Does Technology Advancement Decrease Distracted Driving?*

Harrison Huang

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Distracted driving is often a leading factor of traffic accidents. Using data from OpenDataToronto, this paper will look at how the improvements of technology over the years from 2016 contribute to the number of distracted driving violations. This analysis discovered with technology improving year by year, the overall trend of distracted driving is showing a decreasing trend.

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*Code and data are available at: https://github.com/lemonface88/Distracted-Driving-Analysis

Table 1: Sample of Cleaned ticket Statistics Data

Year	Offence Type	Age Group	Ticket Count
2021	Distracted Driving	Adult	3
2021	Distracted Driving	Adult	5
2021	Distracted Driving	Adult	4
2021	Distracted Driving	Adult	1
2015	Distracted Driving	Adult	158

1 Introduction

As technology is improving everyday year by year, does it help us reduce distracted driving cases or does it increase the distractions in our surroundings? Distracted driving has been the root of many traffic accidents and caused many unfortunate events since personal handheld devices were introduced. With the advancement of technology, how has this been improved or has it worsened? To examine the impact of distracted driving in our everyday life, I will use the ticket data from open toronto specifically looking at distracted driving tickets, and infer the number of distracted driving occurrences from the ticket data.

2 Data

Data used in this paper are retrieved from Open Data Toronto Portal through the library `opendatatoronto` (Gelfand 2022). Data was cleaned and analyzed using the open source statistically programming language R (R Core Team 2023), using functionalities from `tidyverse` (Wickham 2023), `ggplot2` (Wickham, Chang, et al. 2023), `dplyr` (Wickham, François, et al. 2023), `readr` (Wickham, Hester, and Bryan 2024), `tibble` (Müller and Wickham 2023), `janitor` (Firke 2023), and `knitr` (Xie 2023). Details of the data extraction and cleaning processes are discussed in the subsections below.

2.1 Below is a table of the cleaned and filtered table of all distracted driving data

The table is a representation of the selected columns that remain in the data set after cleaning. This table gives insight to the first 5 rows that are left in the distracted driving tickets handed out.

2.2 Violations by age groups

So what about distracted driving violations? To dive deeper into to the data analysis, the table is then separated into a table that only includes either all youth violations or adult violations.

Table 2: Sample of Cleaned youth distracted driving

Year	Ticket Count
2014	2
2014	1
2014	1
2014	2
2014	2

Table 3: Sample of Cleaned adult distracted driving

Year	Ticket Count
2014	41
2014	1
2014	10
2014	4
2014	156

Table 2 is the version that only includes youth distracted driving data, and Table 3 is the other version that only includes distracted driving.
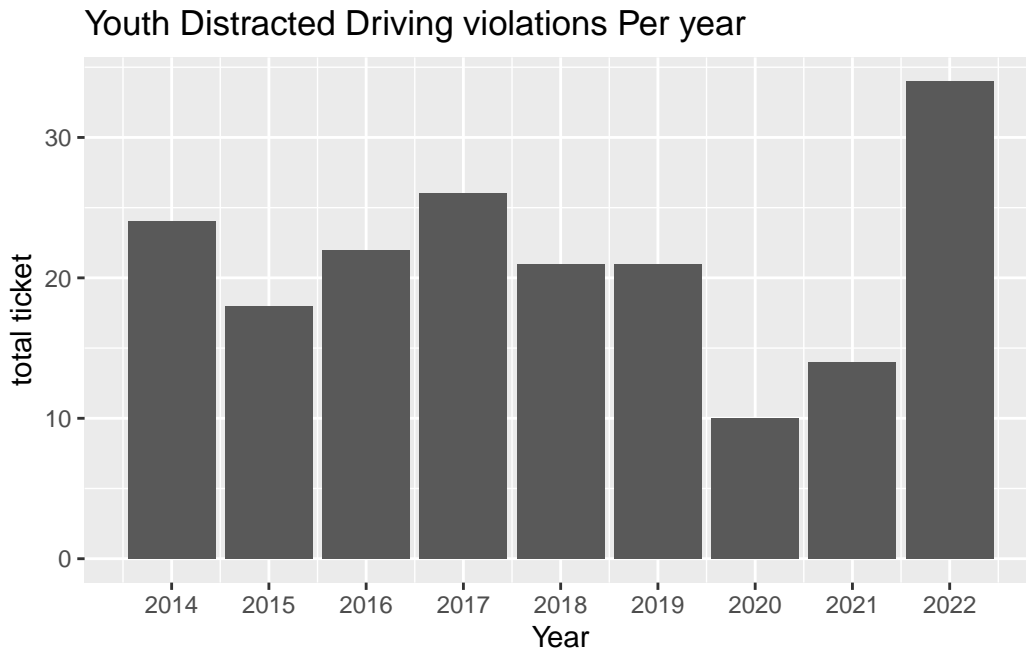
3 Results

