

# Using data to fight crime\*

A look at the Toronto Police Service Annual Statistical Report

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06 February 2022

## Abstract

Policing is heavily relied on to ensure order in the city of Toronto, but it is up to the public to decide if they are doing a proper job. We will look at the Toronto Police Service Annual Statistical Report and use data and statistics to aid in the decision making process about dealing with crime in the City. We seek two key factors: the most popular type of crime, and where the most crime occurs, in working out how to lower the crime rate. We will conclude that our findings align with the Toronto Police Service's goals as a police department, which bodes well for Toronto's safety and security.

## 1 Introduction

To serve and protect. Police departments worldwide share this common goal, as their number one priority is to ensure the safety and security of civilians and innocents living their lives in the city. The Toronto Police Service (TPS) is one of the largest municipal police departments worldwide, among NYPD in New York, LAPD in Los Angeles, and CPD in Chicago. The TPS has over 5500 officers and 2200 civilian employees dedicated to keeping the City of Toronto a safe place to live ("Brief History of the Toronto Police Service," n.d.). With this abundance in resources, it is critical to ensure that they are being used effectively and efficiently, to protect Toronto's population of over 7 million as of 2020 (C. of Toronto 2020). However, in recent years, mistrust in the police department among civilians has gone up, causing reported crimes to go down, and police departments to undergo severe scrutiny. On May 25th, 2020, George Floyd, a citizen of Minneapolis, Minnesota, had been arrested by police on suspicion of using counterfeit bills, which led to an officer pinning their leg down on his neck for 9 minutes, and three other officers supporting his actions by keeping bystanders back and holding guns to his head (Forgey and McCaskill 2021). George Floyd was murdered, his death ruled a homicide, and the four officers involved were fired. This event of police brutality, excessive and unnecessary force in violation of human rights ("Police Violence" 2021), added enough fuel to the fire of people, worldwide, calling towards defunding the police, claiming that crime rates are going down while officer hiring rates are going up (Di Matteo 2014).

Statistics plays a significant role in resource allocation because it allows executives in command to make informed, critical decisions based on prerequisite data, and using projections to meet their desired goal. Thus in the case of spending police resources effectively, we will analyze data provided in the Toronto Police Annual Statistical Report (TPSASR), freely provided by the TPS through the Open Data Toronto portal. Crime statistics can be used to make better decisions in allocating TPS resources. This will address the claims people have on overfunding of police departments by ensuring efficient spending. At the same time, they can accomplish their main goal to keep crime rates low. Further, data, predictions, interpolations, and extrapolations, can be utilized to develop new, more focused, approaches in dealing with popular types of crime.

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\*Code and data are available at: <https://github.com/haqbilal/TorontoAnnualCrimeReports>

In this paper, I will discuss how the data is presented in the TPSASR, through the use of charts and graphs. Furthermore, I will conduct an analysis on how to interpret the data, and use it to make better decisions, while covering the real world implications this has, as both a data scientist, and crime statistician. We will determine that the most popular type of crime is against property, which includes auto theft, breaking and entering, fraud, and theft. From this we discuss how the data can be used to develop preventative measures in property crime, targeting the largest issue, to help reduce the crime rate in Toronto overall.

## 2 Data

### 2.1 Source

The statistical programming language R (R Core Team 2020) was used to conduct the analysis. The data has been sourced in a reproducible way, from the TPSASR, using the ‘opendatatortonto’ package (Gelfand 2020). It is an in-depth review of police-related statistics including reported crimes, victims of crime, search of persons, firearms, traffic collisions, personnel, budget, communications, public complaints, regulated interactions and other administrative information (Toronto 2021). To address the ethical concern of privacy, the Toronto Police service, in collecting this data, has adhered to the Municipal Freedom of Information and Protection of Privacy Act, thus protecting all individuals involved in the reported occurrences. Furthermore, this year’s report will be compared with reports from previous years, but cannot accurately be compared with reports from other agencies. The differing methods in categorization, as well as geographic, technical, data, and time constraints may affect results.

