A Detailed Crime Analysis in the City of Toronto

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Introduction

Metropolitan regions across the globe are consistently challenged with the task of managing and reducing crime rates, which play a significant role in shaping community safety and social cohesion. Toronto, as one of the most populous cities in North America, faces its unique set of challenges in this regard. The complexity and diversity of its urban landscape makes the task of ensuring safety for all its residents an ongoing endeavor.

This report utilizes a comprehensive dataset to explore the relationship between crime rates, neighborhood dynamics, and public safety initiatives in Toronto. Crime not only poses a direct threat to the safety and security of individuals and communities but also has broader implications, undermining trust in public institutions and acting as a barrier to economic growth and prosperity. By examining the dynamics, patterns, and trends of significant crimes within the city, we aim to uncover insights that are critical for the development of effective law enforcement strategies and public policies.

Moreover, the utilization of geospatial analysis in our investigation illuminates the spatial distribution of crime across Toronto, identifying potential hotspots and areas that require targeted interventions. This approach not only helps in pinpointing where crimes are most likely to occur but also aids in further research into the socio-economic and environmental factors contributing to these patterns. Such analysis is indispensable for allocating resources efficiently, designing community-specific safety measures, and ultimately, fostering a safer urban environment.

Through this report, we aim to provide a comprehensive overview of Toronto's current crime landscape. Additionally, this dataset allows us to delve deeper into the relationship between crime rates, neighborhood dynamics and public safety initiatives. Crime not only threatens the safety of individuals and communities but also reduces trust in public institutions and hinders economic development. Visualizing the dynamics, patterns, and trends of significant crimes within the city is vital for developing efficient law enforcement strategies and public policies.

Data Description

Dataset: https://data.torontopolice.on.ca/datasets/TorontoPS::major-crime-indicators-open-data/about

Github: https://github.com/sameerladha/Toronto-Police-Service-Data-Visualization

The dataset we chose was provided by the Toronto Police Service. The dataset contains detailed information on various major crime indicators, occurrences reported from the years between 2000-2023 by the Toronto Police Service, including the type of offense, specific location details, date and time of the report, and the occurrence. We also utilized a dataset with more specific neighbourhood crime rates as it contained the coordinates for each neighbourhood allowing for better visualizations when using folium. The only information we utilized from this dataset were the coordinates of neighbourhoods. The total number of crime occurrences the dataset had before cleaning was 372899. Also the dataset had 51 unique offences, with 5 main categories for those crimes, and it had 7 unique crime premises, 18 police divisions and 159 neighborhoods.

As for data cleaning, we removed any years before 2014 as the majority of the data was from 2014 and onwards. We also removed any rows that contained missing values, totalling 1535 rows of data removed, leaving us with 371364 rows, ensuring that our dataset was free of incomplete data points. This helped in maintaining the integrity of our analysis. We also cleaned up all columns by removing any extra spaces from the entries, as we noticed there were some unwanted extra spaces directly after some characters in the cells. Further documentation and data definitions can be found at the GitHub link above.

Findings

Through a meticulous analysis of crime data spanning various neighborhoods, police divisions, and time periods, we have found critical insights that not only highlight the issues but also shed light on the underlying factors contributing to the city's crime dynamics. This comprehensive analysis is built upon a data-driven approach, ensuring a nuanced understanding of the nature of crime in Toronto. As we delve into the findings, it becomes evident that the challenges we face are not uniform across the city; rather, they vary significantly by location, time of day and year, crime type, and other variables.

The data on crime in Toronto reveals critical insights into the city's safety landscape, notably highlighting the prevalence of assault crimes, with a staggering 196,703 reported incidents. This is complemented by the high rates of property crimes, including 70,051 incidents of break and enter, and 58,384 cases of auto theft. Integrating premises data into our analysis of Toronto's crime landscape highlights the critical need for environment-specific safety interventions. The data

reveals that public spaces, with 100,219 crimes occurring outdoors, are significant hotspots for criminal activities. The high incidence of crimes within residential settings, including 87,162 incidents in apartments and 67,117 in houses, further underscores the urgency of enhancing security measures in these areas.

When examining the different types of crime over the years since 2014, auto theft incidents have increased substantially, they have risen steadily to become the second most common crime to date. Assault cases began as the most frequent crime in 2014, and remained as the most frequent crime over the years. Break and enter occurrences have remained relatively stable over the years, with only minor fluctuations. Robbery and theft over $5,000 crimes are less frequent in comparison to other crime types. Both categories show relatively stable trends. Overall, there appears to be an upward trend in the number of reported crime incidents over the years, with a particular spike in auto theft. There's a notable dip throughout 2019 and 2020 for almost all types of crimes, which may correlate with the COVID-19 pandemic period, possibly due to lockdowns and reduced opportunities for offenders. The sharp increase in auto theft definitely stands out, suggesting a great need for targeted law enforcement and prevention measures.

