Offenses and Enforcement: A Study of Toronto's Ticket Issuance Patterns*

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This paper analyzes Toronto's ticket issuance data from 2018 to 2023 to uncover patterns in traffic enforcement across various offense categories and demographic groups. The analysis reveals that certain offense types (fix this), consistently result in higher ticket counts, with significant geographic concentrations in specific city divisions. Trends in ticket issuance by age group and year also show fluctuations, with noticeable increases in enforcement activity during certain periods. These findings offer valuable insights for guiding targeted law enforcement policies and improving the allocation of resources across the city.

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*Code and data supporting this analysis is available at: https://github.com/cristinaasu/TorontoTicketsIssued

1 Introduction

As of 2021, around 1.107 million Toronto residents commuted by car, van, or truck, while 393,000 used public transport, underscoring the city's heavy reliance on vehicles for daily commuting (S. Canada 2023). Given this large volume of vehicular traffic, ensuring road safety is crucial. Enhancing urban safety involves identifying patterns in traffic violations to target areas and groups with elevated incidents. This data-driven approach can provide the foundation for more effective educational campaigns and enforcement strategies. For instance, a study by Castillo-Manzano et al. demonstrated that the implementation of a points-based driver's license system and increased police monitoring in Spain significantly reduced traffic violations and road fatalities (José I. Castillo-Manzano 2019), highlighting the potential for similar targeted interventions to improve road safety in Toronto.

In Ontario, traffic offenses are primarily regulated by the Highway Traffic Act (HTA), which was introduced in 1923. This provincial legislation classifies various traffic infractions and plays a critical role in maintaining road safety by setting out penalties and enforcement mechanisms, and such rules are still being followed by police officers in this dataset (OPTRAFFIC 2024). This study investigates traffic ticket enforcement trends from 2018 to 2023, a period that saw significant changes in driving behaviors due to factors such as the COVID-19 pandemic and the launch of targeted safety campaigns like "#MarchSafe" (Lavoie 2022) and "Speed Kills" (Morton 2022a). Using openly available data, this research aims to provide a comprehensive view of how enforcement efforts have adapted to shifts in public behavior and urban mobility. The analysis focuses on the spatial and demographic distribution of traffic tickets across the city, aiming to identify patterns that can inform targeted interventions and policy adjustments to enhance road safety.

The findings reveal significant disparities in ticket issuance across Toronto's divisions, with certain neighborhoods and age groups consistently receiving higher numbers of tickets. Additionally, some divisions experienced dramatic increases in specific offenses, particularly speeding and distracted driving. This paper is structured as follows: Section Two discusses the data sources and methodology used. Section Three critically examines the data, comes to several conclusions, and proposes new areas of exploration of this dataset.

2 Data Analysis

To examine ticket issuance patterns in Toronto from 2018 to 2023, recorded data on tickets issued (Services 2024b) and Toronto Police divisions (Services 2024a) were acquired using the OpenDataToronto R package (Gelfand 2022), which sources data from the Toronto Open Data Catalogue. The tickets issued dataset is updated annually, with the latest records dating up to August 2nd, 2024, ensuring that the analysis remains current and accurate. The Toronto Police divisions dataset was used solely for plotting geographic distributions in the mapping section of the analysis.

The datasets were cleaned using R (R Core Team 2022) and several of its packages: tidyverse (Wickham et al. 2019) for data manipulation, janitor (Firke 2023) for cleaning, and sf (Pebesma 2018) for spatial analysis. To maintain data integrity, entries with unspecified division locations marked as "NSA" (No Specified Address) were excluded, as they generally denote occurrences outside the jurisdictional bounds of Toronto or those without a confirmed location. Additionally, entries categorized under "Unknown" within the age group variable were also omitted to enhance the reliability of demographic insights. After these adjustments, the tickets issued dataset was refined to include 15,672 observations; offence year, division, ticket type, offence category, tickets issued, and age group were made of interest for this analysis. A sample of the cleaned dataset is displayed in Table 1. For visual representation, the knitr (Xie 2014), kableExtra (Zhu 2024), ggplot2 (Wickham 2016), sf (Pebesma 2018) packages were utilized to generate tables, graphs and map.

