

Trends in Mortality Rates*

Analyzing Deaths Among Shelter Residents from 2007 to 2024

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Poverty and homelessness remain pressing issues in today's society, particularly evident in downtown Toronto, where many individuals still sleep on the streets or in subway stations. Due to these harsh living conditions, these individuals often face severe health issues, leading to an increased risk of mortality. Luckily, there are services in the city that provide place for some of these people to live. This paper analyzes the trends in mortality rates among shelter residents in the City of Toronto from 2007 to 2024, highlighting patterns over time and exploring the factors contributing to these rates.

1 Introduction

Homelessness is a well-known issue worldwide, particularly in impoverished cities and countries. It was reported approximately 15 million homeless individuals globally by the World Economic Forum in 2021 (Homeless World Cup Foundation (2024)). Although homelessness is more severe in developing countries, it does not mean that developed places are free from this problem. In downtown Toronto, a city that hosts numerous corporate headquarters and some of the Canada's top educational institutions, homelessness remains a significant issue. Homeless individuals can be seen on the streets and even in subway stations, showing the persistent challenges faced by the city and those without stable housing.

Homeless individuals often live and sleep in harsh and unsanitary conditions, which severely compromises their health. They are more likely to get diseases and suffer from various health problems due to limited access to proper healthcare and nutrition. Consequently, this significantly increases their risk of mortality. The City of Toronto is also deeply concerned about this issue and has implemented numerous aid programs and support services to assist homeless individuals. Despite these efforts, many homeless individuals continue to face significant

*Code and data are available at: <https://open.toronto.ca/dataset/deaths-of-shelter-residents/>

challenges, and there are still a considerable number of deaths occurring at relatively young ages

In this paper we will look at the data Toronto (2024), which explore the trends in mortality rates among shelter residents in the City of Toronto from 2007 to 2024, highlighting patterns over time and exploring the factors contributing to these rates. The data indicates that mortality rates were relatively low, with fewer than five deaths per month in the prior 2019. However, after 2019, there was a sharp increase in the number of deaths, peaking in 2021 and 2022. This surge can be attributed to the onset of the COVID-19 pandemic in 2019, which significantly impacted public health and resulted in many fatalities.

Additionally, the challenging living conditions faced by homeless individuals, compared to those of wealthier individuals who also experienced hardships during this time, suggest that the mortality rates among shelter residents are likely to remain elevated. COVID-19 was also a primary driver behind the large number of deaths, as evidenced by the immediate decrease in the number of deaths following the post-pandemic period shown in the graphs. The data was examined more in depth by analyzing the mortality rate and average mortality rate between male and female homeless individuals in shelter residences. There are a lot more male death compare to female death, but this make sense as the proportion of male residents is greater than that of female residents, with 60% male and only 40% female (City of Toronto (2024)). Additionally, the average age of deceased individuals is around 50 to 60 years old (Data Commons (2024)). According to data, the life expectancy in Canada is approximately 81 years, indicating that the average age at death for homeless individuals is quite young.

The remainder of this paper is structured as follows. Section 2 will discuss the data used in the study, highlighting key aspects and limitations. Section 3 will focus on generating graphs using the data presented in Section 2. Section 4 will elaborate on the graphs from Section 3, providing interpretations and possible explanations for the findings.

2 Data

2.1 Raw Data

The data used in this paper is access in from Open Data Toronto and the particular data set used was the Deaths of Shelter Residents (Toronto (2024)). To analysis the data and creating graphs using the data, following package that was build in the R program R Core Team (2023) was used: tidyverse (Wickham et al. (2019)), dplyr (Wickham et al. (2023)), knitr (Xie (2023)), and ggplot2 (Wickham (2023)).

The data used in this paper was collected by the Toronto Shelter and Support Services Division since 2007. Shelters are required to notify the City of Toronto within 24 hours of a death and submit a written report within 30 days. Consequently, the data is updated monthly on the Open Data Toronto website. The raw data set includes 10 variables and 18 observations,

covering the period from 2007 to 2024, as shown in Table 1 ((**Tab-Table1?**)). The key variables used in this paper include: year, total decedents, average age at death for all decedents, male decedents, average age at death for male decedents, female decedents, and average age at death for female decedents. Additionally, the monthly death counts from 2007 to 2024 will be used for graphing, comprising 212 observations.

