

Seasonal Variations in Mortality Rates Among Shelter Residents in Toronto: Is Winter the Deadliest Season?*

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This study explores Toronto winters' influence on the mortality rates among sheltered residents, utilizing data from 2007-2023. I explore how cold weather impacts those in shelters by drawing upon previous research highlighting increased risks for homeless populations during colder months. I find that mortality rates in spring, summer, and fall are similar, while winter shows slight increases compared to the other seasons. This finding suggests while homeless shelters do help to lower the risk of death in winter, further measures should be taken to protect sheltered individuals against cold weather.

1 Introduction

Homelessness is a persistent issue in Canada, with Toronto fostering the largest population of homeless individuals in the country (Blair 2024). On any given night, an estimated 10,000 people in Toronto are without a permanent home (Blair 2024), with many relying on Toronto shelters for safety and warmth. Despite the city of Toronto providing shelters for these homeless people, sheltered residents still face many health risks.

Previous research has shown that homeless populations are at an increased risk of mortality from cold temperatures, particularly during the winter months (Romaszko and Cymes 2017). This paper aims to explore seasonal variations in mortality rates among shelter residents in Toronto between 2007 and 2024. By comparing mortality rates across winter, spring, summer, and fall, I seek to determine whether winter poses a disproportionately high risk for sheltered individuals.

*Code and data are available at: <https://github.com/kevicai/toronto-sheltered-residents-deaths-analysis>

The remainder of this paper is structured as follows: Section 2 addresses the data used in the analysis, Section 3 discusses my findings and limitations in the results.

2 Data

The data was extracted, cleaned, and analysed using the statistic programming software R (R Core Team 2024) and the R libraries `tidyverse` Wickham et al. (2019), `janitor` (Firke 2023), `citeKitr` (Xie 2024), `ggplot2` (Wickham 2016).

2.1 Overview of Dataset

To investigate the effect of winter on sheltered residents in Toronto, the dataset “Deaths of Shelter Residents” (“Deaths of Shelter Residents” 2024) collected by the City of Toronto’s Shelter and Support Services Division was used. This dataset has been systematically documenting the deaths of residents in its shelters since 2007. The number of deaths is recorded for each month, and each death is reported within 24 hours of identifying the deceased (“Deaths of Shelter Residents_2017” 2017). These reports apply to both current and recent shelter residents and no sensitive privacy data that can identify the residents was recorded. The dataset measures deaths of male, female, and transgender/non-binary/two-Spirit sheltered residents. Similar datasets are available by OpenDataToronto, including the number of deaths of people experiencing homelessness in general. However, the chosen dataset is the most relevant to the study of the deaths of homeless people who have used Toronto shelters.

I obtained the data using the OpenDataToronto R package (Gelfand 2022) from OpenDataToronto. A sample of the cleaned dataset is shown in Table 1.

Table 1: Sample of Cleaned Deaths of Shelter Residents Data

Year	Season	Deaths
2007	Fall	6
2007	Spring	6
2007	Summer	7
2008	Fall	3
2008	Spring	1
2008	Summer	14

The variables year and season denote the year and season of death. The data originally contained the number of deaths for each month, but for the purpose of studying the effect of seasons, the months are merged into seasons. Winter of each year includes December of its previous year, January and February; Spring includes March, April and May; Summer includes

June, July, and August; Fall includes September, October, and November. The dataset does not contain the exact date of death, so the four seasons are divided into three months rather than the exact days for each season in Toronto. The original dataset includes months from January 2007 to August 2024, but in the final dataset, only months from March 2007 to February 2024 are included to ensure that there are 17 occurrences of each season. Further, no invalid data was found in the original dataset and the cleaned dataset includes 68 rows.

2.2 Data Summary

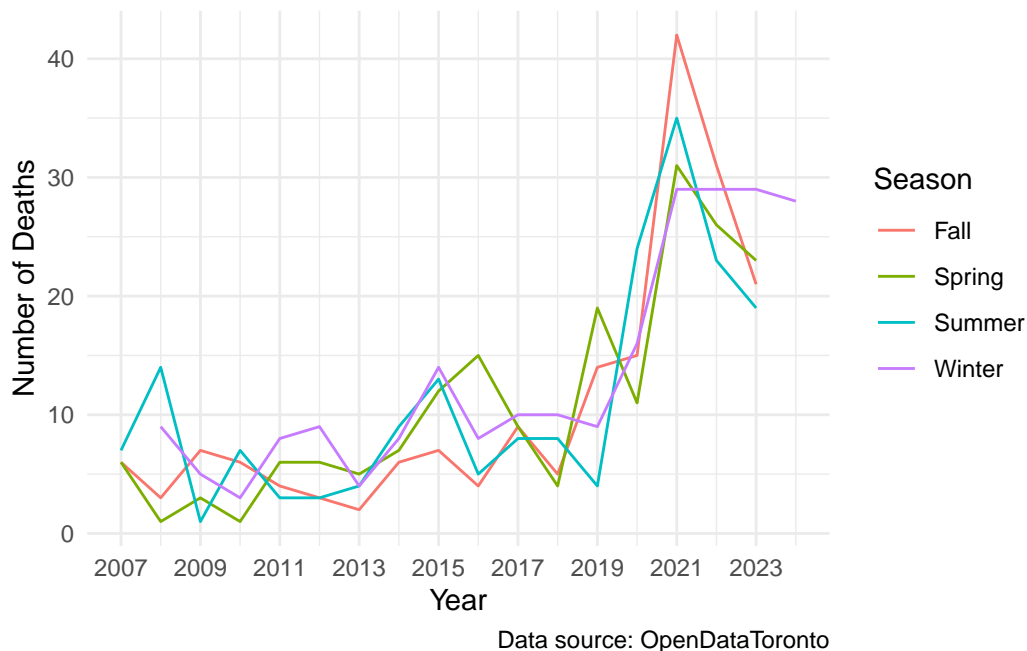


Figure 1: Toronto all seasons sheltered deaths changes, from spring 2007 to winter 2024

Figure 1 presents the changes of sheltered mortality in the seasons of different years. It is important to notice that Winter is no longer the leading season of death after 2019.

Table 2: Summary of deaths of shelter residents in toronto data

Season	Total Deaths	Average Deaths
Fall	185	10.88
Spring	185	10.88
Summer	187	11.00
Winter	228	13.41

Table 2 presents a summary of the total and average deaths by season. It shows that while mortality rates for Fall, Spring, and Summer are relatively similar, Winter experiences a noticeable increase in the number of deaths, indicating potentially higher mortality risks during this season.

3 Discussion

4 References

TODO: add sketches, llm usages

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