

City of Toronto's Response to Homelessness during the COVID-19 Pandemic*

Analyzing Shelter Occupancy, Capacity, and Adaptability in the City of Toronto

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This paper studies the trends in shelter occupancy across Toronto from 2017 to 2020, including the impact of the COVID-19 pandemic on the homeless population. Utilizing data sourced from the Open Data Toronto portal, patterns of shelter utilization among various demographics are analyzed. The findings reveal a significant increase in shelter occupancy during outbreak of the pandemic. The data indicates that the local shelters maintained effective utilization rates and responded to the needs by increasing capacity. The paper highlights key insights into the adaptability of the shelter system in meeting the necessities of the homeless population and potentially contribute to the effectiveness of local government's responses to the issue regards homelessness.

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*Code and data are available at:https://github.com/MaggieZ111119/CityofToronto_Daily_Shelter_Occupancy.Rproj.git

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1 Introduction

Homelessness remains a persistent issue across Canada, including in Toronto(Gaetz (2010)). s one of the country’s largest cities, Toronto faces ongoing challenges in assisting individuals who, primarily due to poverty, cannot afford housing and struggle to meet basic needs(Jadidzadeh and Kneebone (2018)). The City of Toronto operates a network of shelters catering to men, women, youth, and families, making it essential to balance the availability of these services with demand. Monitoring shelter occupancy trends with capacity is crucial for identifying resource gaps and developing effective policies to address the needs of homeless populations.

This paper analyzes shelter occupancy data from 2017 to 2020 in the City of Toronto, sourced from the Open Data Toronto Portal Gelfand (2022). By examining occupancy trends during this period, particularly during the COVID-19 pandemic, we aim to evaluate how effectively the city’s shelters met the increased demand. Our focus on specific sectors within the shelter system will help determine which groups were disproportionately affected and shed light on the system’s adaptability in response to the crisis, particularly in addressing issues of overcrowding in family shelters.

By studying the shelter occupancy data from 2017 to 2020 across four cities, key findings emerged. There was an increase in shelter occupancy from late 2019 to early 2020, which coincided with the onset of the COVID-19 pandemic, particularly in Scarborough, which was observed to have higher than usual capacities of sheltering service during that period. Despite the rise in shelter use, the utilization rates remained high, indicating that the shelters were effectively meeting demand without being overburdened. The government’s timely increase in shelter capacity during the pandemic was especially evident. Over Capacity sheltering experience exists, in Toronto’s shelters for families, but it likely resulted from flexible accommodation arrangements rather than systemic flaws. Overall, the shelter system demonstrated well adaptability and support for homeless populations during this period.

The remainder of this paper is presented in sections: Section 2 :Data, Section 3 :Results, Section 4 :Discussion, and Section 5 :Limitation and Next Steps. The data section introduces the dataset used for analysis, explaining its source and the context that shaped its collection. This section thoroughly summarizes the data using visualizations created with `ggplot2` (Wickham et al. (2024)) and tables produced with `knitr` (Xie (2024)), also with `gridExtra` (Auguie (2017)) to help formatting. Key variables chosen for the analysis, along with the reasoning

behind their selection, are explained. The results section presents the findings drawn from the data, highlighting patterns in shelter occupancy and compare to its availability. Followed by the discussion section, which explores the implications of these findings, particularly in relation to resource allocation and policy development, offering insights into how Toronto’s shelter system responded to increasing demand.

2 Data

All data reviewed and analyzed in this paper comes from the Daily Shelter Occupancy, by Toronto Shelter & Support Services (2022), on Open Data Toronto Portal Gelfand (2022). This data is essential for evaluating how shelters serve various populations (e.g., men, women, youth, families) and for analyzing the shelter service system during and after the pandemic, including capacity shortfalls or surpluses. It provides information on all active shelters in the City of Toronto, collected in four separate datasets corresponding to the years 2017, 2018, 2019, and 2020.

