Toronto's Covid-19 Impact: Effect of Age and Gender on Outcomes*

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The Covid-19 Pandemic caused irreparable damage to the infrastructure of our global systems, highlighting the neccessity to better understand factors that influence health outcomes. This paper uses data from OpenDataToronto to investigate how age and gender affects outcomes of those infected with the virus. xyz about results

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*Code and data are available at: https://github.com/dhruv5423/Covid19-R-Project

1 Introduction

The Covid-19 Pandemic has had an unimaginable effect on human lives around the globe. As of April 13, 2024, Worldometer Info estimates that over 704 million people worldwide have contracted the virus, resulting in approximately 7 million deaths (Worldometer 2024). In Canada alone, there have been almost 4.6 million reported cases and more than 38,000 deaths as of July 20, 2024 (Government of Canada 2024).

While these statistics paint a harrowing picture of the human toll inflicted, the pandemic has exacerbated existing economic inequalities, destabilized political systems, and put immense pressure on societal infrastructure globally. Looking past the immediate health crisis, lockdowns and restrictions have had immeasurable impacts not only on global supply chains, but also on the mental heatlh of many forced to quarantine or self isolate.

An article by Fortune valued the economic burden on the US Economy to be upwards of $14 Trillion USD at the end of 2023 (Lacapra 2023). While this figure mainly took into account the 'standard economic effects' of the pandemic - revenue lost due to mandatory business closures, decreases in air travel, and workplace absences - the article noted that there were many unobservable factors that were incredibly burdernsome to the economy, such as long term physical and mental health effects of the pandemic on the population.

Covid-19 has been found to have varying effects across demographics. A 2020 article published in the PLOS Journal found that 'Covid-19 may be associated with worse outcomes in males than in females'. The article found that men are up to 22% more likely to require ICU admission.

Moreover, an article published in the Springer Link Journal in 2021 found that older adults, in particular those above the age of 65, face higher mortality rates than their younger counterparts. Weaker immune systems, and the higher likely presence of other conditions can exacerbate the effects of the virus.

Understanding how demographic variables like age and gender affect outcomes related to contracting viruses is increasingly important in the shaping of future policies and health measures. This paper aims to analyse the differences in outcomes for various age groups and genders among Covid-19 cases in Toronto, in an effort to contribute to deepening our understanding of the risk factors that may impact the lives of those with Covid-19, and possibly in future pandemics as well.

The remainder of this paper is structured as follows. Section 2 discusses Section 3 xyz Section 4 xyz.

2 Data

We use R Core Team (2023) and Wickham et al. (2019).

2.1 Data Selection

Data used in this report was sourced from OpenDataToronto's portal. Gelfand (2022). More specifically, the dataset "Covid-19 Cases in Toronto" was used and cleaned for the purposes of this report. Toronto Public Health (TPH) released anonymized, person-level data from the start of the pandemic in January 2020. The data spans from the first reported case on in January of 2020 to February 14th, 2024. In a statement on the website for this dataset, OpenDataToronto states that "As case and outbreak management guidelines changed and COVID-19 specific resources were no longer funded, the level of detail available for cases decreased, and more recent data are less complete and not comparable to previous years. TPH discontinued the production of this report with the final refresh as of February 14, 2024" City of Toronto (2024)

2.2 Raw Data

In it's original form, the dataset contains more than 414,000 entries regarding information on cases of Covid-19 in Toronto. Below are two tables with the first three rwos of the raw data, separated into two tables for readability.

Table 1: COVID-19 Case Raw Data

X_id	Outbreak.Associated	Assigned_ID	Age.Group	Neighbourhood.Name	FSA	Source.of.Infection	Classification
1	NO	1	50 to 59 Years	Willowdale East	M2N	Travel	CONFIRMED
2	NO	2	50 to 59 Years	Willowdale East	M2N	Travel	CONFIRMED
3	NO	3	20 to 29 Years	Parkwoods-Donalda	M3A	Travel	CONFIRMED

Table 2: COVID-19 Case Raw Data Part 2

Episode.Date	Reported.Date	Client.Gender	Outcome	Ever.Hospitalized	Ever.in.ICU	Ever.Intubated
2020-01-22	2020-01-23	FEMALE	RESOLVED	No	No	No
2020-01-21	2020-01-23	MALE	RESOLVED	Yes	No	No
2020-02-05	2020-02-21	FEMALE	RESOLVED	No	No	No

(Table Separated using Tips from (Stack Overflow 2015) and LLMs)

2.3 Data Cleaning

Table 3: COVID-19 Case Cleaned Data Part 2

x_id	age_group	client_gender	reported_date	ever_in_icu	ever_hospitalized	ever_intubated	outcome
1	50 to 59 Years	FEMALE	2020-01-23	No	No	No	RESOLVED
2	50 to 59 Years	MALE	2020-01-23	No	Yes	No	RESOLVED
3	19 and younger	MALE	2020-02-04	No	No	No	RESOLVED
4	20 to 29 Years	FEMALE	2020-02-21	No	No	No	RESOLVED
5	60 to 69 Years	FEMALE	2020-02-25	No	No	No	RESOLVED

