

Toronto motor vehicle collisions can be reduced by installing more red cameras*

Toronto motor vehicle collisions can be reduced by installing more red cameras

Alicia Yang

02 February 2022

Abstract

Vehicle collisions occur constantly in big cities. They sometimes could be severe issues when resulting in damage in public and personal properties, injuries, or even death. This report aims to investigate the motor vehicle collisions in Toronto that result in injuries or deaths from 2006 to 2020. By exploring the trend of these traffic collisions in respect of number and location, I find that Implies that ... The data used in this report is obtained from the City of Toronto Open Data Portal, and .

Contents

1	Introduction	2
2	Data	2
3	Model	7
4	Results	7
5	Discussion	7
5.1	First discussion point	7
5.2	Second discussion point	7
5.3	Third discussion point	7
5.4	Weaknesses and next steps	7
	Appendix	8
A	Additional details	8
B	References	9

*Code and data are available at: <https://github.com/Alicia-y/Telling-stories-with-data>.

1 Introduction

As one of the busiest and most modern city in Canada, Toronto constantly faces a large number of citizens, and, inevitably, heavy traffic. The road condition in Toronto is busy most of the time. The vast majority of roads and buildings under construction that take place almost everywhere narrow the roadway of vehicles and turn off traffic lights. Heavy traffic is definitely one of the main reasons behind car accidents, because it increases road rage and encourage the vehicle drivers to make dangerous moves to save time. Vehicle collisions have always brought large financial costs to the involving parties, and even more, they even brought injuries and deaths. The motor vehicle collisions data of Toronto provides a record of the past severe vehicle collisions in Toronto, and with the help of statistical data analysis, it can possibly offer insights on the ways to reduce this type of accident. In this report, This report investigates the motor vehicle collisions in Toronto that result in injuries or deaths from 2006 to 2020, with a focus on the change in the annual number of accidents, frequency of the accidents by district and by type.

However, numbers of annual motor vehicle collisions demonstrate a generally descending trend from 2006 to 2020.

You can and should cross-reference sections and sub-sections. For instance, Section 2. R Markdown automatically makes the sections lower case and adds a dash to spaces to generate labels, for instance, Section 5.1.

2 Data

To investigate the motor vehicle collisions in Toronto, I obtained the dataset “Motor Vehicle Collisions involving Killed or Seriously Injured Persons” from the Toronto Open Data Portal. Provided by the Toronto Police Service, this dataset included all vehicle collisions occurred in Toronto between 2006 and 2020 that result in injuries or deaths.

```
vehicle_collision <- read_csv(here::here("inputs/data/vehicle_collisions.csv")) %>%
  clean_names()
```

```
## Warning: One or more parsing issues, see `problems()` for details
## Rows: 16860 Columns: 54
## -- Column specification -----
## Delimiter: ","
## chr  (43): STREET1, STREET2, OFFSET, ROAD_CLASS, DISTRICT, DIVISION, LOCCOOR...
## dbl  (8): _id, ACCNUM, YEAR, TIME, HOUR, FATAL_NO, HOOD_ID, ObjectId
## lgl  (1): EMERG_VEH
## dtm  (1): DATE
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

Show an extract of the cleaned dataset (Table 1)

```
library(knitr)
vehicle_collision <- read_csv(here::here("inputs/data/vehicle_collisions.csv")) %>%
  clean_names()
```