2.1 Overview

Each dataset includes characteristics of the shelters. The data was sourced from the Open Data Toronto Portal Gelfand (2022), with each row representing a unique entry for a specific sector of a specific shelter on a specific date. Each entry has a unique row identifier, “_id”, for the Open Data database. The collection process records information about the name of the non-profit organization responsible for the shelter, the name of the facility (e.g., hotel, residential building), and its capacity to accommodate homeless individual. Capacity is measured by the number of beds or mats/cots available. Data is collected at 4:00 AM each day to record the number of homeless clients occupying the shelters. This consistent method provides a accurate snapshot of shelter use across all organizations.

Other similar datasets, especially another one published by Toronto Shelter & Support Services, were considered; however, they did not provide the cross-sector view of both occupancy and capacity needed for this analysis. The selected dataset allows for broad comparisons across time (importantly covering the period of the pandemic outbreak) and sectors within different cities, providing a more comprehensive picture of trends within the shelter system.

2.2 Feature Selection and Aggregation

This analysis focuses on several key features. The variables of interest include the city (“SHELTER_CITY”) where the shelters are located, the date of data recording (“OCCUPANCY_DATE”), the sector (“SECTOR”) of clientele served by the shelters (e.g., men, women, youth, families, and co-ed), as well as the shelter’s capacity (“CAPACITY”) and

occupancy (“OCCUPANCY”) levels. These variables were selected for their relevance in examining shelter occupancy and capacity across different cities and sectors, with a particular emphasis on the City of Toronto from 2017 to 2020.

The dataset also includes seven additional detailed features: “ORGANIZATION_NAME”, which is the registered name of the entity in charge; “SHELTER_NAME”, the name of the shelter sit; “SHELTER_ADDRESS”, the address of the shelter, “SHELTER_PROVINCE”, which are all Ontario in this case; “SHELTER_POSTAL_CODE”, the postal code of the shelter; “FACILITY_NAME”, the name of the facilities taking in homeless clients; and “PROGRAM_NAME”, which means the name of actual programs or services within the facility. The R programming language R Core Team (2023), the `janitor` Firke (2023), `tidyverse` Wickham (2023), and `dplyr` Wickham et al. (2023) packages are used in data simulation, downloading, cleaning, and writing test. were utilized for data simulation, downloading, cleaning, and writing tests for data. No new variables were created for this analysis. The data was aggregated by grouping observations by city, date, and sector, enabling a more comprehensive comparison across cities and sector groups in the duration of time. A random sample of the cleaned data is presented in Figure 1.

Table 1: Sample of Cleaned Shelter Data

occupancy_date	shelter_city	sector	total_occupancy	total_capacity
2020-09-27	Toronto	Women	370	511
2017-07-11	Toronto	Men	1741	1801
2019-08-30	Toronto	Families	2949	3177
2017-04-30	Toronto	Women	680	697
2018-04-04	Toronto	Families	2535	2661

Figure 1: Sample of Cleaned Shelter Data

2.3 Data Breakdown

As shown in Figure 2, the data includes observations from four cities: Toronto, Etobicoke, North York, and Scarborough. The recorded sectors encompass Co-ed (mixed), Families, Men, Women, and Youth. Notably, the Youth age group is represented across all cities, as well as being the only population recorded in Etobicoke and North York. Toronto, with the highest number of observations, includes an equal number of sectors, but the distribution of individuals within the total population is unclear. This aspect will be addressed in the following sections.