3.1 Violations by youth group per year

The graph below shows the total distracted driving violations cases in each year, which is inferred from the total number of tickets given for distracted driving. Overall, the trend sees a big dip in the year 2020 and 2021, this could be due to the effect of covid. As we all know, the lock down that happened during the pandemic prevented people from leaving the house, thus might have caused the overall decrease in the number of violations in those years.

```
only_youth_data |>
summarize(sum_per_year = sum(ticket_count, na.rm = TRUE),.by = offence_year) |>

ggplot(mapping = aes(x = offence_year, y = sum_per_year))+
geom_bar(stat= 'identity') +
scale_x_continuous(breaks =c(2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022))+
labs(title = "Youth Distracted Driving violations Per year", x = "Year", y = "total tick
```

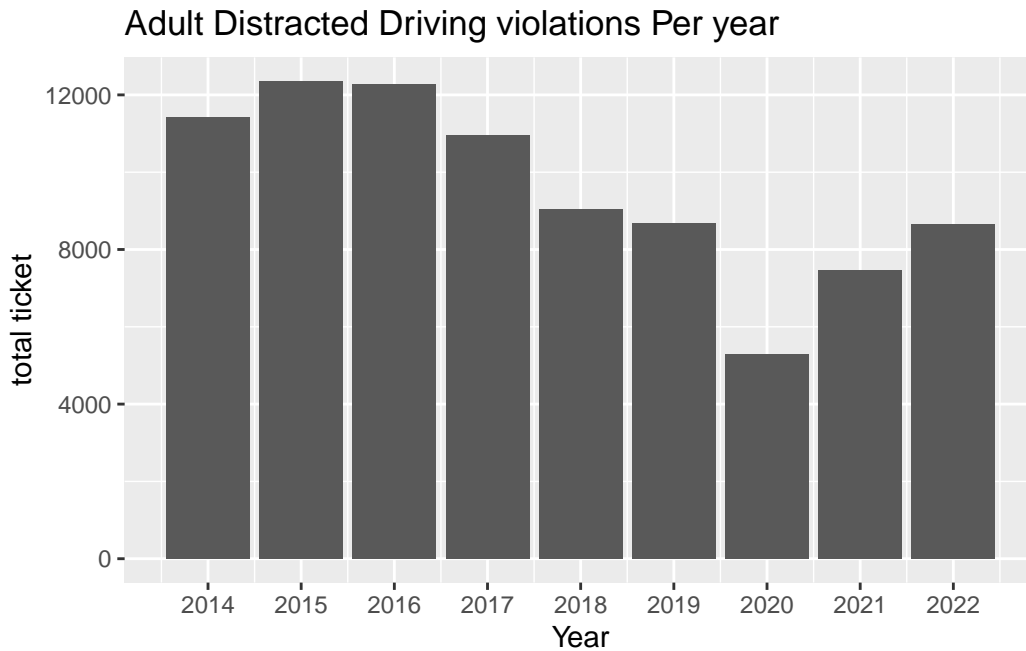# Youth Distracted Driving violations Per year

3.2 Violations by adult group per year

The graph below shows the total distracted driving violations cases committed by adults in each year, which is inferred from the total number of tickets given for distracted driving. Overall, the trend sees a big dip in the year 2020 and 2021, this displays a similar trend as the youth drivers. With the two groups of driving having overall lower violations in the year 2020 and 2021, it could suggest that those years might have some other contributing factors involved other than the advancement of technology.

```
only_adult_data |>
summarize(sum_per_year = sum(ticket_count, na.rm = TRUE),.by = offence_year) |>

ggplot(mapping = aes(x = offence_year, y = sum_per_year))+
geom_bar(stat= 'identity') +
scale_x_continuous(breaks =c(2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022))+
labs(title = "Adult Distracted Driving violations Per year", x = "Year", y = "total tick
```