2.4 A Note on Measurement

- gold data quality
- updates on funding/measurement changes + discontinuation
- likely many unreported cases

3 Results

3.1 Cases over Time

Figure 1 displays the progression of COVID-19 cases in Toronto from January 2020 to March 2024.
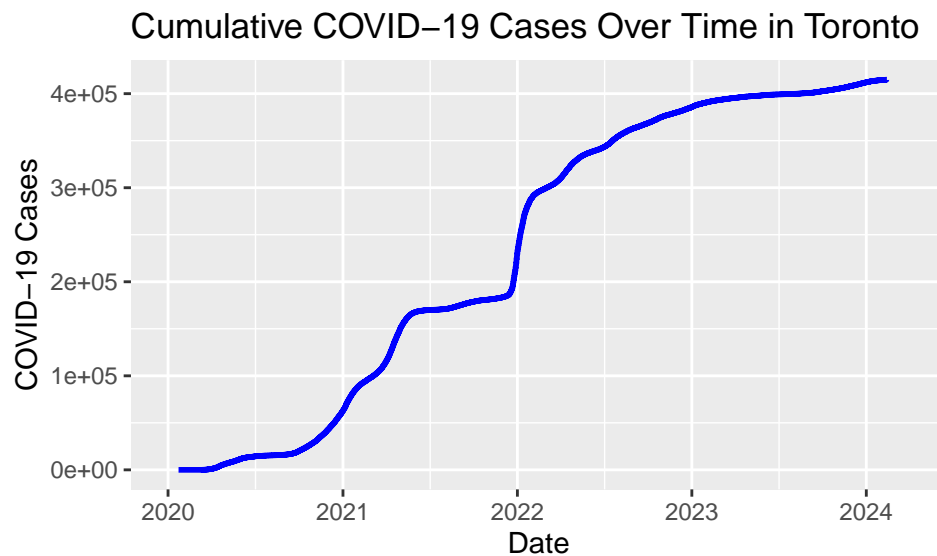

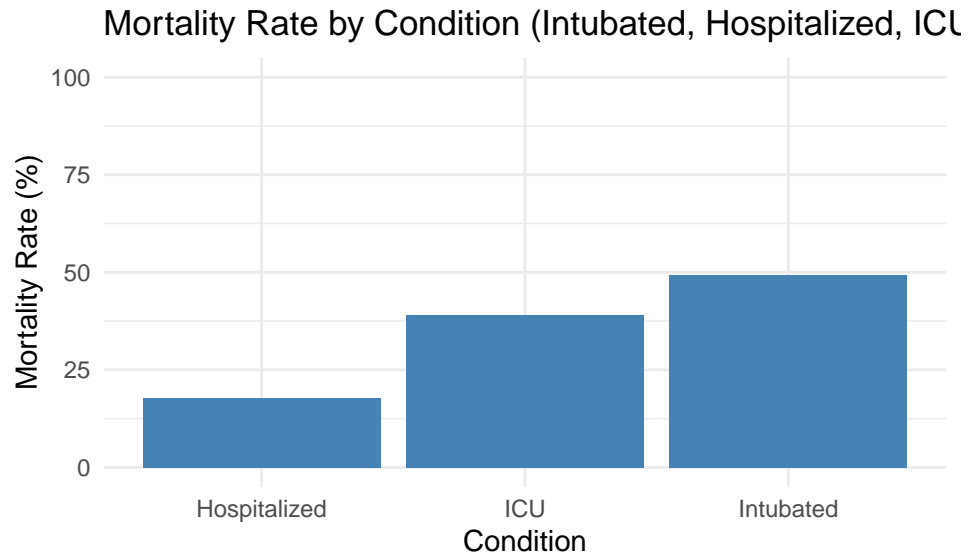Figure 1: COVID-19 Case Progression Over Time, Toronto