### 2.2 Methodology

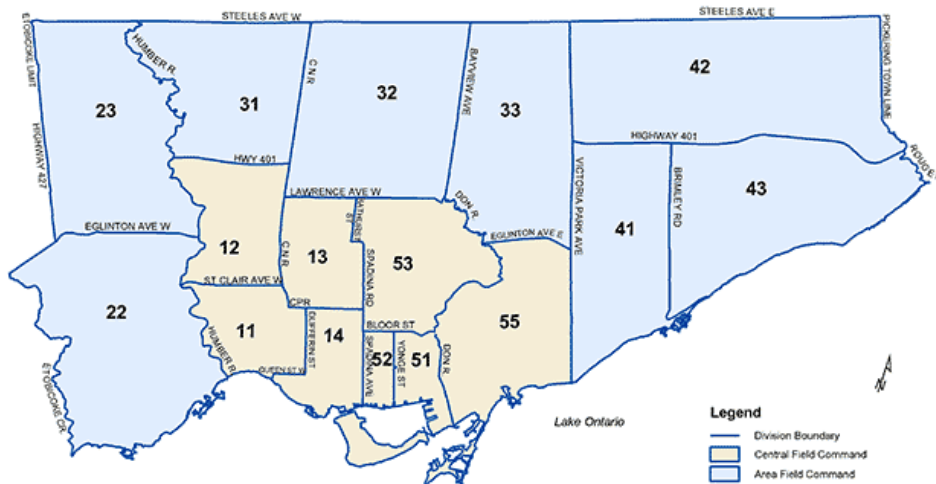


Figure 1: Command and Divisionsal Boundaries

The dataset was prepared by the Toronto Police Service, using Versadex; their records management system. It contains logs from January 1st, 2014 at the earliest, to the current date, but only the past 5 years are used for each annual statistical report. This practice ensures that the data being used and analyzed comes from a modern context, and accurately reflects the public policies of the current age. Crime statistics are and will be based on the information as soon as it becomes available to the police. This ensures consistency in results, and allows for the data to be accurately compared over the years. While this paper will focus on the dataset of crime reports in 2020, the TPSASR also has datasets featuring: Victims of Crime, Search of Persons, Firearms, Traffic, Personnel and Budget, Calls for Service, Public Complaints, Regulated Interactions, and

Administrative data. The reader is encouraged to view and cross reference the other datasets on their own, comparing with the analysis here, for an even broader context.

The dataset contains reports on crime offences sorted by the year, from 2014 to 2020, and by police division 1. The data includes 5 categories of crime: Crimes against the Person, Crimes against Property, Criminal Code Traffic, Controlled Drugs and Substances Act, Other Criminal Code Violations, Other Federal Statute Violations. For subtypes see the table 2. If a crime occurrence belongs to multiple categories, it will be counted once for each category (*ASSR Documentation* 2021). Some occurrences may occur outside Toronto limits, in which case the division is NSA, for not specified address. Note that the dataset counts crimes that were later deemed unfounded, meaning that the crime was initially reported, but later found to not have happened. A critique of the dataset is that it is currently impossible to determine the number of unfounded crimes, indicating they are not distinguished in the early phases of data reporting. However, this amount becomes negligible in later data analysis.