Table 1: Sample of Toronto Tickets Issued Data

Offence Year	Division	Ticket Type	Offence Category	Age Group	Ticket Count
2018	D22	Prov Offence Summons Part III Form 104	Other HTA	Adult	1
2018	D11	Prov Offence Notice - Part I (Pot)	Other HTA	Adult	1
2018	D23	Prov Offence Notice - Part I (Pot)	Other HTA	Adult	1
2018	D22	Prov Offence Notice - Part I (Pot)	Other HTA	Adult	1
2018	D32	Prov Offence Summons Part III Form 104	Other HTA	Adult	1

The Table 2 revealed a total of 1,145,119 tickets issued over a six-year period from 2018 to 2023, averaging 190,853 tickets annually with a standard deviation of 14,082. This variation suggests fluctuations in driving behaviors over time, perhaps influenced by changes in local regulations such as road safety campaigns.

Table 2: Summary Statistics

Statistic	Value
Total Tickets Issued	1,145,119
Mean Tickets Issued per Year	190,853.2
Standard Deviation of Yearly Tickets Issued	14,082.49

2.1 Offence Categories

Figure 1 highlights a significant distribution in the types of traffic tickets issued within Toronto. A substantial 93% of these tickets fall under Provincial Offence Notices - Part I (Pot), with the remaining 7% processed through Provincial Offence Summons Part III Form 104. This disparity underscores a law enforcement strategy that focuses on managing less severe infractions through notices, rather than escalating them to court summons.

Among the offenses, as shown in Figure 2, "Speeding" and "Other HTA" (Highway Traffic Act) violations are most frequently issued, constituting the majority of enforcement efforts. In contrast, tickets for "Distracted Driving" and "All CAIA" (Compulsory Automobile Insurance) are issued less frequently. For the reader's convenience, a brief guide on the differences between these ticket types and offense categories is provided in the Appendix.

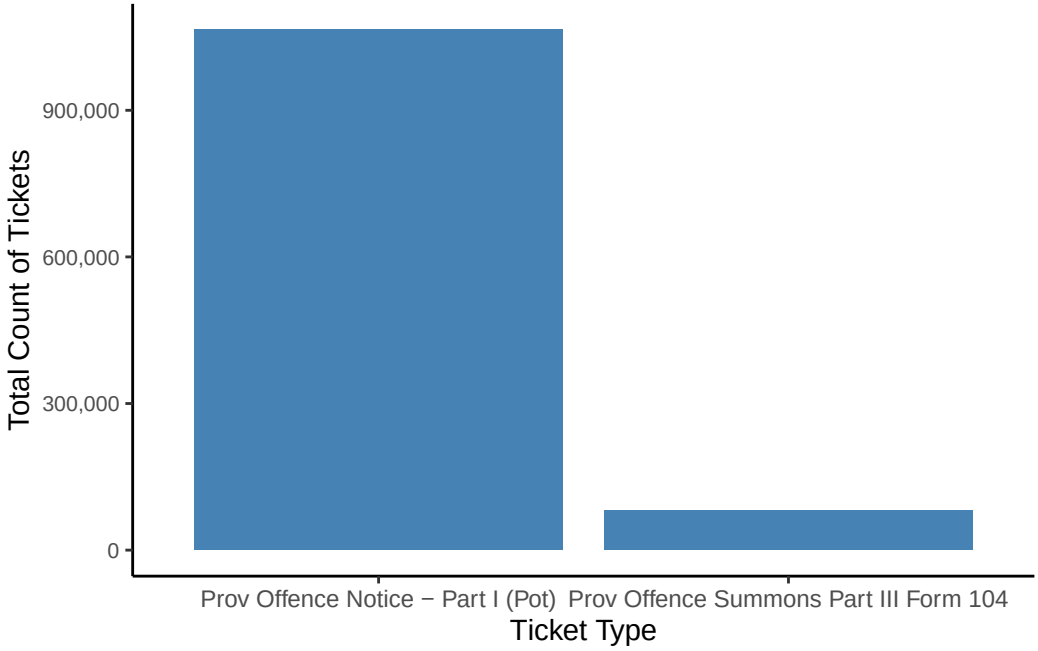

Figure 1: Distribution of Ticket Type

2.2 Age Group

Under the guidelines of the Toronto Police Service, an individual aged 18 or above is classified as an adult (Service 2024). As of March 2022, only 1.86% of licensed drivers in Ontario are categorized as youths, reflecting their minimal representation on the roads (G. of Canada 2023). While this analysis spans from 2018 to 2023, we can infer that the youth population

Figure 2: Distribution of Offences by Ticket Type

has likely remained consistent over the past five years, as growth in the number of licensed youths may not significantly alter this disparity.