The following table Figure 3 summarizes the average, maximum, and minimum occupancy and capacity quantity for each city. Toronto has the highest number of shelters available by

Table 2: Number of Observations by City and Sector

shelter_city	Co-ed	Families	Men	Women	Youth	Sum
Etobicoke	0	0	0	0	1461	1461
North York	0	0	0	0	1461	1461
Scarborough	1461	0	569	632	207	2869
Toronto	1461	1461	1461	1461	1461	7305

Figure 2: Number of Observations by City and Sector

looking at the capacity; as well as the with greatest amount of individuals utilizing them. The maximum occupancy in Toronto, across all sectors from 2017 to 2020, reached 6,803 people, while Etobicoke had only 53 individuals occupying shelters. The fact that Etobicoke recorded homeless individuals solely within the Youth group provides some explanation, but the significant difference still implies that the homeless population in Toronto is much larger as compared to other cities.

Table 3: Statistics for Homeless Shelter Occupancy by City

City	Average Occupancy	Max Occupancy	Min Occupancy	Average Capacity	Max Capacity	Min Capacity
Toronto	5443.37577	6803	3001	6042.49281	7241	4460
North York	64.50650	73	20	67.36345	73	32
Scarborough	159.58727	564	60	178.18549	577	67
Etobicoke	48.06913	53	20	50.81383	53	33

Figure 3: Statistics for Homeless Shelter Occupancy by City

The relationship between two key features, occupancy and capacity, is essential for understanding the shelter service system for the period 2017 to 2020, as well as proposing possible improvements for the current system. This relationship is illustrated by Figure 4. Occupancy and capacity show a good following to positive correlation, indicating that there is not much over-investment in the shelter system, nor are shelters heavily over-occupied. However, few noticeable deviations from perfect correlation suggest presence where occupancy exceeds capacity, indicating that some individuals in homeless condition may be accomading in over-crowded shelters Further discussions on trends in the shelter service system and how this data reflects the homeless population will be presented in Section 3.

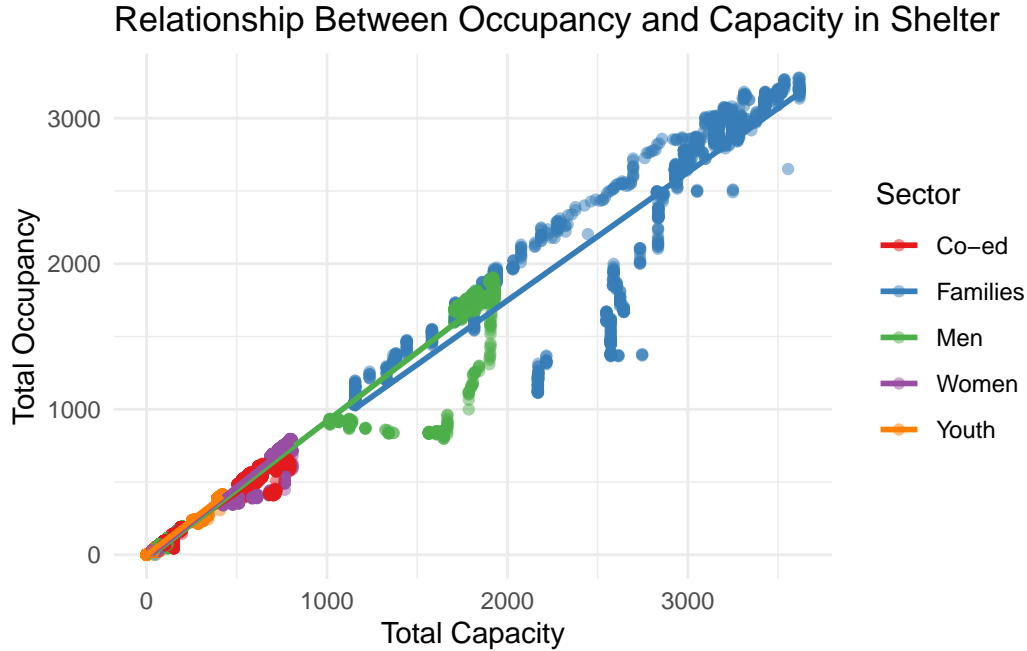


Figure 4: Relationship Between Total Occupancy and Total Capacity in Shelter of the City of Toronto

3 Results

Through a graphical and numerical analysis of the dataset, some valuable insights into shelter system usage are uncovered. By visualizing the trends over time and studying data across different demographics and time, we can try to figure out how various factors influence the utilization and performance of shelter services. This section will delve into the findings, highlighting patterns and variation that emerged from the data. Additionally, we will discuss the implications of these results for working to address the living needs of homeless populations.