```
## Warning: One or more parsing issues, see `problems()` for details
## Rows: 16860 Columns: 54
## -- Column specification -----
## Delimiter: ","
## chr  (43): STREET1, STREET2, OFFSET, ROAD_CLASS, DISTRICT, DIVISION, LOCCOOR...
```

Table 1: Extracting the first ten rows from the Motor Vehicle Collisions data

Year	Street1	Street2	Collision location	Neighbourhood
2006	BLOOR ST W	DUNDAS ST W	At Intersection	High Park North (88)
2006	BLOOR ST W	DUNDAS ST W	At Intersection	High Park North (88)
2006	MORNINGSIDE AVE	SHEPPARD AVE E	At Intersection	Rouge (131)
2006	MORNINGSIDE AVE	SHEPPARD AVE E	At Intersection	Rouge (131)
2006	EGLINTON AVE E	COMMONWEALTH AVE	NA	Eglinton East (138)
2006	EGLINTON AVE E	COMMONWEALTH AVE	NA	Eglinton East (138)
2006	EGLINTON AVE E	COMMONWEALTH AVE	NA	Eglinton East (138)
2006	OSSINGTON AVE	DUNDAS ST W	At Intersection	Trinity-Bellwoods (81)
2006	OSSINGTON AVE	DUNDAS ST W	At Intersection	Trinity-Bellwoods (81)
2006	ISLINGTON AVE	DIXON RD	At Intersection	Kingsview Village-The Westway (6)

```
## dbl    (8): _id, ACCNUM, YEAR, TIME, HOUR, FATAL_NO, HOOD_ID, ObjectId
## lgl    (1): EMERG_VEH
## dtm    (1): DATE

##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
vehicle_collision %>%
  select(year, street1, street2, accloc, neighbourhood) %>%
  slice(1:10) %>%
  kable(
    caption = "Extracting the first ten rows from the Motor Vehicle Collisions data",
    col.names=c("Year", "Street1", "Street2", "Collision location", "Neighbourhood"),
    linesep = "", digits = 1, booktabs=TRUE)
```

Table 1 shows

```
ggplot(mapping = aes(x = year), data=vehicle_collision) +
  geom_bar()
```

Data cleaning

```
vehicle_collision <- vehicle_collision %>%
  drop_na(street1) %>%
  drop_na(street2) %>%
  drop_na(accloc) %>%
  drop_na(neighbourhood)

ggplot(mapping = aes(x = year, fill=accloc), data=vehicle_collision) +
  geom_bar()
```

```
## Warning: It is deprecated to specify `guide = FALSE` to remove a guide. Please
## use `guide = "none"` instead.
```

Talk more about it.

Also bills and their average (Figure 4). (Notice how you can change the height and width so they don't take the whole page?)