Consequently, it is expected that ticket issuance statistics would similarly reflect a significant difference between the two groups. Indeed, there is a marked difference in ticket issuance in Figure 3, with adults receiving the vast majority—1,138,393 tickets, or 99.4% of the total issued across all offense categories—correlating with their more frequent interactions with traffic enforcement.

2.3 Yearly Patterns

To analyze changes in traffic ticket issuance from 2018 to 2023, data was compiled into Table 3 and visually represented in Figure 4, illustrating trends across various offense categories. Each line in Figure 4 is color coded to correspond with different offenses, facilitating easy comparison.

Speeding tickets peaked in 2021 with 83,742 issued, before declining to 63,630 by 2023, a decrease of 24%. This significant drop is clearly depicted with a pronounced downward trajectory, reflecting a reduction in these offenses. Conversely, Other HTA violations recorded the largest increase, surging by 47% from 46,356 in 2022 to 68,146 in 2023. Aggressive Driving shows a

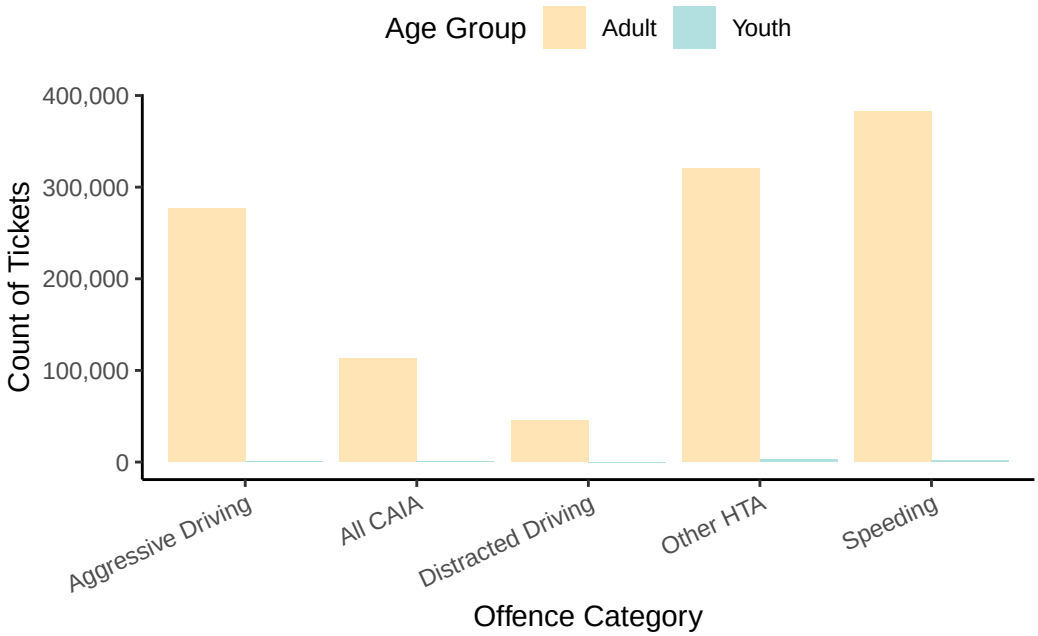

Figure 3: Distribution of Offences by Age Group

similar trend but with less magnitude, peaking at 52,779 tickets in 2023. The categories of All CAIA and Distracted Driving showed more moderate changes. Notably, Distracted Driving tickets increased steadily, rising 18% from 8,332 in 2018 to 9,825 in 2023. These trends align with earlier findings in **?@fig-offencebyticket** from Section 2.1, where Speeding and Other HTA offenses were highlighted for having a higher incidence of tickets issued.

Overall, the total number of tickets issued saw a significant 15% increase from 2019 to 2020, likely influenced by changes in enforcement strategies or public behavior during the COVID-19 pandemic. The upward trend continued with a 17% increase from 2022 to 2023, resulting in a total of 212,840 tickets, indicative of a rebound in traffic volumes and enforcement activities as pandemic related restrictions were lifted.

