

An Analysis of Motor Vehicle Theft in Toronto: Patterns and Trends (2020-2024)*

Xinze Wu

September 24, 2024

This paper explores patterns of motor vehicle theft in Toronto between 2020 and 2024 using data from Open Data Toronto. The analysis reveals a significant correlation between location type and the frequency of thefts, with parking lots being the most common theft sites. This study shows how public data can inform targeted strategies to prevent motor vehicle theft.

1 Introduction

Motor vehicle theft is getting more and more serious across Great Toronto Area. This phenomenon damages the safety of the citizens' personal property, and it has increased the price of vehicle insurance to a certain extent and increased the financial pressure on residents. Therefore, understanding the patterns and trends behind such thefts can help law enforcement and policymakers implement preventive measures.

The availability of Open Data Toronto provides a valuable resource for analyzing crime trends. This paper uses data from Open Data Toronto on thefts from motor vehicles to identify key factors that contribute to these incidents.

The remainder of this paper is constructed as follows:

Data: Explain data sources and simulation process and visualize the relationship between variables.

Result: Provide a comprehensive description and summary of the data.

Discussion: Express personal thinking on the result.

*Code and data are available at: https://github.com/ke3w/term_paper1

2 Data

The data used in this analysis was sourced from Open Data Toronto. Specifically, the dataset focuses on reported incidents of motor vehicle theft in Toronto from 2020 to 2024. As for the key variables in the dataset,

- **REPORT_DATE**: The date on which the theft was officially reported.
- **OCC_DATE**: The date on which the theft occurred.
- **LOCATION_TYPE**: Describes the type of location where the vehicle was stolen (e.g., “Parking Lot”, “Street”).
- **PREMISES_TYPE**: Indicates whether the theft occurred inside or outside (e.g., “Outside”, “House”).
- **OFFENCE**: A categorical variable that describes the type of offense (e.g., “Theft From Motor Vehicle Under”).
- **DIVISION**: Represents the police division that handled the report.
- **HOOD_158**: Represents the neighborhood where the incident occurred.

Each of these variables provides crucial information for understanding the characteristics of motor vehicle thefts, such as the type of locations most susceptible to theft, the geographic spread of incidents, and any potential time-based patterns.

Shown as the diagram (Figure 1), the number of reported incidents of motor theft is relatively close every year. As for 2024, the total number is approximately half of the other year’s since the dataset used in this paper only up to June 2024. The relationship between the number of cases and year indicates that there is not a strong connection between these two variables. The number of incidents is likely not to be affect by any certain year.

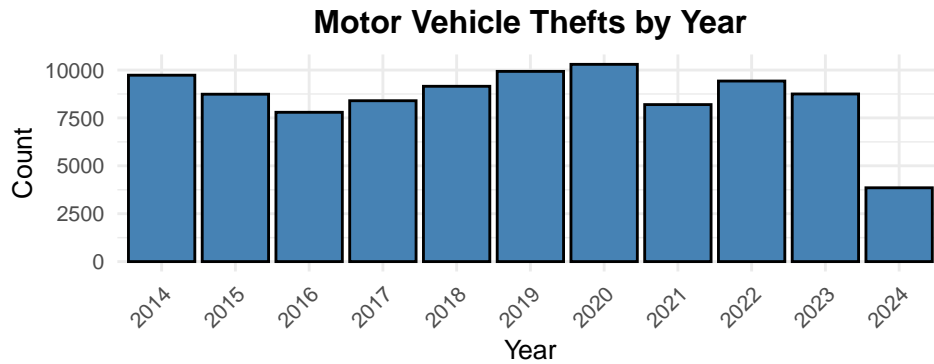


Figure 1: Motor Vehicle Thefts by Year

Compare to “year”, another of the most critical independent variable in this dataset is location, the following figure shows the number of incidents at the top 5 locations where car thefts are most likely to occur shown as (Figure 2). Top 5 motor theft location (from top1 - top5) are Parking lots, single home, streets, apartment and private property structure.