```
## Warning: It is deprecated to specify `guide = FALSE` to remove a guide. Please
## use `guide = "none"` instead.
```

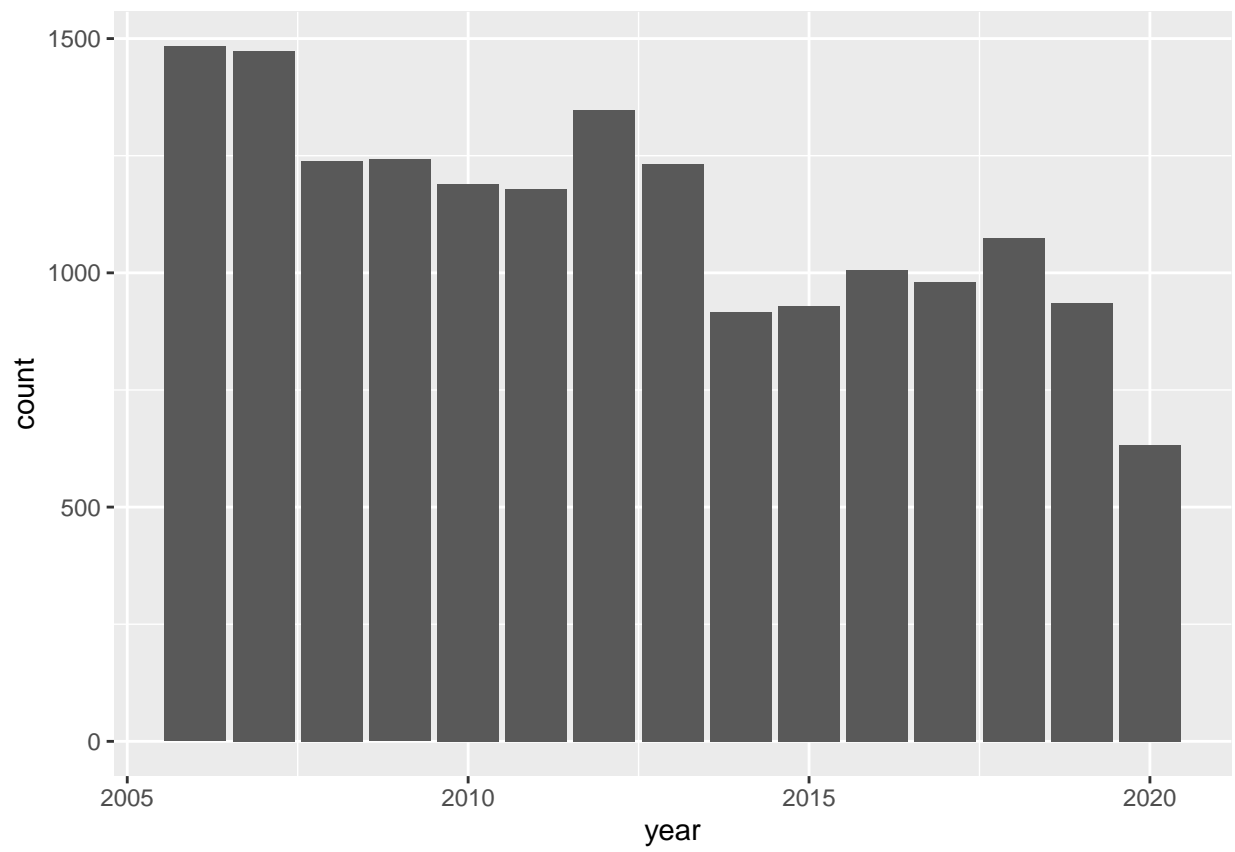


Figure 1: Comparing the number of traffic collisions each year from 2006 to 2020

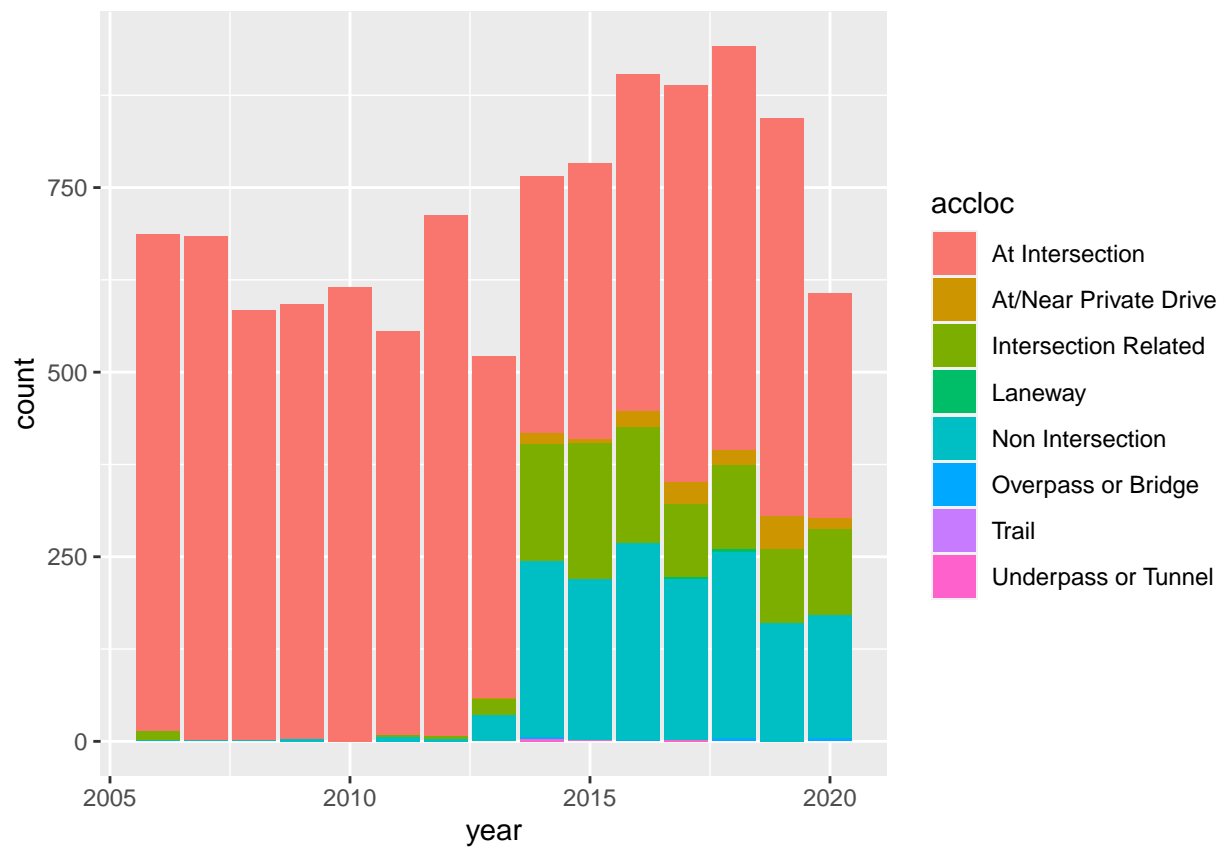


Figure 2: Comparing the location of traffic collisions each year from 2006 to 2020

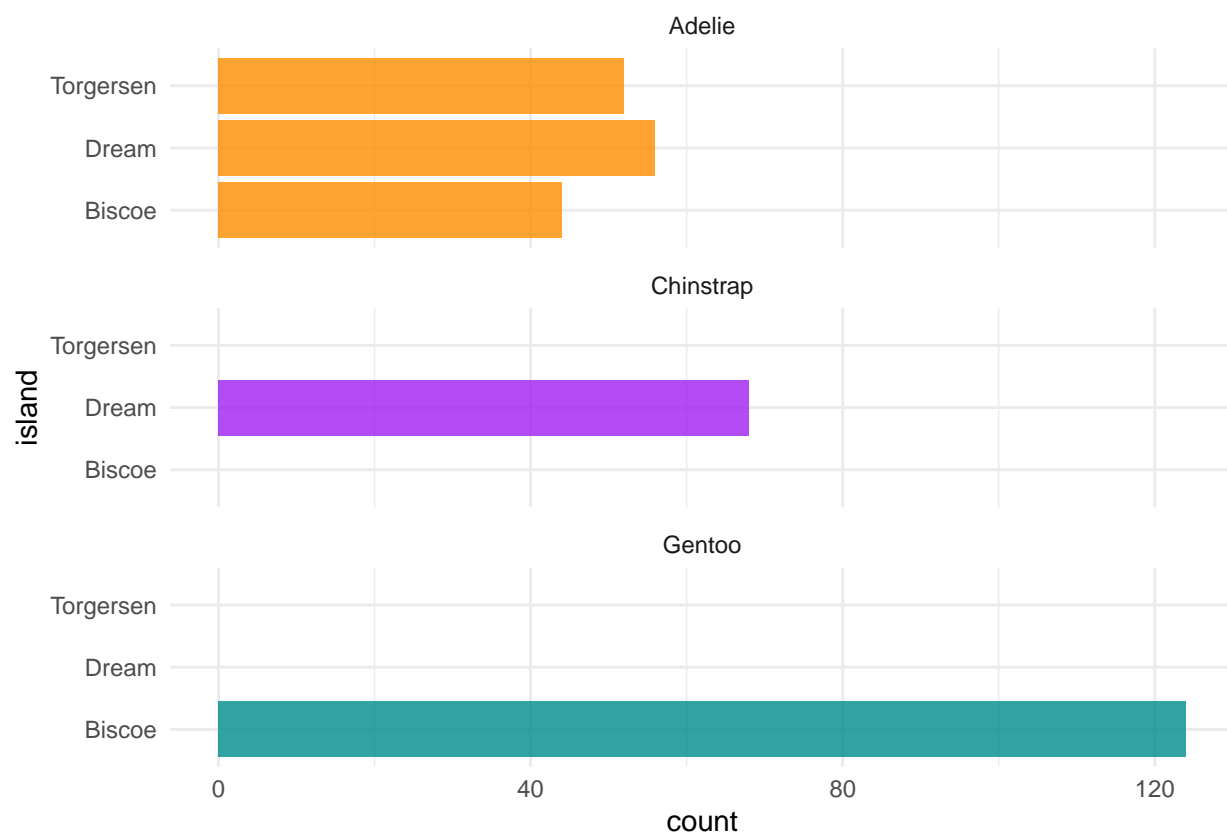


Figure 3: Bills of penguins

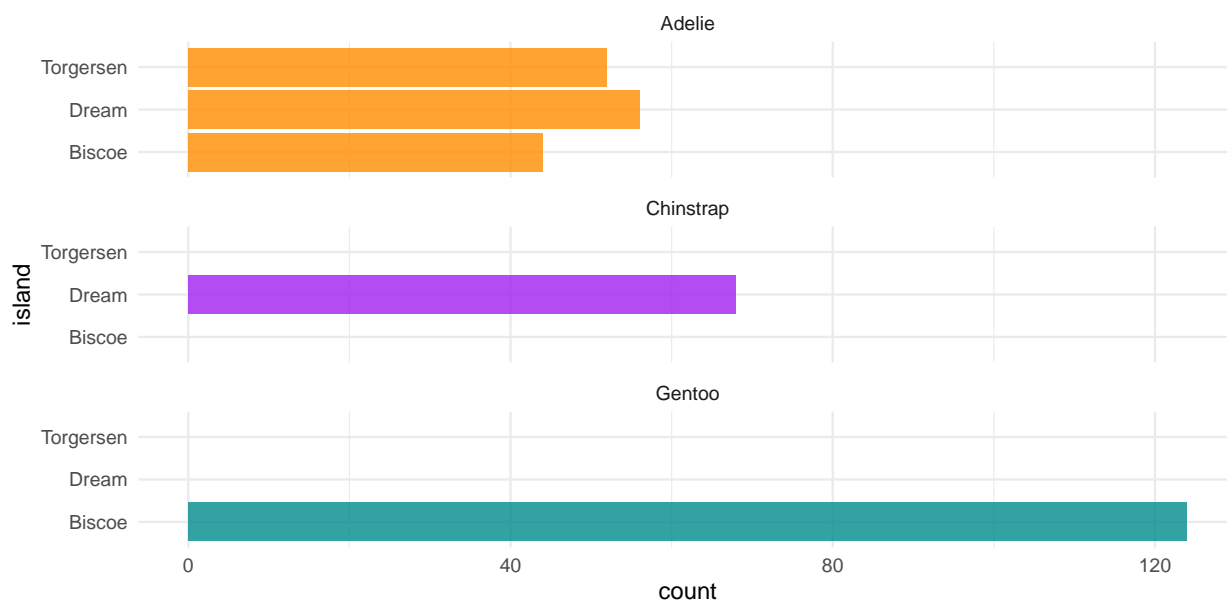


Figure 4: More bills of penguins

Talk way more about it.

3 Model

$$Pr(\theta|y) = \frac{Pr(y|\theta)Pr(\theta)}{Pr(y)} \quad (1)$$

Equation (1) seems useful, eh?

Here's a dumb example of how to use some references: In paper we run our analysis in **R** (R Core Team 2020). We also use the **tidyverse** which was written by Wickham et al. (2019) If we were interested in baseball data then **(???)** could be useful.

We can use maths by including latex between dollar signs, for instance θ .

4 Results

5 Discussion

5.1 First discussion point

If my paper were 10 pages, then should be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

5.2 Second discussion point

5.3 Third discussion point

5.4 Weaknesses and next steps

Weaknesses and next steps should also be included.

Appendix

A Additional details

B References

Yihui Xie (2021). knitr: A General-Purpose Package for Dynamic Report Generation in R. R package version 1.37.

<https://newcanadianlife.com/why-does-toronto-have-so-much-traffic/>

R Core Team. 2020. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.

Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, et al. 2019. “Welcome to the tidyverse.” *Journal of Open Source Software* 4 (43): 1686. <https://doi.org/10.21105/joss.01686>.