In Depth Analysis of Event Patterns in Crisis Situations*

City of Toronto Data

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First sentence. Second sentence. Third sentence. Fourth sentence.

1 Introduction

Toronto's Person In Crisis lines are an invaluable community asset that provides free, anonymous assistance to people experiencing a serious crisis. The frequency of crisis situations in today's cities, particularly those involving populations at risk (PICs), highlights the need to better understand the dynamics behind such incidents. Over the years, the situation has drastically changed. As stated by Beverly Romeo-Beehler, Before the COVID-19 pandemic hit in 2018 and 2019, the call centre handled over 1.9 million service calls a year, with slightly under 60% of those calls coming from emergency 9-1-1 lines. This is quite a large number of calls being received. He further adds that calls for service fell to 1.7 million in 2020 and then slightly increased to 1.8 million in 2021. During the pandemic in 2020 and 2021, slightly more than 60% of emergency 9-1-1 calls were placed. The call centre received over 5,000 calls a day on average between 2018 and 2021, with nearly 3,000 of those calls being 9-1-1 calls.

The Toronto Police Service is in charge of the system, which is built to handle several kinds of crisis calls, each of which calls for a unique reaction. A variety of event types, including attempt suicide, person in crisis, elopee, jumper, overdose, and threatened suicide, are included in the dataset.The geographical location of the calls according to Toronto's hood_158 system has also been recorded in the year 2014,2015. In this paper, all the neighborhood (Hood_158) data is used as an estimand to get a better understanding of all the hotspots of the PIC calls in Toronto neighborhood. In order to identify significant patterns and trends within the Persons in Crisis calls for help attended dataset, several examination of the interactions between type of events, geographical locations, month, day of the week & time of the day and event-specific

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*Code and data are available at: https://github.com/vanshikav2/Data_Analysis_1.

aspect are used. The focus of this paper is to draw correlation between suicide related event and time of the day or day of the week.The analysis between suicide related events, their frequency and the geographical area of PIC call shows a definitive trend among these factors. The analysis aims to provide insightful information that will improve crisis response system and promote community well-being.

In this data section, various aspects of dataset comparisons are analyzed, and the process of data cleaning used to derive those datasets is discussed. The results section of the paper presents all the results derived from different comparisons and datasets, and their analysis, trends, and understandings are discussed in the discussion section. Lastly, the conclusion section concludes the paper and provides final insights. Cross-referencing sections and subsections is implemented for coherence and clarity.

The remainder of this paper is structured as follows. Section 2….

2 Data

The data used in this paper is derived from the City of Toronto's opendatatoronto Portal(). The dataset is titled 'Persons in Crisis Calls for Service Attended'. Data was cleaned and analyzed using the statistical programming software R (**r?**), and using other libraries such as `tidyverse` (**rTidyverse?**), `ggplot2` (**rGgplot2?**), `dplyr` (**rDplyr?**), `readr` (**rReadr?**), `tibble` (**rTibble?**), `janitor` (**rJanitor?**), `KableExtra` (**rKableExtra?**), `knitr` (**rknitr?**), `ggbeeswarm` (**rggbeeswarm?**), `ggrepel` (**rggrepel?**), and `here` (**rHere?**). Later in this paper, there will be a more thorough explanation of the procedures involved in collecting, cleaning, and analyzing data.

#Some of our data is of penguins (**?@fig-bills**), from Horst, Hill, and Gorman (2020).

```
[1] 291991
```