Category	Subtype
<b>Crimes against the Person</b>	Assault Attempt Murder Robbery-Financial Robbery-Other Sexual Violation Other
<b>Crimes against Property</b>	Auto Theft Break & Enter – Apartment Break & Enter – Commercial Break & Enter – House Break & Enter – Other Theft Over \$5000 Theft Under \$5000 Fraud Other
<b>Criminal Code Traffic</b>	Other
<b>Controlled Drugs and Substances Act</b>	Other
<b>Other Criminal Code Violations</b>	Other
<b>Other Federal Statute Violations</b>	Other

Figure 2: Subtypes of Crimes Corresponding to their Category

The counts of each type of crime and the counts of crimes cleared are reported as well. Crimes are reported by the officers involved, and are hence susceptible to some bias on the officers' part. For example, a form of racialized bias that may be present in the dataset is carding. Carding is when a police officer stops and searches an individual arbitrarily, without a valid reason to do so. Officers disproportionately target visible minorities, but this does not manage crime effectively ("Know Your Rights" 2022). When a crime gets cleared, it means it has been resolved, and charges have been laid. The table 3 indicates the total amount of crimes that have been counted (in red) versus those that were successfully cleared (in green). This shows that the majority of crimes go uncleared, giving reason to continue determining which crimes occur and where.

## 2.3 Analysis

In terms of raw data, this dataset has 2369 observations of 10 variables. The variables '\_id,' 'index\_,' 'ObjectId' are just unique identifiers for the data and do not provide any other information. The variable 'geometry' contains the latitude and longitude coordinates of the police division, which is used to visualize