3.1 Shelter Occupancy Trend Over Time

The figure Figure 5 depicts the trend of homeless people occupying shelters in each city over time. A noticeable peak in occupancy is observed across all four cities between late 2019 and early 2020. Especially, there is an rising trend in Scarborough. This rise coincides with the outbreak of COVID-19, as noted in the “About Daily Shelter Occupancy” section in the data website Toronto Shelter & Support Services (2022). The decrease in occupancy from mid-2020 across all cities further supports this correlation, suggesting the pandemic had a direct impact on shelter use.

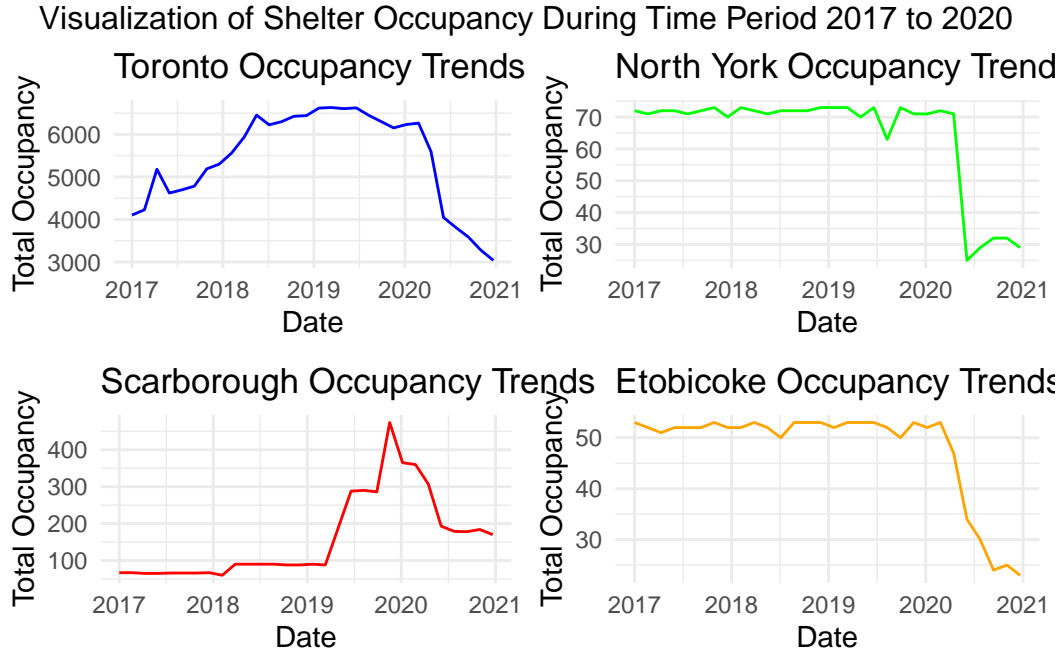


Figure 5: Visualization of Shelter Occupancy During Time Period 2017 to 2020

3.2 Shelter Utilization Analysis

The Utilization Rate as being calculated as:

$$\text{Utilization Rate} = \left(\frac{\text{Number of Occupancy}}{\text{Number of Capacity}} \right) \times 100\%$$

As shown in Figure 6, Toronto almost consistently has the lowest utilization rate compared to the other cities over four years, although the rates remain relatively high. This suggests that shelter services are well-used and not over-invested, meaning that the shelters are indeed serving the homeless population effectively. Despite an increase in occupancy around the end of 2019, utilization rates decreased during this period, likely due to an increase in available shelter spaces provided during the COVID-19 pandemic, suggested in Figure 5. This indicated that more shelter are timely provided, the government are providing larger amount of shelter than usual during pandemic. This is particularly evident in Scarborough, where a sharp increase in shelter capacity is visible at the end of 2019 and the start of 2020. Refers to Figure 7 to observe more capacity changes in shelters over time.

