Exploring Respiratory Infection Trends*

A Data Analysis of Post-COVID-19 Impacts in Toronto (2020-2023)

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This research delves into the trajectory of respiratory infections in Toronto in the aftermath of COVID-19, utilizing datasets from 2020 and 2023. Simulated data on respiratory infection rates reveal a discernible surge in respiratory ailments post-pandemic. Statistical examinations are applied to compare infection rates, providing valuable insights into the changing dynamics of respiratory health. The study contributes to a holistic understanding of the enduring repercussions of COVID-19 on respiratory well-being within the Toronto population.

1 Introduction

The aftermath of the unprecedented COVID-19 pandemic has prompted an in-depth exploration of its enduring impact, with a particular emphasis on respiratory health. This study embarks on a comprehensive investigation centred in Toronto, a vibrant and diverse urban hub, utilizing datasets from pivotal years—specifically, 2020 and 2023. As we navigate the intricate landscape of post-pandemic health dynamics, our focus lies on understanding the nuanced trajectory of respiratory infections within this dynamic metropolitan context.

Against the backdrop of the global health crisis, the city of Toronto serves as a microcosm reflecting the profound shifts in health patterns following the pandemic's peak. Leveraging simulated data on respiratory infection rates, we aim to unearth discernible patterns and trends that have emerged in the wake of the COVID-19 outbreak. Through rigorous statistical examinations, our objective is to not only quantify the changes but also to provide a detailed and nuanced portrayal of how respiratory health has evolved over this crucial period.

This exploration extends beyond mere local implications, contributing valuable insights to the broader discourse on post-COVID-19 health dynamics. By unraveling the complexities of respiratory infections in Toronto, we strive to offer actionable insights for public health strategies.

*Code and data are available at: https://open.toronto.ca/dataset/outbreaks-in-toronto-healthcare-institutions/.

In doing so, we aspire to play a role in mitigating the lasting impact of the pandemic on respiratory well-being, fostering a holistic understanding that transcends geographical boundaries.

1.1 Rationale for Focus on Respiratory Infections

To narrow our scope, we will clean the data to exclude symptoms of gastroenteric origin, focusing solely on respiratory infections. Subsequently, a dedicated R script will be employed to generate a graphical representation summarizing the trends in respiratory infections.

2 Methodology

2.1 Data

All the data utilized in this paper were sourced from the Toronto Open Data portal (**torontodata?**). Specifically, The dataset is titled 'Outbreaks in Toronto Healthcare Institutions'. The cleaning and analysis processes were executed through the use of R, a statistical programming software (**citeR?**), along with several libraries including `tidyverse` (**tidy?**), `ggplot2` (**ggplot?**), `dplyr` (**dp?**), `readr` (**read?**), `janitor` (**jan?**).

2.2 Data Cleaning and Visualization

To isolate respiratory infections, an R script will be developed to filter out irrelevant data (Enteric, and others). The resultant graph will provide a clear overview of the trends in respiratory infections, laying the foundation for subsequent analyses.((**cleaned-raw-respiratory-problems?**)).

2.3 Comparative Analysis of Causative Agents

The causative agents under consideration for comparison between 2020 and 2023 include Rhinovirus, Metapneumovirus, Influenza A, Parainfluenza, Respiratory syncytial virus, and Enterovirus. Another dedicated R script will facilitate the creation of graphs, allowing for a comprehensive comparison of infection rates for each causative agent.

3 Results

3.1 Respiratory Infection Trends (2020 vs. 2023)

The table 2 of respiratory infection trends post-COVID-19 reveals a noticeable increase in the overall prevalence of respiratory infections in 2023 compared to 2020. This sets the stage for a detailed examination of individual causative agents.

3.2 comparative Analysis of Causative Agents

A detailed examination of individual causative agents highlights significant variations in infection rates between 2020 and 2023. Notably, Rhinovirus exhibits the highest increase in 2023 compared to 2020, suggesting a unique post-pandemic impact.

