

An analysis of outbreak management in Toronto Health Institutions from 2020 - 2022*

Julie Nguyen

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Outbreak management has always been one of the most important mission for healthcare institutions, not only to prevent transmissions of diseases/illnesses but also to protect public health. Especially in the COVID-19 era, outbreak response and management is considered as the top priority in healthcare institution operation. This paper discusses the big picture of outbreak management in Toronto health institutions from 2020 to 2022, as well as pointing out the relationship between healthcare setting, outbreak type and outbreak response.

1 Introduction

In the previous years, a lot has been learned with regards to the COVID-19 pandemic. With the unprecedented cases increase of different diseases, the responsibility for outbreak response and management in healthcare institutions has become more important than ever before. Outbreak management helps stop the further transmission of illnesses/diseases by identifying the source and implementing control measures.

In order to protect and improve public health, the Toronto Public Health works with healthcare institutions to prevent and control institutional outbreaks, including the use of best practices in infection prevention control. Healthcare institutions are required to monitor staff and patients/residents for signs and symptoms of gastroenteric and respiratory infections under the Ontario Health Protection and Promotion Act (HPPA) (Gelfand (2022)). The institutions must also actively seek, detect and report suspected and/or confirmed outbreaks to their local public health unit.

In the following paper, I will delve into the Outbreaks in Toronto Healthcare Institutions in the previous years to shed light on the differences and trends in reacting to outbreaks. According to opendatatoronto (Gelfand 2022), an outbreak is defined as “a localized increase (e.g. in an institution, or a specific ward or floor within an institution) in the rate of infection or illness, above that which is expected.” I will first guide you through the data collection and analyzing process, which will be explained thoroughly in Section 2. Then I will visualize the data and explain the implications of the data, finally draw some limitations and conclusions of this data set.

*Code and data are available at: <https://github.com/julieenguyennn/Outbreak-Management-in-Toronto-Health-Institutions>

2 Data

2.1 Source

All the data used in this paper was obtained from the City of Toronto Open Data Portal and is titled “Outbreaks in Toronto Healthcare Institutions”. The dataset is published by Toronto Public Health and is refreshed weekly, with the latest refresh on Jan 19, 2023. The data provided on the portal include subsets of data from the year 2003 to the time of writing, which is 2023. For each year, the dataset displays each observation’s details, namely:

1. Outbreak setting: the type of facility, in terms of the type of healthcare provided
2. Type of Outbreak: The mode of transmission classification description of the outbreak
3. Causative & Etiological Agent: the aetiological agent(s) that have been identified from one or more outbreak-related cases
4. Date Outbreak Began & Date Declared Over
5. Active Status
6. Institution Name & Address

2.2 Methodology

Based on the dataset, I first generated some questions that this paper aim to answer to gain a better understanding of outbreak management over the COVID-19 in Toronto health institutions, specifically:

- (1) What type of outbreak was the most encountered by the institutions during the period?
- (2) Which setting was more prone to expect an outbreak?
- (3) How was the response rate for each type of outbreak in each setting?

In order to answer those questions, I chose the 03 dataset that lies in the COVID-19 era - 2020, 2021, and 2022, to analyze, compare, and contrast. During the process, all the necessary libraries and packages, tidyverse (Wickham et al. 2019), janitor (Firke 2021), ggplot2 (Wickham 2016), RColorBrewer (Neuwirth 2022), and kableExtra (Zhu 2021), are utilised.

3 Discussion

To comprehend the context, I first observed the total cases that were recorded. Throughout the period, there was a total of 2080 cases reported to experience an outbreak, with a surge from 2021 to 2022. In particular, Toronto health institutions underwent 553 cases in 2020, 394 cases in 2021, and 1133 cases in 2022. (Table 1)

Table 1: Total number of outbreaks from 2020 - 2022

Year	No. of Outbreak
2020	553
2021	394
2022	1133

Looking deeper into these outbreaks, it is obvious that Respiratory diseases remain the major type of outbreak throughout the period, with a surge of approximately 700 cases from 2021 to 2022. While Enteric and other types of outbreak only account for a very small proportion of the outbreaks in total, these two types also remain constant throughout the period. See Figure 1 for illustration.

