Do homeless people experience more death before and after the COVID-19 pandemic? An analysis of the deaths of people experiencing homelessness from 2017 to 2023.*

Sky Suh

2024-01-20

The datasets of the deaths of people experiencing homelessness were tracked down the number of deaths and their causes across Toronto-by-Toronto Public Health (TPH) beginning in January 2017 and including unknown or pending causes of death that were reported and updated on these datasets (Casaletto and Hunt 2022). Based on using the data and analysis from (Gelfand 2022), this paper will explain how homeless people will experience death before, during and after the COVID-19 pandemic and talk about the hypothesis of this argument with tables and figures to support the hypothesis. For further data analysis, this paper shows the performance of the survey for the count of deaths of people experiencing homelessness betweeb before and after COVID-19 pandemic.

Table of contents

*Codes and datas for this analysis paper are available at: https://github.com/sjp2023/Analysis-of-Deaths-of-Homeless-from-2017-to-2023.git

1 Introduction

In the heart of a city in Canada, Toronto, the vibrant metropolis, among the glittering, complex skyscrapers and busy, crowded people on the bustling streets and roads to go to work, a grim but bleak, cold reality exists on the side of these bright, glowing, almost look-alike fake world - the silent of deaths among individuals experiencing homelessness. These marginalized members of society face not only the harsh and barren elements of the Canadian environment but also a myriad of systemic challenges that contribute to a tragically shortened lifespan including lack of education, healthcare, easy exposure to dangerous situations and diseases such as pneumonia, drug-related disorders physically and mentally. In 2019, the year before the COVID-19 pandemic happened, a total of 128 people experiencing homelessness died in Toronto, however, COVID-19 - the new variant of coronavirus outbreak that makes the announcing a global pandemic by the World Health Organization (WHO), and comparing to the number of deaths of homeless people in 2022 during the pandemic, it was a total of 191 people which approximately 70 people more than 2019 ("Deaths Among Toronto's Unhoused People Still Trending High with Drug Toxicity Crisis to Blame" 2023). Even in the first six months of 2023, 79 unhoused individuals passed away for various reasons ("Deaths Among Toronto's Unhoused People Still Trending High with Drug Toxicity Crisis to Blame" 2023). According to CBC, more than 3 homeless deaths per week in Toronto in 2022 based on what City of Toronto found ("More Than 100 Unhoused People Died in Toronto This Year. Some Say the Shelter System Is 'Crumbling Quickly"' 2021). The most common and highest cause of death for homeless people between 2017 - 2023 is drug toxicity including addiction, overdose-related disorders and suicide by withdrawal symptoms ("Deaths Among Toronto's Unhoused People Still Trending High with Drug Toxicity Crisis to Blame" 2023) ("Toronto Saw More Than 3 Homeless Deaths Per Week on Average in 2022" 2023). As the government and city delve into this critical issue, it becomes imperative

to uncover the factors that lead to the premature deaths of those struggling with homelessness in Toronto with their ages, genders and months with the highest rates of death.

The counts of deaths of people experiencing homelessness by different variables including causes, genders and ages are continuously higher than what was been before the pandemic. Among these reasons, what is the factor that contributes to the deaths of homeless into three major variables, causes, demographics and months from 2017 to 2023. The dataset for this information is shown well in the open datasets source, 'OpenDataToronto'. In this paper, I used the three datasets from OpenDataToronto for death by month, cause and demographic from the homeless. The data on homeless deaths by three variables from January 2017 to June 2023 were used as the supporting data to create the figures including tables, graphs and scatters (Gelfand 2022) To examine this data, I analyze three main variables for the death of the homeless, as well as the social factors such as the ages, genders, the location of major deaths and the numbers between before and after the pandemic that may influence the cause of the deaths. I discovered the positive correlation between the COVID-19 pandemic and the cause of deaths by month and year with the demographic and cause to see the influences of the pandemic. According to Toronto Public Health(TPH), approximately 25% of the causes of death of homeless people are unknown or still pending but the researched data presents the relations between the pandemic and the death of homeless ("Deaths Among Toronto's Unhoused People Still Trending High with Drug Toxicity Crisis to Blame" 2023). Based on this, this paper will investigate more about this topic deeply.