3.3 Over Capacity Cases

The relationship between occupancy and capacity over the four years (Figure 4) reveals instances where shelter capacity was exceeded, as we discussed in the Data section (Section 2).

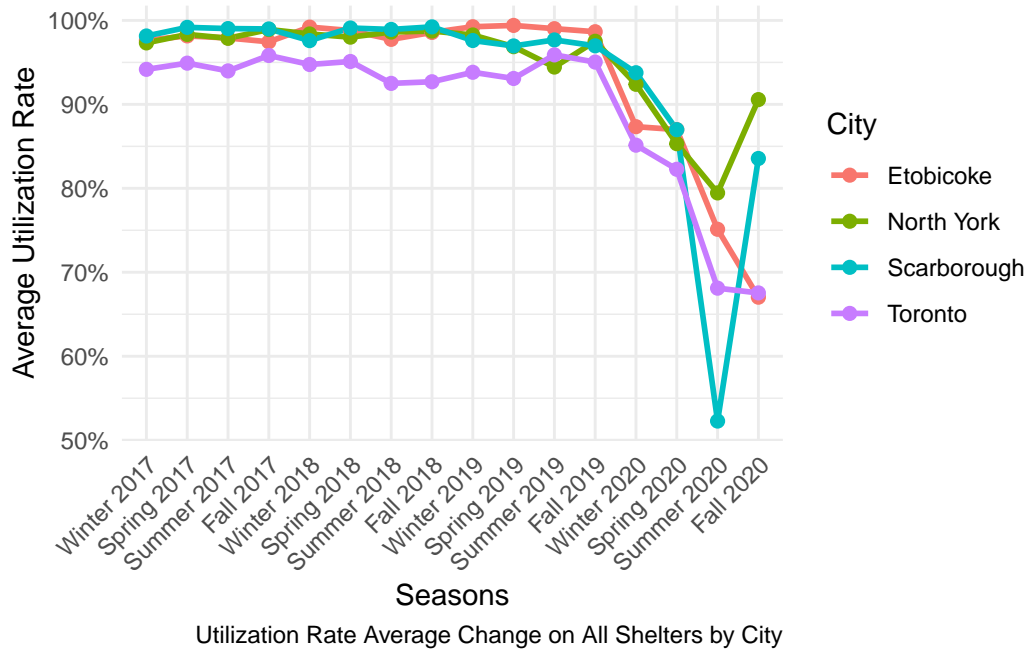


Figure 6: Yearly change in Utilization Rate Average on All Shelters by City (2017-2020)

