unaffected by the pandemic, but with a reduction in the sizes of child and youth victim groups. In contrast, the number of robbery victims, particularly in the youth group, significantly decreased in 2020, likely influenced by pandemic-related lockdown measures. The findings offer insights into the relationship between external events and crime statistics.

References

Best Countries. 2023. "U.S. News Best Countries - Canada." https://www.usnews.com/news/best-countries/canada. https://www.usnews.com.

Gelfand, Sharla. 2020. "Opendatatoronto: Access the City of Toronto Open Data Portal." https://github.com/sharlagelfand/opendatatoronto.

Grolemund, Garrett, and Hadley Wickham. 2021. *Lubridate: Make Dealing with Dates a Little Easier*. https://CRAN.R-project.org/package=lubridate.

R Core Team. 2022. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Statista Research Department. 2021. "Crime in Canada - Statistics & Facts." Statista. 2021. https://www.statista.com/topics/2814/crime-in-canada/#dossierKeyfigures.

Toronto Police Services. 2023. "TPS Crime Statistics - Victims of Crime." https://data.torontopolice.on.ca/datasets/TorontoPS::victims-of-crime-asr-vc-tbl-001/about. https://data.torontopolice.on.ca/.

Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. https://CRAN.R-project.org/package=ggplot2.

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.