Decoding Toronto's Crime Patterns*

A Comprehensive Analysis of Victims and Trends (2014-2022)

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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. Analyzing this extensive dataset reveals a correlation between the pandemic and crime rates, emphasizing broader trends in the top three crimes across different age groups. The findings underscore the nuanced relationship between external events, law enforcement, and crime reporting, offering insights into the complex interplay between specific events and crime statistics. This research contributes to a comprehensive 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.

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1 Introduction

Analyzing this dataset becomes imperative as it unravels a nuanced narrative beneath the overarching claim of declining crime rates in Canada, as reported by Statistics Canada. Contrary to the general trend, the Statista Research department asserts that the overall crime rate in Canada has consistently decreased since 2000, with the 2021 crime rate approximately

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

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30 percent lower than its peak in 2003. Property crime aligns with this decline, dropping by 30.6 percent during the same period (Statista Research Department 2021). However, a surprising surge in violent crime rates in 2021 challenges this narrative, 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 under analysis comprises observations on the number of victims reported each year for crimes, including robbery, assault, and sexual violation, to the Toronto Police from 2014 to 2022. This inclusive dataset considers cases that may have been deemed unfounded post-investigation, incidents occurring beyond the City of Toronto limits, or those lacking verified locations. The analysis extracts key 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 don't contribute explicitly to defining data groups. The dataset lacks explicit details regarding these unknown values. Additionally, the analysis focuses solely 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 inherent uncertainty. Notably, the data within this paper centers on trends related to these three crimes, with age groups classified into three subgroups: adult, youth, and child. The overarching trend indicates a resurgence in reported victims of crimes following a period of decline, 2020 - 2021.

The paper begins with a comprehensive overview, presenting a table illustrating the total number of victims across various age groups over the specified period. This overview is complemented by corresponding graphs derived from the table. 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 concise table is presented, offering 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.

The table (Table 1) above illustrates the overarching 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

REPORT_YEAR	Victims Count		
	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 (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 substantial 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 significant reduction in crime reporting rates.
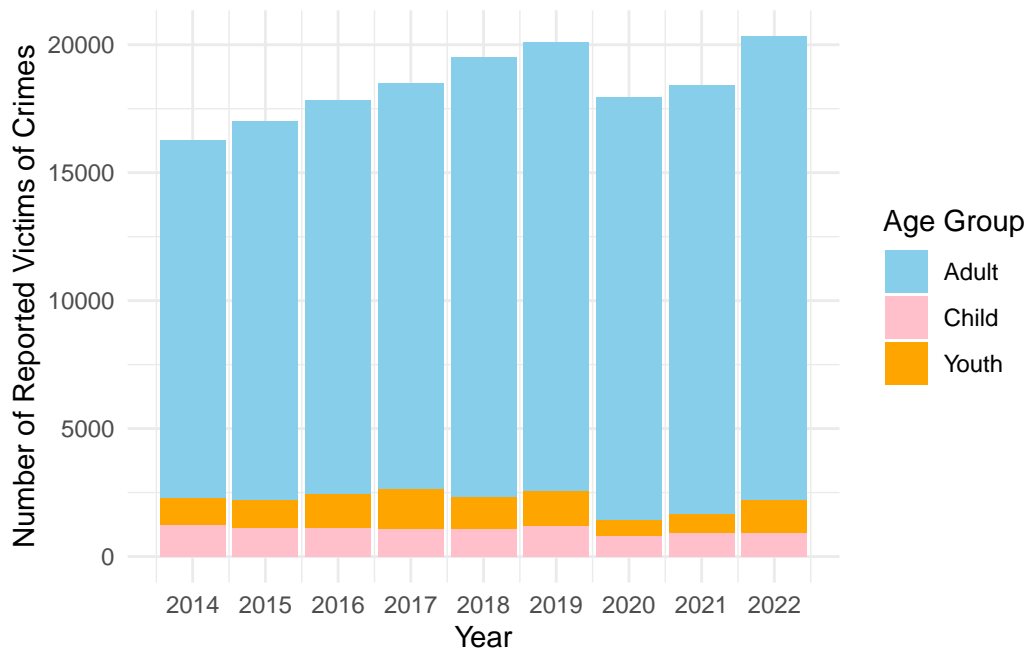
Figure 1: Number of Reported Victims of Crimes in Different Age Groups Over the Years

Graph 1 (Figure 1) corresponds to the information presented in table 1 (Table 1). Visualizing the data by age group across each year reveals that the majority of reported crime victims fall into the "Adult" category. Notably, 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 significantly influenced crime reporting rates during this period.