Table 1: Trends in Mortality Rates Among Shelter Residents (2007-2024)

Year	Total Decedents	Avg Age of Death (All)	Male Decedents	Avg Age of Death (Male)	Female Decedents	Avg Age of Death (Female)	Trans/NB/2S Decedents	Avg Age of Death (Trans/NB/2S)
2007	24	52	22	53	2	50	0	0
2008	26	50	19	47	7	58	0	0
2009	16	56	14	59	2	37	0	0
2010	21	54	11	53	10	56	0	0
2011	21	54	15	53	6	56	0	0
2012	18	53	18	53	0	0	0	0
2013	16	52	13	51	3	59	0	0
2014	30	57	26	57	4	58	0	0
2015	45	58	41	58	4	64	0	0
2016	33	57	27	58	6	47	0	0
2017	35	56	23	54	12	58	0	0
2018	26	57	23	58	3	45	0	0
2019	48	54	38	57	10	43	0	0
2020	74	51	54	51	19	50	1	0
2021	132	47	96	48	31	48	5	33
2022	110	51	81	52	29	49	0	0
2023	91	51	78	52	12	45	1	0
2024	47	50	35	49	7	52	5	50

Yearly Mortality rate from 2007-2024

2.2 Limitation of Data

The Deaths of Shelter Residents data is part of a larger database shared by Toronto Public Health (TPH), which also includes deaths of homeless individuals living in shelters and outdoors. Therefore, the findings in this paper focus solely on homeless individuals residing in shelters, which may limit the dataset and lead to potential biases that do not fully represent the mortality of all homeless individuals.

Other limitations include the absence of certain data points, such as the cause of death and additional information that could identify the deceased, due to confidentiality concerns. This

lack of information may impact the reasoning behind the findings, as possible explanations will need to be drawn from other research and sources.

3 Results

Figure 1 is showing the total amount of decedent of homeless living in the Shelter.

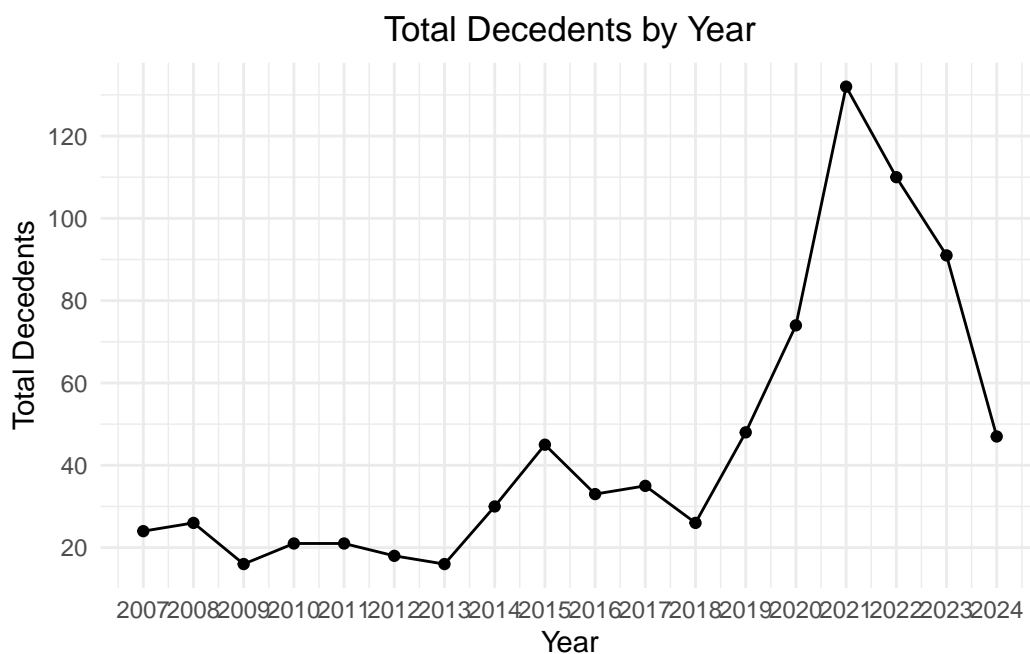


Figure 1: Yearly Mortality rate from 2007-2024

Figure 2 shows the number of deaths in each month-year pair from 2007 to 2024.