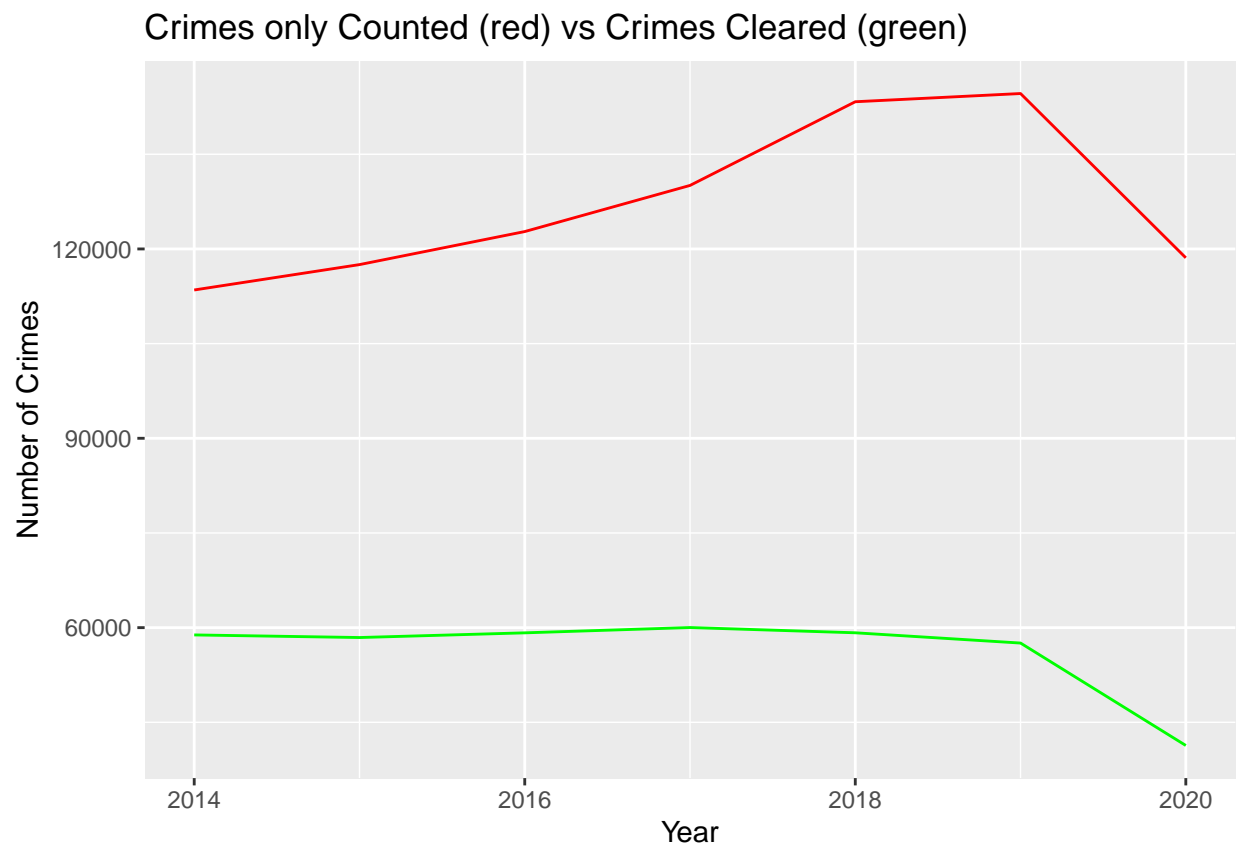


Figure 3: Graph of Crimes Cleared

Table 1: First ten rows of the raw dataset

ReportedYear	GeoDivision	Subtype	Count_	CountCleared
2014	D11	Other	201	195
2014	D11	Auto Theft	119	42
2014	D11	Break & Enter-Apartment	85	37
2014	D11	Break & Enter-Commercial	58	18
2014	D11	Break & Enter-House	89	34
2014	D11	Break & Enter-Other	23	7
2014	D11	Fraud	232	83
2014	D11	Other	628	230
2014	D11	Theft Over \$5000	36	12
2014	D11	Theft Under \$5000	1774	790

crime occurrences respective to their location in the city. The important variables to discuss are ‘ReportedYear,’ the year in which the crime took place, ‘GeoDivision,’ the police division where the crime occurred, ‘Category,’ ‘Subtype,’ ‘Count\_,’ and ‘CountCleared,’ all as discussed above. The first 10 rows of the raw data have been tabulated, omitting Category to fit the table.

Looking at the frequency of each type of crime provides insight into the appropriate distribution of methods and resources available to the TPS. The graph (see graph of most popular crimes each year) shows how many times each type of crime was committed in total from 2014 to 2020. From this, we determine that Crime against Property is, by a significant margin, the most popular type of crime. Using the table 2 on subtypes, this entails that the vast majority of crime in Toronto takes the form of auto-theft, breaking and entering, fraud, and theft over/under \$5000. This is consistent with cities in the United States, as in 2019, the FBI reported the majority of their crimes were also against property, in the same forms listed above (FBI 2019). Statistics Canada defines crime rate as the amount of crime occurred per 100,000 population, and so the property crime rate in Toronto in 2020 was approximately  $\frac{78000}{100000} = 0.78$ . This high rate justifies the need to address property crime when targeting a lower crime rate overall.