Adult Distracted Driving violations Per year

3.3 Overall violation by both groups per year

Upon looking at the summary, the graph below shows the total distracted driving violations cases committed by both adults and youth in each year, which is inferred from the total number of tickets given for distracted driving. As absorbed above, 2020 and 2021 both indicate a big decrease in violation numbers compared to all the other years. However, by combining both of the you and adult data, the overall trend observed is that distracted driving violations have steadily decreased during 2015 to 2019. Despite the numbers increasing again in 2022, the total violations compared to 2015 is still less by about 4000 cases.

```
sum_total_data |>
ggplot(mapping = aes(x = offence_year, y = total_violations))+
geom_bar(stat= 'identity') +
scale_x_continuous(breaks =c(2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023)
labs(title = "Both Groups Distracted Driving violations Per year", x = "Year", y = "tota
```

Both Groups Distracted Driving violations Per year
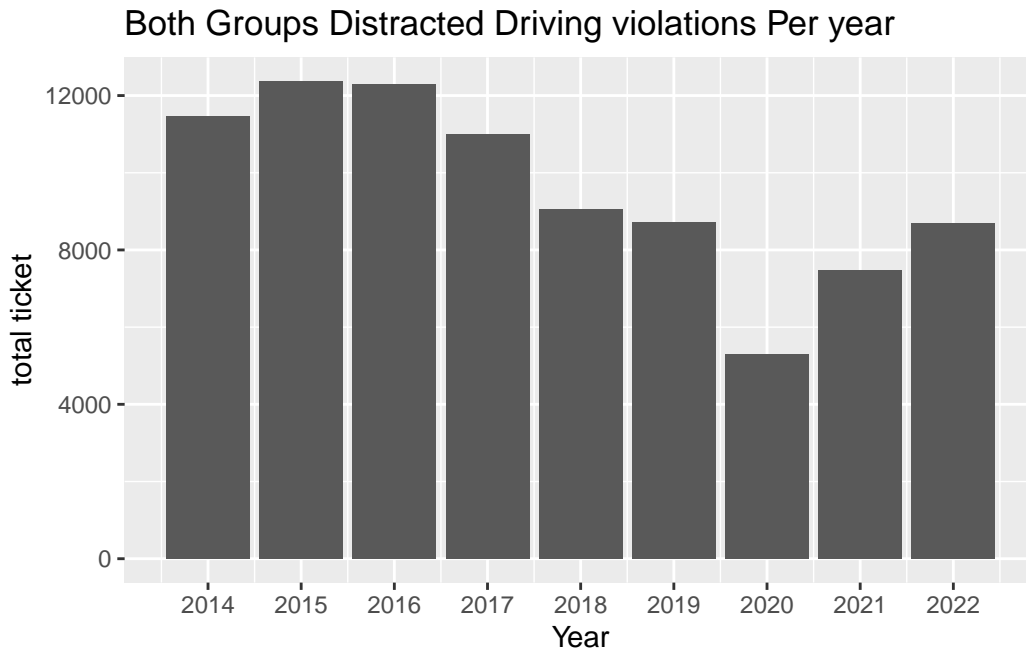
4 Discussion

Simply looking at the numbers of distracted driving tickets, the data shows an overall trend of decreasing occurrences. However, the youth group and adult groups show a slightly different trend with the youth group not showing a clear decreasing trend. A worthy mention is that the amount of youth data could be contributing to the different trend, because there is very little youth data compared to the adult data. In the future, it would be worthwhile to look at other data sets such as integrated technology trends such as how many models of cars have car play or support handless controls. # Conclusion Overall, the paper examines the number of distracted driving occurrences from 2014 to 2022. Adults show a steady decrease in occurrence with a jump back up in 2022, and the youth data on the contrary shows a steady increase of distracted driving cases. Both data show a dip in 2020 and 2021 with a jump back up in 2022. When looking at the data with both youth group and adult group, we do see an overall decreasing trend of distracted driving cases. With the big jump in 2022, tech companies should look into how to integrate driving and technology better to continue the decreasing trend in the future.

References

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