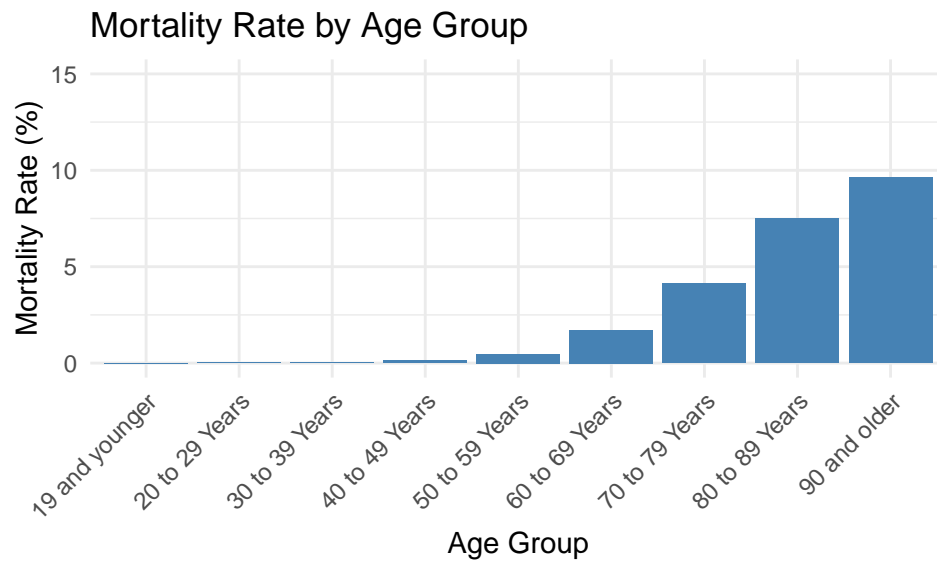Figure 2: Level of Hospitalisation vs Mortality Rates

3.2 Age vs Outcomes

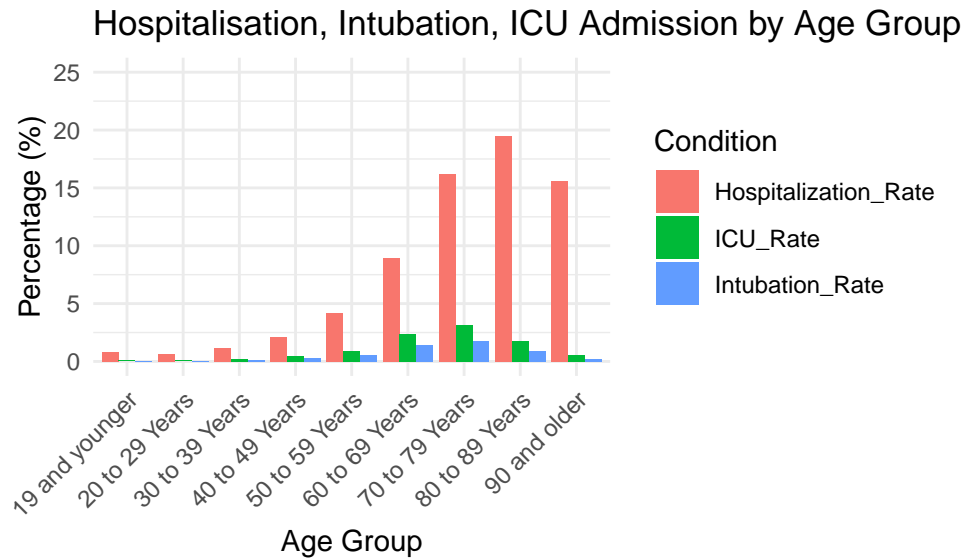Figure 3: Age Group vs Mortality Rates

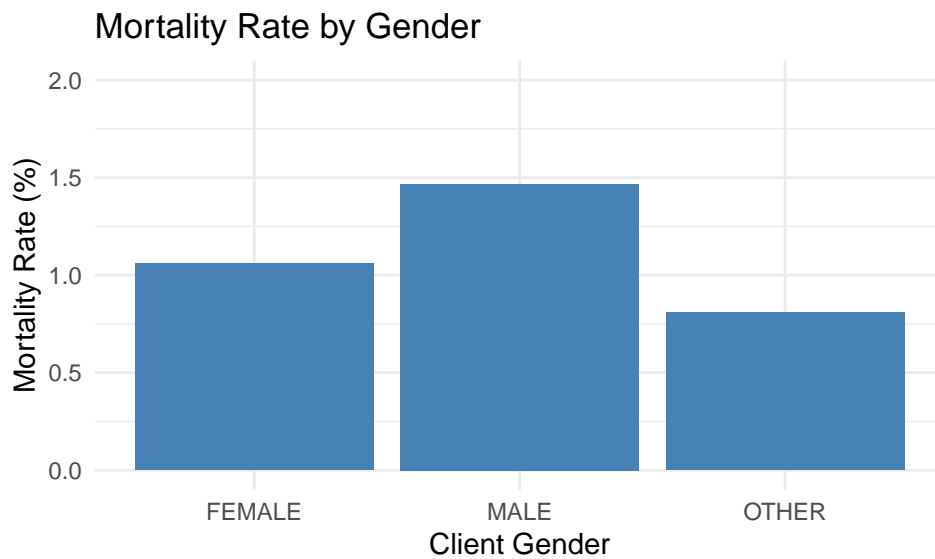Figure 4: Chance of Hospitalisation by Age Group

3.3 Gender vs Outcomes

Figure 5: COVID-19 Mortality by Gender

4 Discussion

4.1 Effect of Age on Outcomes

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.

4.2 Effect of Gender on Outcomes

4.3 Broader Discussion and Takeaways

4.4 Weaknesses and next steps

Weaknesses and next steps should also be included.

5 LLM Disclosure

References

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