Examining the data for crime types over the year of 2023, auto theft shows a seasonal pattern, with higher occurrences in the spring and early summer months (March through June) and a notable dip during certain months (July to October). The number of break and enter occurrences appears relatively steady throughout the year, with slight increases during the Fall months. There is a noticeable increase in assault toward the middle of the year, which might correlate with summer holiday activities, increase in outdoor excursions or other seasonal factors.

Similarly, when exploring the data with a time of day lens, it reveals a consistent trend, the night period consistently exhibits the highest number of crimes across all types, surpassing any other time of day. This pattern strongly indicates that criminal activity tends to peak when darkness falls, possibly due to reduced visibility and a decrease in the number of people present to deter or witness crimes. On the contrary, the morning exhibits the lowest crime rates, potentially attributed to more individuals beginning their day and increased visibility with the onset of daylight. Increased police presence during the night can act as a deterrent to criminal activity and improve overall public safety. Improved lighting in areas prone to crime during the night could help to increase visibility and deter criminal behavior. Investing in street lighting upgrades or implementing additional lighting fixtures in high-crime areas can contribute to reducing opportunities for criminal activity.

The exploration of crime data across Toronto's neighbourhoods unveils disparities in urban safety, shedding light on the distribution and potential root causes

of crime within the city. West Humber-Clairville emerges as a significant concern, with an alarming 10,309 reported crimes, markedly higher than other areas such as Moss Park and Downtown Yonge East, which report 8,621 and 7,762 incidents, respectively. The disparity becomes even more significant when compared to those from safer neighbourhoods, where reported crimes are a fraction of those numbers, showcasing a variance in crime distribution that spans more than seventeen-fold across different Toronto areas.

The analysis of crime distribution across Toronto's police divisions serves as a critical tool in understanding the nuances of the urban safety landscape, thereby guiding strategic decisions crucial for enhancing public safety and community well-being. Divisions such as D51, D32, and D31 are at the forefront, reporting the highest crime rates, which could be attributed to factors such as dense population and vibrant commercial activities. Conversely, divisions at the lower end of the crime spectrum offer a unique opportunity to identify what factors contribute to their relatively peaceful status, providing a learning ground for implementing successful practices city-wide.

Between 2014 and 2019, there was a noticeable steady increase in both reported and occurred crimes, hinting at a multifaceted interaction of factors including population growth, changes in reporting practices, and potentially a genuine rise in criminal activities. The emergence of the COVID-19 pandemic in 2020 marked a significant turning point, leading to a noticeable decline in crime rates that continued into 2021. However, as we moved into the post-pandemic era in 2022 and 2023, there was a notable resurgence in crime rates, with 2023 experiencing a particularly sharp increase in reported crimes.

Conclusions

Navigating the complexities of urban crime in Toronto, our comprehensive analysis has revealed a city that demands a nuanced understanding and targeted interventions. The data presented showcases the diversity in crime dynamics across various types of crimes, locations, and spanning neighbourhoods and police divisions, highlighting the urgent need for a sophisticated approach to urban safety. This complexity is accentuated by a post-pandemic rise in crime rates, emphasizing the critical need for immediate action and the importance of addressing the environmental and socio-economic factors driving these patterns.

Our findings underscore the importance of engaging communities and other stakeholders in the creation of policies and programs that are inclusive and reflec-

tive of Toronto's diversity. This approach is vital in ensuring that the strategies developed are well-informed and effectively address the specific needs and concerns of different communities.

A data-driven approach has been key to our analysis, enabling the strategic allocation of resources and enhancing the efficiency and effectiveness of our public safety initiatives. Through data analysis, we have identified high-risk areas, understood the nuances of crime patterns, and implemented measures that are both proactive and responsive to the evolving urban crime landscape.

In conclusion, creating a safer Toronto is a collective endeavor that demands the efforts of law enforcement, policymakers, community organizations, and residents. Our analysis, grounded in a comprehensive examination of crime data, sets the foundation for a collaborative approach to addressing the challenges faced. By leveraging the power of data and visualization and focusing on both prevention and intervention, we can pave the way for a safer, more resilient Toronto.