This research paper will help to extend and highlight beyond the statistics for tracking the issue of homelessness. It is crucial for policymakers, healthcare professionals, and advocacy groups to formulate effective strategies that can break the mortality cycle of homelessness based on an understanding of the causes. This paper is structured into the following sections: Data, Results, Conclusion and Discussion. In the data section, I will show the graph and tables of the cleaned data and explain the analysis of cleaned and organized data. Following the result section, I will present the correlation of the analysis so far while in conclusion, I will summarize what I analyzed and explained in both the data and results parts to recap the information lastly, the discussion section will discuss further action and the solution for the future to help the unhousing people.

2 Data

The data utilized in this paper is claimed from the OpenDataToronto Portal by the City of Toronto throughout opendatatoronto (Gelfand 2022) In one data source entitled as Deaths of People Experiencing Homelessness (Data 2017-2023)(Gelfand 2022), three data sets were filed as CSV for graphs and tables used for the analysis of this paper. To collect and extract the

Table 1: Simple cleaned data of death of homeless by year

Id	Year of Death	Cause of Death	Age group	Gender	Counts
1	2017	Accident	40-59	Male	2
2	2017	Accident	60+	Male	3
3	2017	Cancer	60+	Female	1

data, data from this paper utilizes the statistical programming language, R (R Core Team 2022), with using other functional features tidyverse (Wickham 2017), ggplot2 (Wickham 2016), dplyr (Wickham et al. 2023), readr (Wickham, Hester, and Bryan 2023), tibble (Müller and Wickham 2023), janitor (Firke 2023), kableExtra (Zhu 2021) and knitr (Xie 2014). For further processing for collecting, cleaning, organizing and analyzing the data in detail will be found below the data section.

2.1 Death of homeless Statistics

This dataset, published by Toronto Public Health ("Toronto Public Health Releases 2022 Data for Deaths of People Experiencing Homelessness" 2023) collects information about the deaths of people experiencing homelessness with subdivision of month, cause and demographic with refreshing semi-annually in the Open Data Toronto Portal. This statistical data source highlights the statistics of the death of homeless people through simplified from 2017 to 2023 and as shown in the download data as a CSV file with three different subdivisions, it is categorized month, cause and demographic from before to after the COVID-19 pandemic. The latest refreshed data day is September 29, 2023, and the extracted data on January 20, 2024.

Upon analyzing the data sets, one of the sub-categories, age from the demographic is not an exact age number but it presents an age gap such as 20-35, 12-19, so instead, I use an exact number for an age on the graph, I will clean and organize the age gap on the column for easy to see (Table 1)(see Table 1).

2.2 Simple data for by Month

Creating simple profiles for the parts of the data sources - Deaths of People Experiencing Homelessness from Open Data Toronto, Homeless death by month data set filed as CSV (Gelfand 2022) help to include the analysis. It was updated in June 2023 lastly including the year of death, the month of death and counts for every section. I selected the data elements, number and name of simplified from this dataset to summarize up and simplify it (Table 2)(see Table 2); the column will remain the same name as the dataset that this information had.

Table 2: Simple count of death of homeless by month

Id	Year of Death	Year of Month	Counts
1	2017	January	9
2	2017	February	11
3	2017	March	7
4	2017	April	8

Table 3: Simple count of death of homeless by cause

Id	Year of Death	Cause of Death	Counts
1	2017	Accident	2
2	2017	Accident	3
3	2017	Cancer	1
4	2017	Cancer	2

2.3 Simple data for by Cause

In addition, the death cause simplified datasets (Gelfand 2022) published by Toronto Public Health on Open Data Toronto was uploaded the latest information on September 2023 including a year of death, cause, and counts which I cleaned and re-organized the demographic part since it is unnecessary for making the table of the simplification by causes. It includes unknown causes which is 25% with not show the transgender people counts due to the small. Please see Table 3 for viewing the sample data set(Table 3).

2.4 Simple data for Demographic

Furthermore, for using the cleaned data set for the demographic part, I utilize the same components and names including the year of death, age, gender and count for the demographic that are provided in the data set from Open Data Toronto. To view a sample data table, please see Table 4(Table 4).

2.5 Merged Simple Death Data before/after COVID-19 Pandemic

Lastly, to make the merged simple table for death data before/after the pandemic to combine 2.2, 2.3, and 2.4 tables' components, I used the merge function to make into one table data set and further graphs including the year of death, months, gender, age and counts to summarize the data of Deaths of People Experiencing Homelessness per simplified before and after the COVID-19 pandemic. Please see Table 5 below this data writing for a sample of this merged data set.