2.0.1 Person In Crisis for Calls Attended

This dataset is collected and provided by the Toronto Police Service and the dataset was last updated January 11, 2024 as of January 21, 2024. It includes data from year 2014 to 2024. This dataset included event_id, the time,day,month, year of the call, the type of event that occured, if an apprehension after call was made, police division of event, whether an Occurrence was created or not. For the year 2014 and 2015, it also included the calls old and new name of neighbourhood, according to Hood_158 and Hood_140 system, which was left NSA after in order to protect the privacy of the parties. Upon collection of the data, it was cleaned in several different ways to analyse the data fully. The columns of neighbourhood addresses were removed, including division and event id. Please see Table 1 for the sample of this dataset
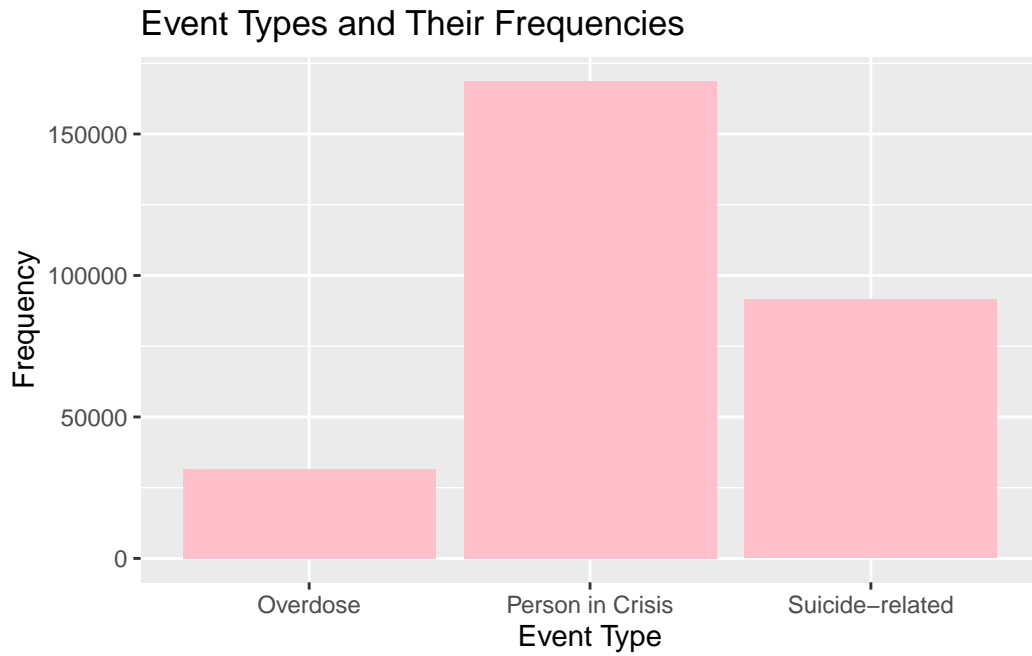
Figure 1: Types of Call Events

Table 1: Sample of Cleaned Person In Crisis for Calls Attended Data

Id	Event Year	Event Month	Event DOW	Event Hour	Event Type	Apprehension made
1	2014	January	Wednesday	9	Suicide-related	No
2	2014	January	Wednesday	2	Person in Crisis	No
3	2014	January	Wednesday	16	Suicide-related	No
4	2014	January	Wednesday	0	Suicide-related	No
5	2014	January	Wednesday	12	Person in Crisis	No

Table 2: Sample of Cleaned Person In Crisis With Hood_158 data

Id	Event Type	Hood_158 Number
1	Suicide-related	168
2	Person in Crisis	124
4	Suicide-related	88
5	Person in Crisis	78
6	Overdose	87

2.0.2 Hood_158 and Type of Event

Moreover, using the same data from Toronto Police Service, it was cleaned differently by deleting all the years after 2015 with no location, time,month,day of the evnt and adding hood_158 column of the data to show the geographical location of the calls in early years. A sample of this dataset can be viewed by Table 2

```
[1] "170"
```

```
[1] "73"
```

```
[1] 858
```

```
[1] "Number of unique values in the 'Category' column: 158"
```

Talk way more about it.

3 Results

3.0.1 Type of Events

From the years 2014 to 2023, Toronto has the highest number of PIC calls for the Person In crisis event which consists of all the different of type of crisis like elopee, jumper, and much more. The second highest category is suicide related which includes both suicide and suicide attempted and is a total of 91501 calls. The last category is Overdose.The total number of calls recorded in this dataset is 291991. The results can be seen Figure 1.