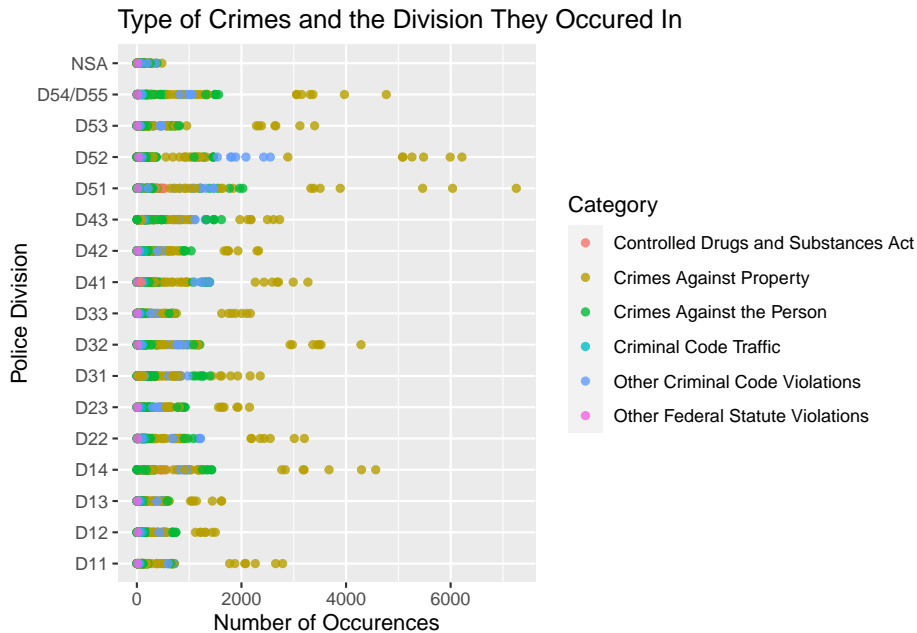


Figure 4: Crime on a Categorical Basis

Another way to target a lower crime rate is to look at the frequency of total crime per police division. Allocating more support, and the correct type of support, to corresponding regions, will effectively deal with crime occurrences more often and quicker. The graph (see graph of total amount of crime per division) shows that divisions 51-55 and 11-14 see the most criminal activity. These divisions correspond to the city’s central core, downtown as indicated by 5. It seems reasonable in this case that more crime occurs there, since the population density is naturally higher as well. According to the U.S department of Justice, the average amount of crime in a location goes down as the police presence goes up (Rouse 1985). This entails that by keeping more available units in those divisions, the crime rate will decline accordingly. However, the U.S department of Justice, in their study (Rouse 1985), also discovered that crime was prevented more effectively through close cooperation with the community, team policing, and increased night patrols. This exemplifies the influential role that preventative measures have in dealing with crime.

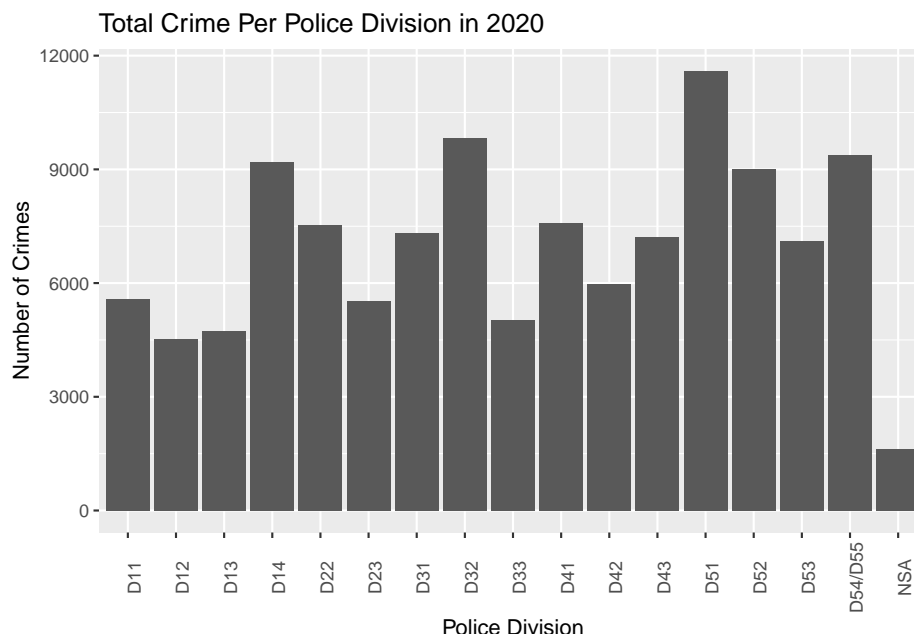


Figure 5: Crime on a Divisional Basis

### 3 Discussion

Events such as the murder of George Floyd in 2020 have caused communities to feel uneasy in trusting their police department to do its job, and it is up to the police departments to earn back that trust, by being open and accessible. That is exactly what the Toronto Police Service has done, by publicly releasing their datasets and statistical reports. It allows public citizens to look at the data themselves, and decide whether or not their police department is doing its job to represent its members of the community. In the same way, it is the citizens’ job to ensure that these analyses are spread out, to spark conversations and discussions on the matters outlined in this paper and beyond.