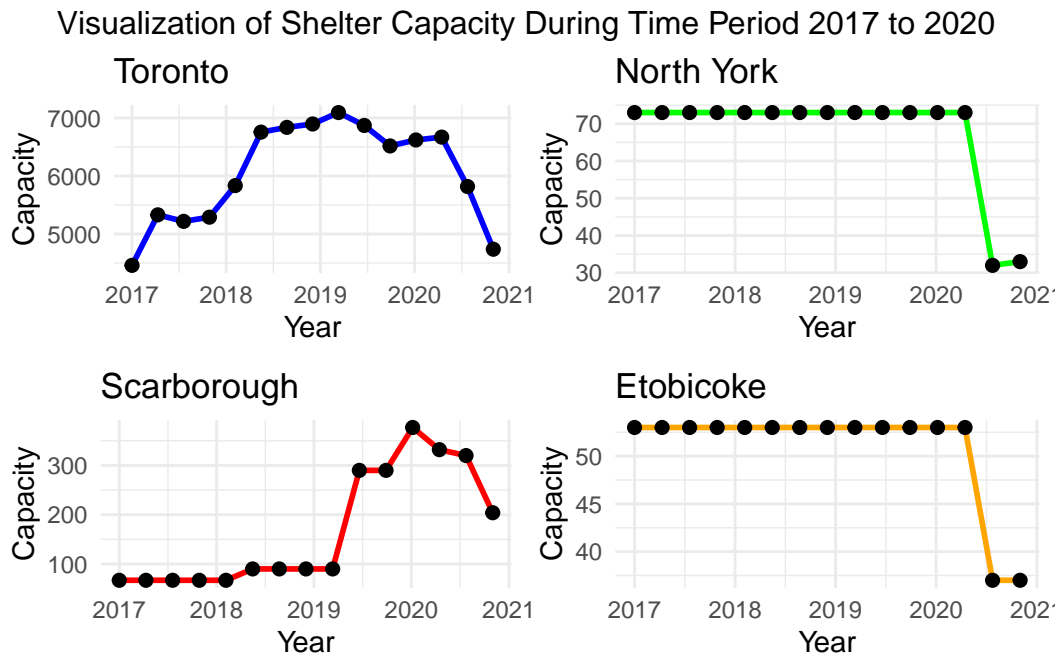


Figure 7: Shelter Capacity During Time Period 2017 to 2020 of Cities

These cases where capacity is exceeded (when *occupancy* > *capacity*) are important to study when considering improvement shelter system improvement. By further investigation of the data, these overcrowded cases are primarily observed in the Families sector in Toronto (see Figure 8). Other sectors did not experience overcapacity, indicating that the shelter services were generally adequate. The possible overcrowding experience that happens to the Families sector may not necessarily reflect poor shelter conditions, as it could result from families being assigned to rooms with slightly fewer beds than their family size would suggest. For example, children might share beds (Toronto Shelter & Support Services (2022)), which does not indicate a systemic issue in shelter management.

Table 4: Overcrowded Cases by City and Sector

shelter_city	Families	Youth	Co-ed	Men	Women
Toronto	87	0	0	0	0
Etobicoke	0	0	0	0	0
North York	0	0	0	0	0
Scarborough	0	0	0	0	0

Figure 8: Overcrowded Cases by City and Sector

4 Discussion

4.1 Shelter service evaluation

Based on the findings, particularly from the utilization rate data Figure 6, the shelter service system in the City of Toronto appears to be well-structured. Utilization rates consistently fall within the 90%-100% range, indicating that shelters are effectively supporting the homeless population.

4.2 COVID-19 Impact

The occupancy of shelters reached its peak around winter 2019 to early 2020, as seen in Figure 5. This increase is likely linked to the COVID-19 pandemic, as shelters saw heightened demand. After this peak, occupancy dropped significantly. Suggesting the efforts by local governments to provide additional resources during the pandemic. The government intention to support homeless population is presented by higher capacities of living resources provided (see Figure 7). These might be through higher capacities of existing shelters or adding in new shelters.

5 Limitation and Next Steps

COVID-19 has significantly impacted homeless populations, and the effort to meet their needs continues even five years after the outbreak. This data provides evidence of government support during the pandemic, but it is not enough to evaluate the effectiveness of shelter services and other government support for people living in homelessness. More rigorous research is required. The decreased utilization rate during the COVID outbreak may indicate that more individuals are experiencing severe challenges, preventing them from accessing shelters. Furthermore, it is insufficient to comment on the current state of government support since this data only goes up to 2020.

Understanding the development and importance of support services among people experiencing homelessness is essential. Moreover, a critical issue is how this support should be delivered. It is important to provide assistance without disrupting individuals' lives, for instance, by avoiding practices that displace or isolate them from their communities, such as relocating them to shelters far from their usual support systems (Boucher et al. (2022)). This is a long journey to go.

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