Talk way more about it.

Figure 3 is a close up look from Figure 2 focusing on data ranging from year 2019 to 2022, during the pandemic.

@ fig-TotalDecedentsFemaleVsMale display a comparison in number of death between females and males.

Figure 4 presents a comparison of the average age at death between females and males.

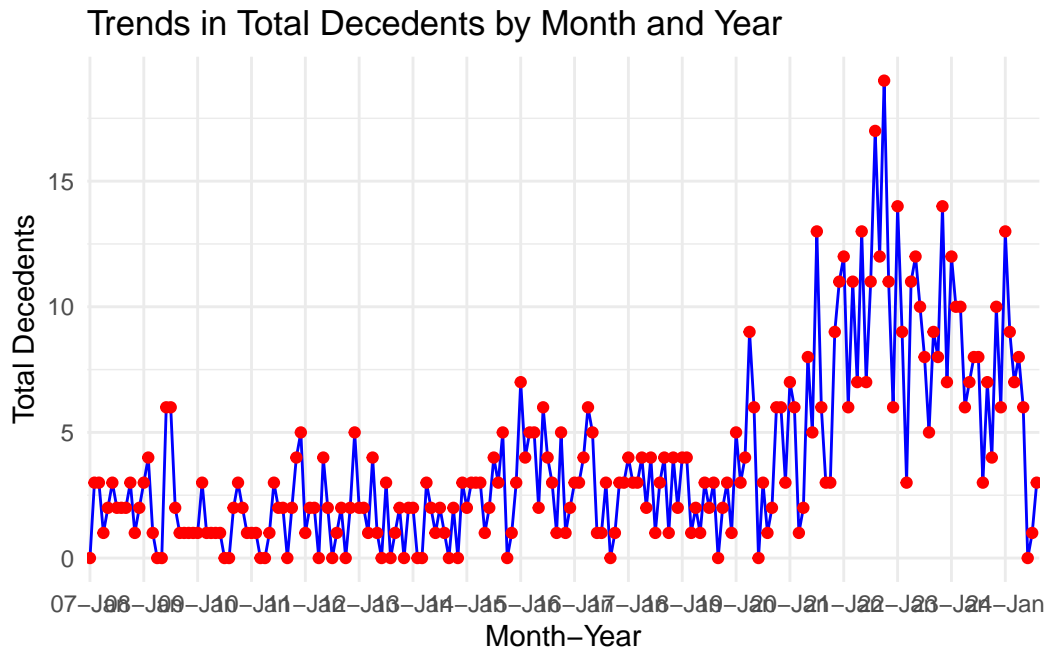


Figure 2: Yearly Mortality rate from 2007-2024

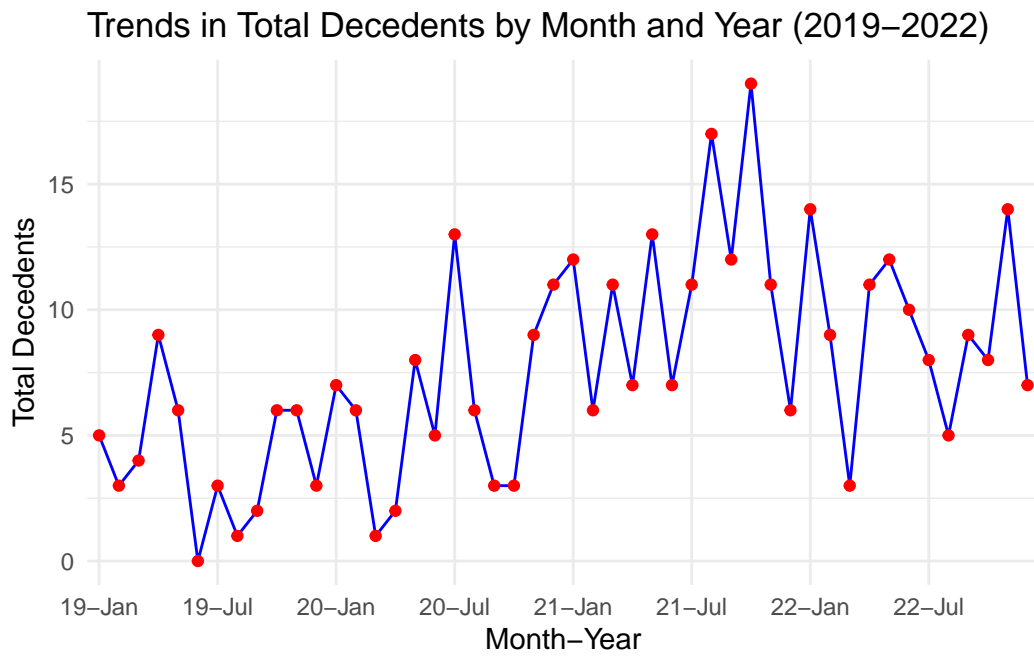


Figure 3: Yearly Mortality rate from 2019-2022

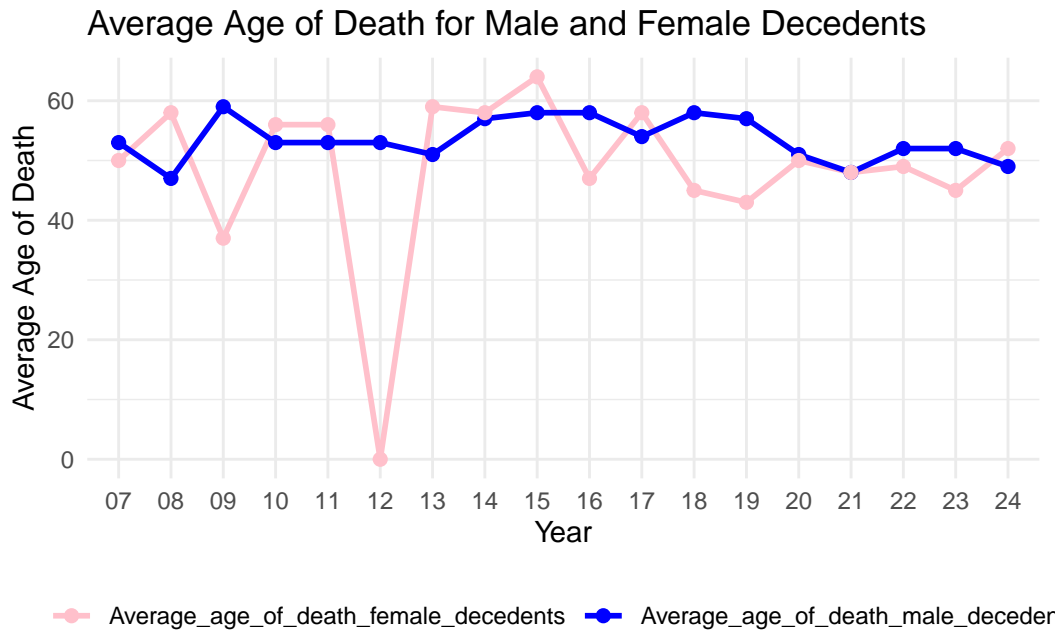


Figure 4: Total Decedents Female VS Male

4 Discussion

4.1 First discussion point

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 Second discussion point

4.3 Third discussion point

4.4 Weaknesses and next steps

Weaknesses and next steps should also be included.

Appendix

A Additional data details

B Model details

B.1 Posterior predictive check

In `?@fig-ppcheckandposteriorvsprior-1` we implement a posterior predictive check. This shows...

In `?@fig-ppcheckandposteriorvsprior-2` we compare the posterior with the prior. This shows...

B.2 Diagnostics

`?@fig-stanareyouokay-1` is a trace plot. It shows... This suggests...

`?@fig-stanareyouokay-2` is a Rhat plot. It shows... This suggests...

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