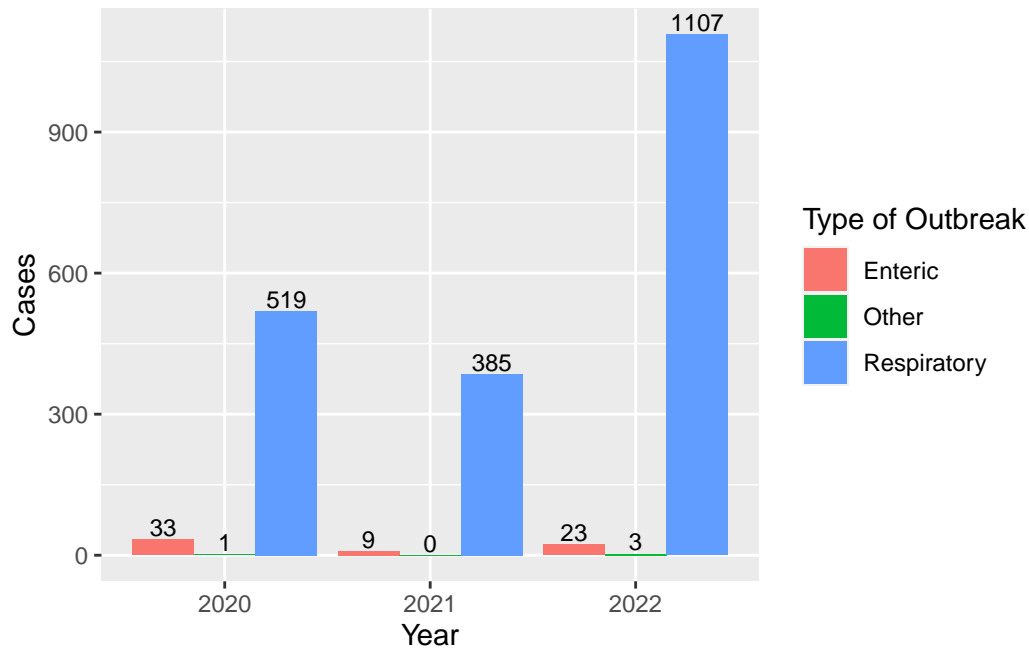


Figure 1: Outbreaks occurred in 2020 - 2022 by type

When examining the correlation between the outbreak type and the setting, it is noticed that the majority of outbreaks happened in Long-term Care Housings (LTCH). In 2020, those LTCHs witnessed 20 cases of Enteric outbreak and 296 cases of Respiratory outbreak. In 2021, the number of outbreak dropped down to 187 cases in both type, while that of in 2022 increased to more than 450 cases. A notable detail to point out is that other types of outbreak only occurred in the Acute Care division of the hospitals. In 2022, Toronto also encountered the emergence of outbreak in Transitional Care with 9 cases. It is also noticeable that the hospital settings ceased to report cases for Enteric type of outbreak from 2021, on the other hand received more cases on respiratory diseases. (?@tbl-setting)

	2020	2021	2022
Enteric			
Hospital-Acute Care	6	NA	NA
Hospital-Chronic Care	1	NA	NA
LTCH	20	7	18
Retirement Home	6	2	5
Other			
Hospital-Acute Care	1	NA	3
Respiratory			
Hospital-Acute Care	75	102	245
Hospital-Chronic Care	48	47	177
Hospital-Psychiatric	9	3	17
LTCH	296	180	459
Retirement Home	91	53	200
Transitional Care	NA	NA	9

Another significant aspect in outbreak response is the numbers that the outbreak is controlled. In this case, I calculated the average days that each type of outbreak are controlled by the settings, which is counted by days, as shown in [?@tbl-responserate](#). A limitation when looking into the duration that outbreak was controlled is that I only chose the observations that were successfully controlled by the end of 2022. In general, the LTCH had the highest response time with an average of 32 days in 2020, 35 days in 2021 followed by Retirement Home with 27 days in 2020 and 31 days in 2021.

	2020	2021	2022
Enteric			
Hospital-Acute Care	9	NA	NA
Hospital-Chronic Care	7	NA	NA
LTCH	12	6	10
Retirement Home	15	19	14
Other			
Hospital-Acute Care	27	NA	32
Respiratory			
Hospital-Acute Care	18	18	15
Hospital-Chronic Care	20	21	15
Hospital-Psychiatric	20	20	15
LTCH	32	35	23
Retirement Home	27	31	20
Transitional Care	NA	NA	22

4 Conclusion

Overall,

Through `?@tbl-setting` and `?@tbl-responserate`, I can conclude that one aspect that leads to longer response time is the number of cases reported in that setting. However, in 2022, although there were only 03 cases in experiences other types of outbreak but it took an average of 32 days to control them. Therefore, the number of cases doesn't account for the amount of time that the outbreak can be controlled. It is influenced by other aspects, such as human resources, supplies, environmental conditions, and systems, etc. - which was not mentioned in this dataset by Gelfand (2022).

Reference

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