Table 3: Tickets Issued by Category and Year

Offence Category	2018	2019	2020	2021	2022	2023
Aggressive Driving	50986	51889	44015	39038	39484	52779
All CAIA	21999	20655	19173	17391	16068	18460
Distracted Driving	8332	7868	4873	6732	8087	9825
Other HTA	60186	58136	49086	41484	46356	68146
Speeding	41821	36142	83742	87278	71458	63630
Total	183324	174690	200889	191923	181453	212840

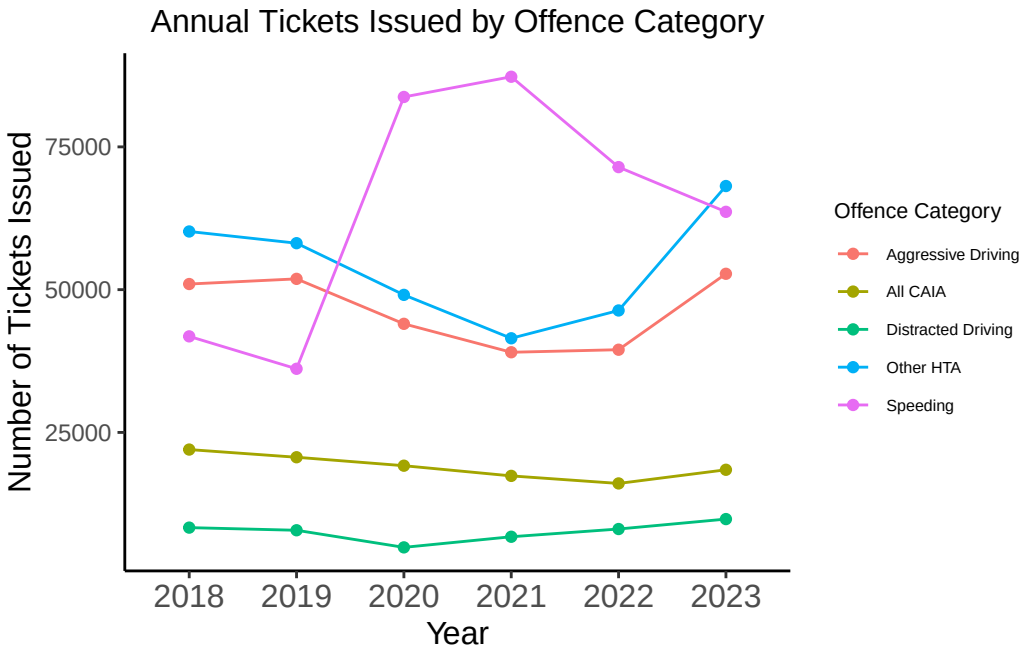

Figure 4: Ticket Issued by Offence Category and Year

2.4 Geographic Distribution

To assess the geographic distribution of traffic ticket issuance across Toronto, Figure 5 and Table 4 provide detailed insights into how tickets are dispersed among various police divisions, highlighting areas with the highest enforcement activities. Figure 3, using color gradients, visually emphasizes divisions D14, D41, D42, and D55, where ticket issuance is most concentrated, with green to blue tones indicating higher frequencies of tickets.

Table 2 details the breakdown of tickets in these divisions, showing D55 with the highest count at 99,065, primarily in Speeding and Other HTA offenses. D14, with a total of 98,307 tickets, shows a comparative decrease in Speeding offenses by 18% relative to D55. D41 and D42, meanwhile, exhibit similar ticket distribution profiles, pointing to consistent enforcement approaches or similar driver behaviors in these regions.

Table 4: Tickets Issued by Division and Offence Category

Division	Aggressive Driving	All CAIA	Distracted Driving	Other HTA	Speeding	Total
D14	40337	9965	4836	29477	13692	98307
D41	14671	8564	3068	24209	39237	89749

Table 4: Tickets Issued by Division and Offence Category

Division	Aggressive Driving	All CAIA	Distracted Driving	Other HTA	Speeding	Total
D42	14668	9687	2073	24560	38362	89350
D55	22073	9931	4416	29383	33262	99065

3 Discussion

3.1 Results and Implications

The analysis of traffic ticket issuance in Toronto from 2018 to 2023 reveals key enforcement patterns and highlights areas for targeted policy interventions. Divisions D55, D42, D41, and D14 consistently recorded the highest numbers of traffic tickets, particularly for Speeding and Other Highway Traffic Act (HTA) offenses. These findings suggest a need for increased patrols and advanced monitoring technologies in these divisions to address high rates of violations and improve road safety.