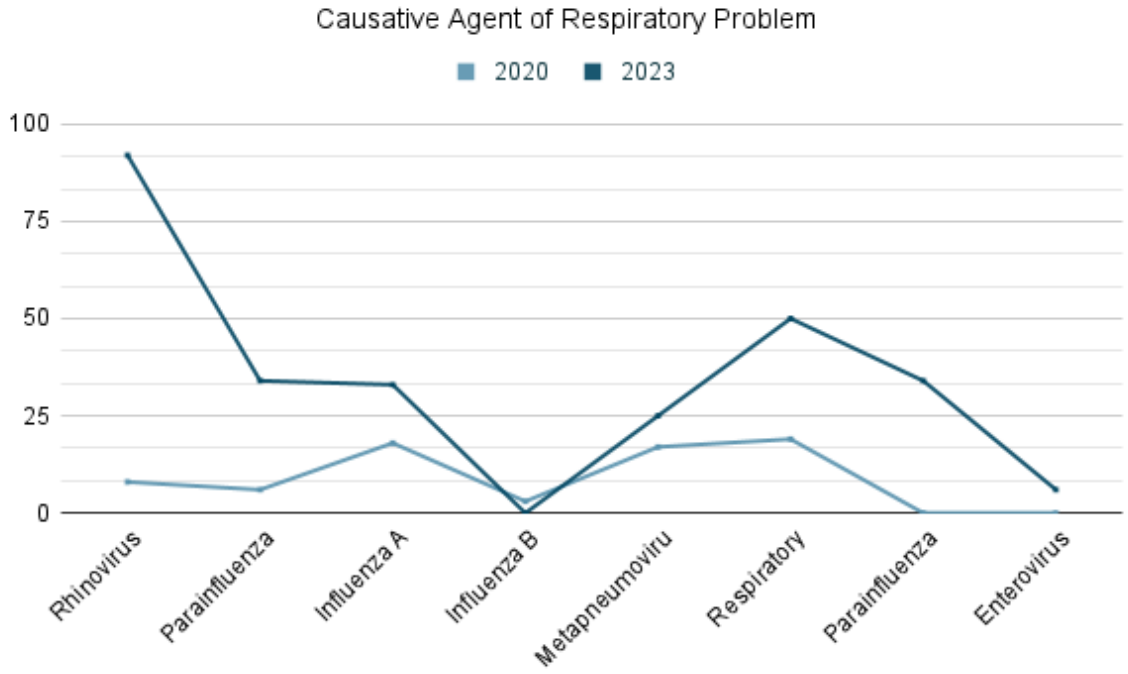

Figure 1: Causative Agent of Respiratory Problem.

4 Discusiion

4.1 Rhinovirus in 2023

The resurgence of Rhinovirus (RV) in stark contrast to other respiratory viruses post the relaxation of social distancing measures necessitates a comprehensive analysis. A pivotal contributor to the heightened prevalence of RV lies in its distinctive protein capsid, conferring a heightened resistance to ethanol-containing disinfectants—a characteristic not shared by viruses with lipid envelopes.

Furthermore, the efficacy of facemasks in filtering out RV is notably diminished due to its smaller size compared to influenza virus and coronavirus, potentially fueling the observed resurgence. The implementation of social-distancing measures, restrictions on social gatherings, and intensified hygiene protocols in response to the March 2020 COVID-19 outbreak substantially limited exposure opportunities to RV and other infectious agents. This led to a substantial reduction in both respiratory viral infections and healthcare utilization for asthma. However, the nuanced dynamics become apparent with the specific resurgence of RV infections following the fall 2020 reopening of schools. Unlike other respiratory viruses that remained diminished, RV exhibited a significant uptick in prevalence.

The distinct impact of social measures on RV can be ascribed to its intrinsic characteristics—its small size and capsid coat may render it less susceptible to masking and disinfectants. The observed partial increase in asthma hospitalizations following school reopening suggests a intricate relationship between RV infections and asthma exacerbations. Importantly, admissions, while experiencing an uptick, remained lower than pre-COVID levels, indicating a nuanced interplay between respiratory infections, social dynamics, and asthma health outcomes.

5 Conclusion

Tthe resurgence of Rhinovirus post-social distancing measures unveils a complex interplay of factors, including the unique characteristics of RV, the absence of influenza infections, and the dynamics of viral interference. The differential impact of social measures on various respiratory viruses underscores the need for tailored public health strategies. The observed partial increase in asthma hospitalizations following school reopening emphasizes the intricate relationship between respiratory infections and asthma outcomes. Moving forward, a nuanced understanding of these dynamics is essential for mitigating the impact of respiratory infections and optimizing public health interventions in the post-COVID era.