4
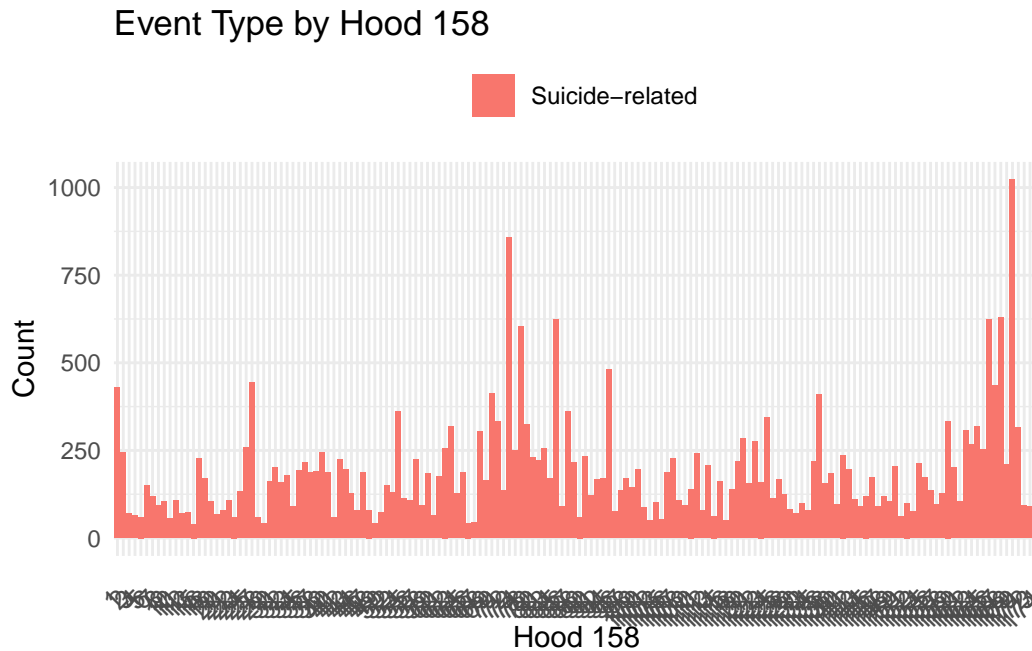
Event Type by Hood 158

Figure 2: Relationship between suicide rate and the neighbourhood

3.0.2 Neighbourhood and Suicide PIC Calls

Figure 2 shows the relationship between neignbourhood and suicide PIC calls. There are around 174 neighbourhoods divided in Hood_158 system and the graph shows around 158 neighbourhoods have reported a PIC call for suicide-related events. The most number of calls were received from Hood 170 which were about 1022 suicide related calls and second most calls from recieved from the area Hood_73 which were around 858 calls. The Hood_170 is Yonge-Bay Corridor area and Hood_73 is Moss Park area in Old City of Toronto.(Toronto neigbourhoods #https://www.toronto.ca/city-government/data-research-maps/neighbourhoods-communities/neighbourhood-profiles/about-toronto-neighbourhoods/)

3.0.3 Suicides and Apprehension made

4 Discussion

4.1 First discussion point

If my paper were 10 pages, then should be be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.
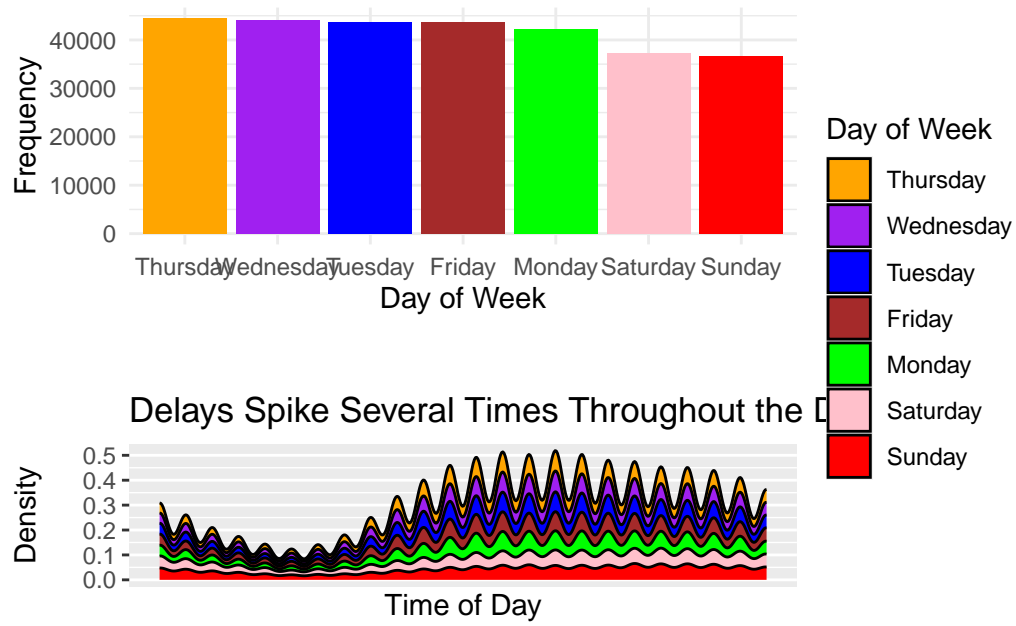
Figure 3: **?(caption)**

4.2 Second discussion point

4.3 Third discussion point

4.4 Weaknesses and next steps

Weaknesses and next steps should also be included.

Appendix

A Additional data details

B Model details

B.1 Posterior predictive check

In **?@fig-ppcheckandposteriorvsprior-1** we implement a posterior predictive check. This shows...

In **?@fig-ppcheckandposteriorvsprior-2** we compare the posterior with the prior. This shows...

Examining how the model fits, and is affected
by, the data

Figure 4: **?(caption)**

B.2 Diagnostics

?@fig-stanareyouokay-1 is a trace plot. It shows... This suggests...

?@fig-stanareyouokay-2 is a Rhat plot. It shows... This suggests...

Checking the convergence of the MCMC
algorithm

Figure 5: **?(caption)**

References

Horst, Allison Marie, Alison Presmanes Hill, and Kristen B Gorman. 2020. *Palmerpenguins: Palmer Archipelago (Antarctica) Penguin Data.* https://doi.org/10.5281/zenodo.39602 18.