A notable increase in tickets issued between 2019 and 2020 is surprising, given the expectation that the pandemic would lead to fewer violations. However, speeding offenses saw a rise, possibly due to lower traffic volumes and fewer pedestrians, which may have encouraged higher speeds on less congested roads. Speeding remains a significant public safety concern, with the Toronto Police emphasizing the direct link between speed and the severity of injuries: "Drivers who speed, drive distracted or aggressively cause collisions—but it's speed that directly impacts the severity of injury" (Morton 2022b). While targeted safety campaigns like "#MarchSafe" and "Speed Kills" in 2022 initially had some impact, overall ticket counts for that year were lower than in previous years, likely due to pandemic-related reductions in traffic volumes.

The demographic analysis revealed that only 0.6% of tickets were issued to the youth demographic, consistent with the relatively small proportion of young drivers on Toronto's roads. The vast majority of tickets were issued to adults, particularly for high-risk behaviors such as speeding and distracted driving. This highlights the need for targeted educational programs specifically aimed at adult drivers to address these risk factors. Additionally, most tickets were issued under Provincial Offence Notices - Part I (Pot), reflecting an enforcement strategy focused on efficiently managing minor infractions without escalating them to court summons.

In summary, these findings underscore the need to adapt enforcement strategies to address both the geographic concentration of violations and the behavioral patterns of adult drivers. By increasing patrols in high-violation areas and implementing educational campaigns targeting adult drivers, Toronto can enhance road safety citywide, particularly as traffic volumes normalize post-pandemic.

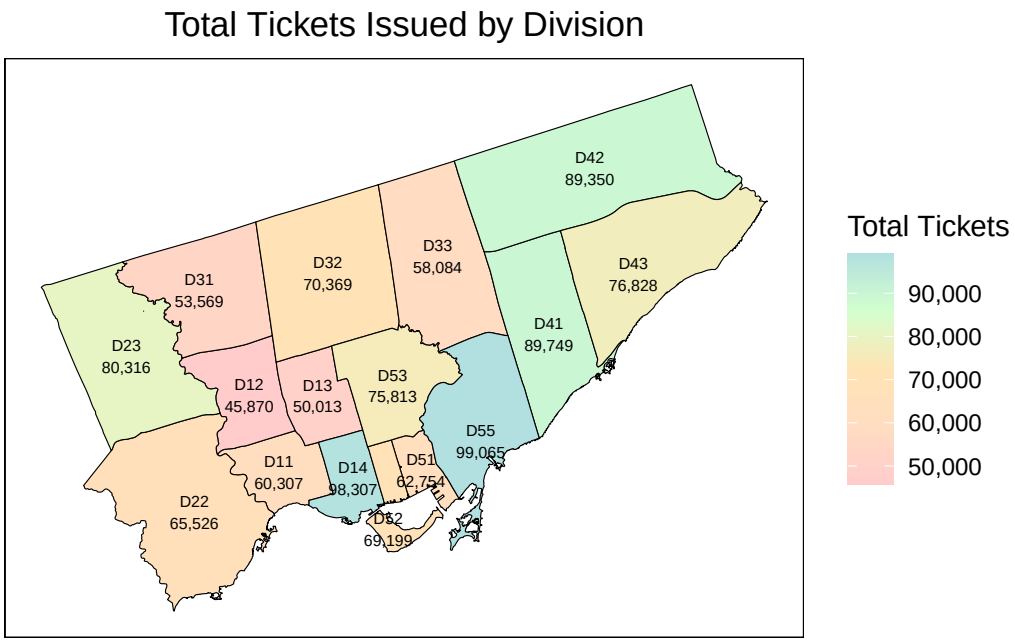

Figure 5: Map of Total Tickets Issued by Division

3.2 Further Areas of Exploration

Future analyses could be expanded by incorporating more detailed data on the specific locations within Toronto's divisions where traffic violations are most frequently issued. This would allow for a more granular understanding of the factors contributing to higher violation rates in certain neighborhoods or intersections, enabling targeted interventions. Additionally, exploring temporal factors, such as time of day or seasonality, could provide insights into when traffic offenses are most likely to occur, helping law enforcement allocate resources more effectively during high-risk periods.

Moreover, with additional data on driver behaviors or vehicle types involved in violations, future studies could analyze whether certain demographics or types of vehicles are overrepresented in specific traffic offenses. This information could further inform public education campaigns or targeted enforcement strategies, ensuring that interventions are not only geographically but also demographically appropriate. Employing more advanced spatial analysis tools and machine learning techniques could also help in predicting high-risk areas or times, optimizing road safety efforts citywide.

4 Appendix

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