From 2014 to 2020, graph 2 (Figure 2), the trend indicates that the adult group is consistently twice the size of the child group. 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.

Graph 3 (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.
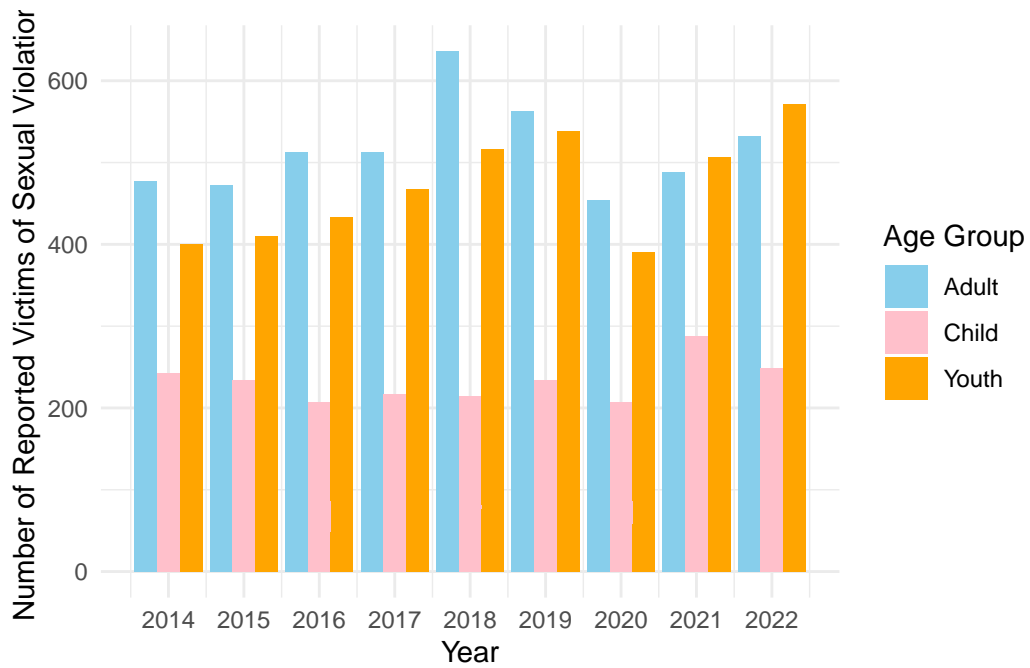
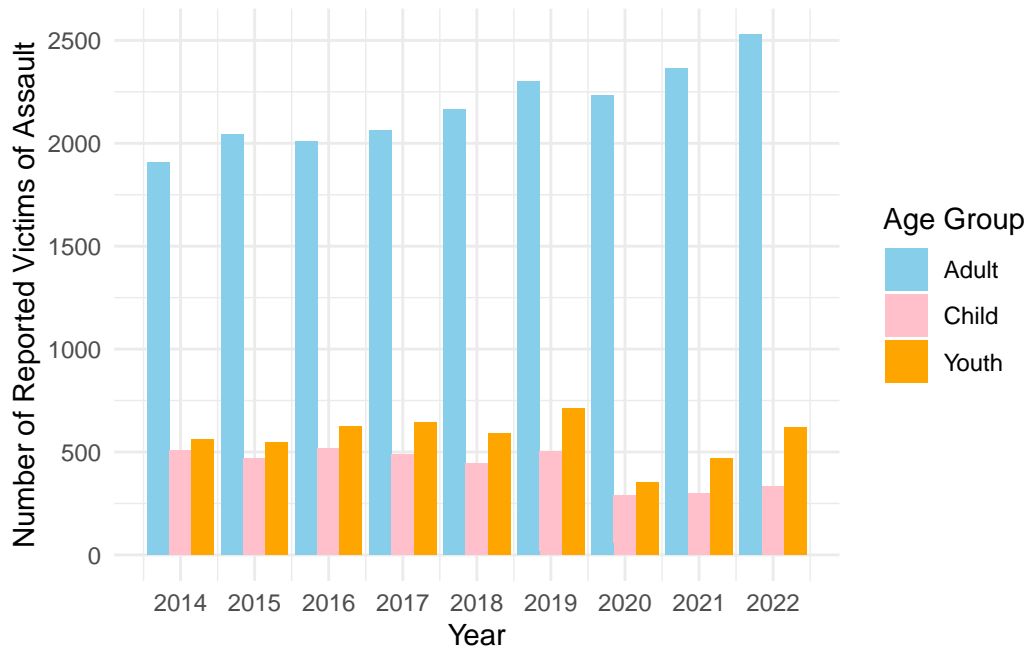Figure 2: Victims Count of Sexual Violation by Age Group Over the Years