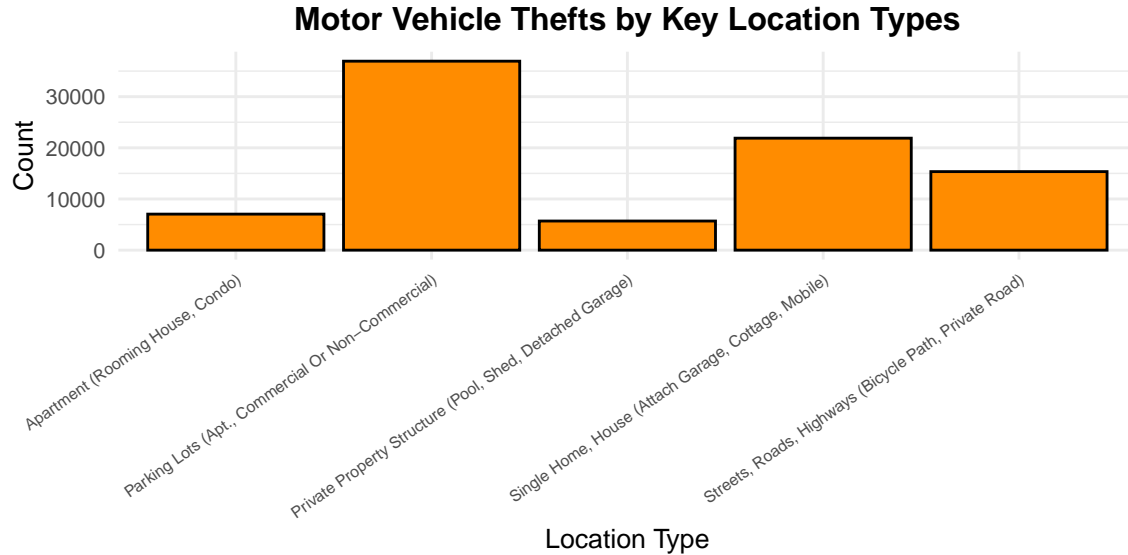


Figure 2: Motor Vehicle Thefts by Key Location Types(Top 5)

3 Results

The analysis of motor vehicle theft incidents reveals several important trends and patterns. This section presents the results of the data exploration, focusing on the relationship between the number of theft incidents and **location type**.

A deeper look into the relationship between location type and theft incidents reveals a clear pattern. As shown in (Figure 2), parking lots, streets, and residential areas are the most common locations for motor vehicle theft. In particular, **parking lots** are the most frequent sites for vehicle thefts, followed closely by thefts on streets. Residential areas, such as private driveways or garages, also account for a significant portion of the incidents.

The results highlight that certain location types are more vulnerable to theft than others such as parking lots and streets. This pattern underscores the need for increased security measures in these areas.

4 Discussion

The analysis demonstrates that the number of motor vehicle theft incidents has remained relatively stable over the years, with no major fluctuations, which suggests that motor vehicle theft is a persistent problem in Toronto, unaffected by year-specific external factors. The data shows that certain locations, particularly **parking lots** and **streets**, are consistently more vulnerable to theft. This is likely due to the relatively low levels of security in these areas and the ease of access for potential offenders.

The findings suggest that targeted interventions, such as improving security in high-risk areas (e.g., parking lots) and increasing public awareness, could help reduce motor vehicle theft. Enhanced security measures, such as installing surveillance cameras, increasing street lighting, and encouraging car owners to use anti-theft devices, are practical recommendations that could mitigate theft in these vulnerable areas.

4.1 Policy Implications

City planners, law enforcement agencies, and community safety organizations could benefit from focusing on high-risk areas identified in this analysis. For example, the city could:

- Introduce stricter security protocols for parking lots.
- Encourage neighborhood watch programs in residential areas.
- Collaborate with private businesses to implement surveillance in public parking spaces.

4.2 Weaknesses and next steps

While this study provides valuable insights, several limitations need to be acknowledged:

1. **Incomplete Data for 2024:** The dataset for 2024 only covers incidents up to June. This incomplete data may affect the interpretation of trends for that year and limit our ability to compare 2024 with previous years.
2. **Lack of Specific Contextual Factors:** The dataset lacks additional contextual information such as the time of day, weather conditions, or detailed security measures in place at the time of the incidents. Besides, the dataset also lacks the detailed information of the stolen vehicles such as brand, model, year even vehicle body type. Including these factors could provide a more nuanced understanding of what drives theft in certain locations.

3. **Focus on Location Type:** While location type is a significant factor in motor vehicle theft, this study does not explore other potentially important variables such as the type of vehicles targeted or the socio-economic characteristics of the neighborhoods where thefts occurred.
4. **Exclusion of Unreported Thefts:** Like many crime statistics, the data only includes reported incidents. Unreported thefts may lead to an underestimation of the true scope of the problem, particularly in certain areas where reporting may be less common.

These weaknesses suggest that future research could benefit from incorporating more detailed variables and a broader data set, potentially integrating qualitative information from police reports or victim surveys to complement the quantitative data.

5 References

City of Toronto. (n.d.). *Theft from Motor Vehicle*. Open Data Toronto. Retrieved [09/26/2024], from <https://open.toronto.ca/dataset/theft-from-motor-vehicle/>