I have argued that the TPS has done an exemplary job in being open to its community, but still has ways to improve, in preventing bias and accuracy of data collection. Research and practice has shown the efficacy of preventative measures in reducing crime, and this paper, using data, has outlined the path forward. Consequently, the Toronto Police Service’s efforts align with the above conclusions, as indicated in their report, *The Way Forward*, outlining their intent to: be where the public needs them the most, enhance partnerships to create safe communities, focus on complex needs of a large city (*“The Way Forward”* 2017). On the whole, this paper demonstrates the importance to perform critical analysis by oneself before making any conclusions, and represents the major role that data plays in telling stories.

## References

- Alexander, Rohan. n.d. “Telling Stories with Data.” *Preface*. <https://www.tellingstorieswithdata.com/index.html>.
- ASSR Documentation. 2021. *Annual Statistical Report Open Data Documentation*. Toronto Police Services.
- “Brief History of the Toronto Police Service.” n.d. *Toronto Police Service :: To Serve and Protect*. <http://www.torontopolice.on.ca/careers/history.php>.
- “Command and Divisional Boundaries.” 2021. *Toronto Police Service :: To Serve and Protect*. <http://www.torontopolice.on.ca/divisions/map.php>.
- Di Matteo, Livio. 2014. “Police and Crime Rates in Canada: A Comparison of Resources and Outcomes.” *Fraser Institute*. <https://www.fraserinstitute.org/sites/default/files/police-and-crime-rates-in-canada.pdf>.
- FBI. 2019. “Table 9.” *FBI*. FBI. <https://ucr.fbi.gov/crime-in-the-u.s/2019/crime-in-the-u.s.-2019/topic-pages/tables/table-1>.
- Forgey, Quint, and Nolan D. McCaskill. 2021. “Celebration Is Laced with Warnings After Derek Chauvin Conviction.” *POLITICO*. POLITICO. <https://www.politico.com/news/2021/04/20/derek-chauvin-trial-verdict-george-floyd-483535>.
- “Function Reference.” n.d. *Function Reference Ggplot2*. <https://ggplot2.tidyverse.org/reference>.
- Gelfand, Sharla. 2020. *Opendatatoronto: Access the City of Toronto Open Data Portal*. <https://CRAN.R-project.org/package=opendatatoronto>.
- Government of Canada, Department of Justice. 2015. “Exploring the Link Between Crime and Socio-Economic Status in Ottawa and Saskatoon: A Small-Area Geographical Analysis.” *Executive Summary*. [https://canada.justice.gc.ca/eng/rp-pr/csj-sjc/crime/rr06\\_6/p0.html](https://canada.justice.gc.ca/eng/rp-pr/csj-sjc/crime/rr06_6/p0.html).
- “Know Your Rights.” 2022. *Toronto Police Service :: To Serve and Protect*. <http://torontopolice.on.ca/know-your-rights/faq.php>.
- “Police Violence.” 2021. *Amnesty International*. <https://www.amnesty.org/en/what-we-do/police-brutality/>.
- R Core Team. 2020. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Rouse, J. J. 1985. “Relationship Between Police Presence and Crime Deterrence.” *Relationship Between Police Presence and Crime Deterrence | Office of Justice Programs*. U.S. Department of Justice. <https://www.ojp.gov/ncjrs/virtual-library/abstracts/relationship-between-police-presence-and-crime-deterrence>.
- “The Way Forward.” 2017. *Action Plan: The Way Forward*. Toronto Police Services. <https://www.torontopolice.on.ca/TheWayForward/#>.
- Toronto. 2021. “Open Data Dataset.” *City of Toronto Open Data Portal*. Toronto Police Services. <https://open.toronto.ca/dataset/police-annual-statistical-report-reported-crimes/>.
- Toronto, City of. 2020. “Toronto at a Glance.” *City of Toronto*. <https://www.toronto.ca/city-government/data-research-maps/toronto-at-a-glance/>.