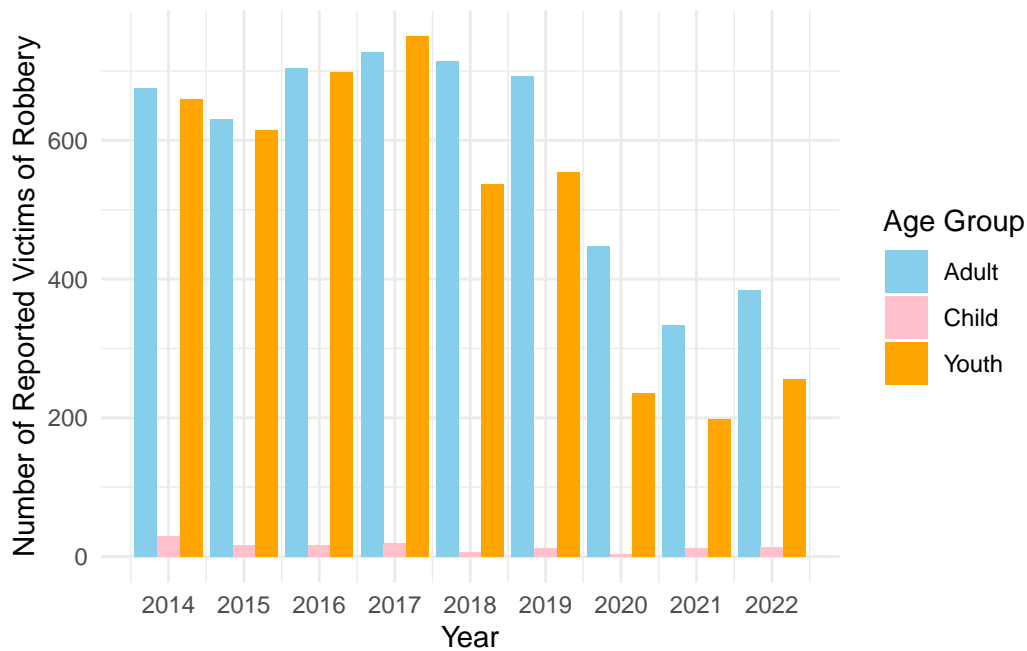Figure 3: Victims Count of Assault by Age Group Over the Years

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Figure 4: Victims Count of Robbery by Age Group Over the Years

Graph 4 (Figure 4) depicts that as of 2018, the youth group of robbery victims diminished and has remained at a lower level. The COVID pandemic is a significant 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 significantly decreased, indicating a possible impact of lockdown mandates on the decrease in victims.

The analysis reveals notable 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. These findings provide valuable insights into the complex dynamics of crime reporting and its interaction with external events.

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

REPORT_YEAR	Victims Count		
	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 significant factor that impacted crime trends throughout the subsequent years, especially in 2020 and extending up to 2022. One plausible 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.

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