Table 4: Simple count of death of homeless by demographic

Id	Year of Death	Age Group	Gender	Counts
1	2017	Unknown	Female	1
2	2017	20-39	Female	6
3	2017	60+	Female	6
4	2017	40-59	Female	12
5	2017	Unknown	Male	6

3 Results

3.1 Death of Homeless Before/After COVID-19 Pandemic by year

Below this paragraph, the graph - Figure 1 presents the deaths of the homeless before and after the COVID-10 pandemic by year, and comparing the death tolls of the homeless before and after the COVID-19 pandemic, there was a total 949 of people experiencing homelessness died across the City of Toronto. Among 949 people, 2021 was the highest year of homeless deaths after the pandemic, mostly unknown - might be the COVID-19 and drug toxicity while the lowest year was 2023 a total 79 of people passed away due to various reasons including cancer, accident, and drug toxicity). 2022 had the second highest year of death of homeless which is 189, following by 2020 as the third highest year of homeless death's year with 143 people happened during/after the pandemic. 2018 is the second lowest year of death with 94 people before the pandemic, with 2017 coming in the third lowest with 100 people also before COVID-19. Lastly, 2019 was the median of the death toll. For the full visualization, please look through of Figure 1

3.2 Death of Homeless Before/After COVID-19 Pandemic by month

Death of homeless people before and after COVID-19 divided by month was 961 in total across the City of Toronto from 2017 to 2023. May had the highest monthly death toll of homeless with November had the lowest death toll in total from 2017 to 2023 at 53 people in total. February and June were tied for the second highest of people who died at 90 people each before and after the pandemic. 87 of the death toll was October as the third highest while December had the second lowest death toll with 63 people. September had 67 people death which is the third lowest and January and April were almost tied at 85 and 94 people each. For a further full view of the graph, please see Figure 2 for visualization.

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Correlation between year and count: 0.09312914
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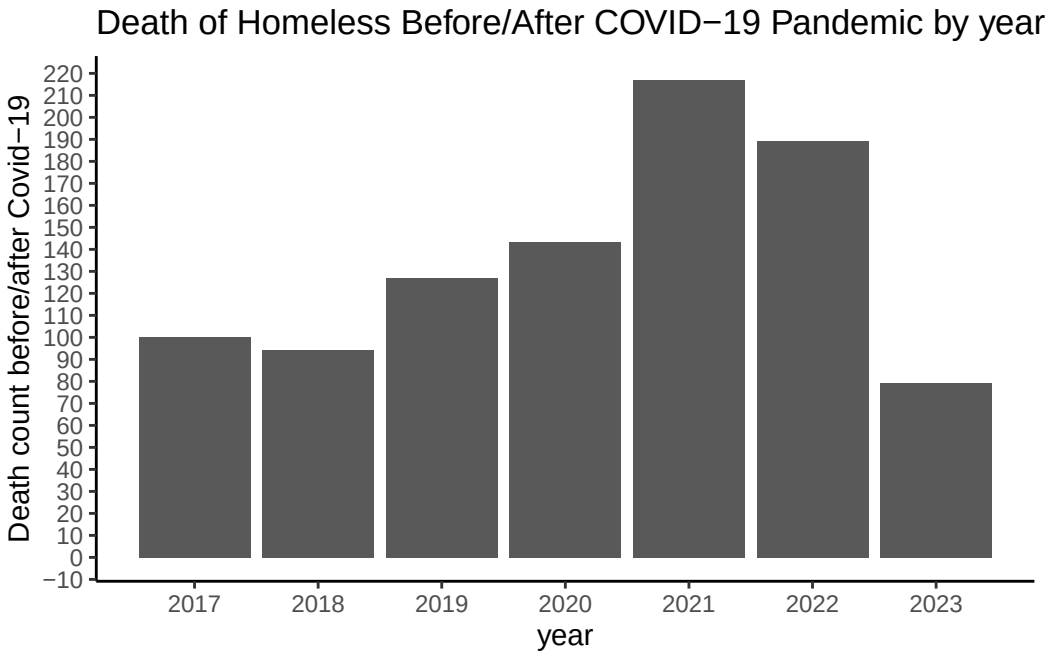

Figure 1: Death of Homeless Before/After COVID-19 Pandemic by year

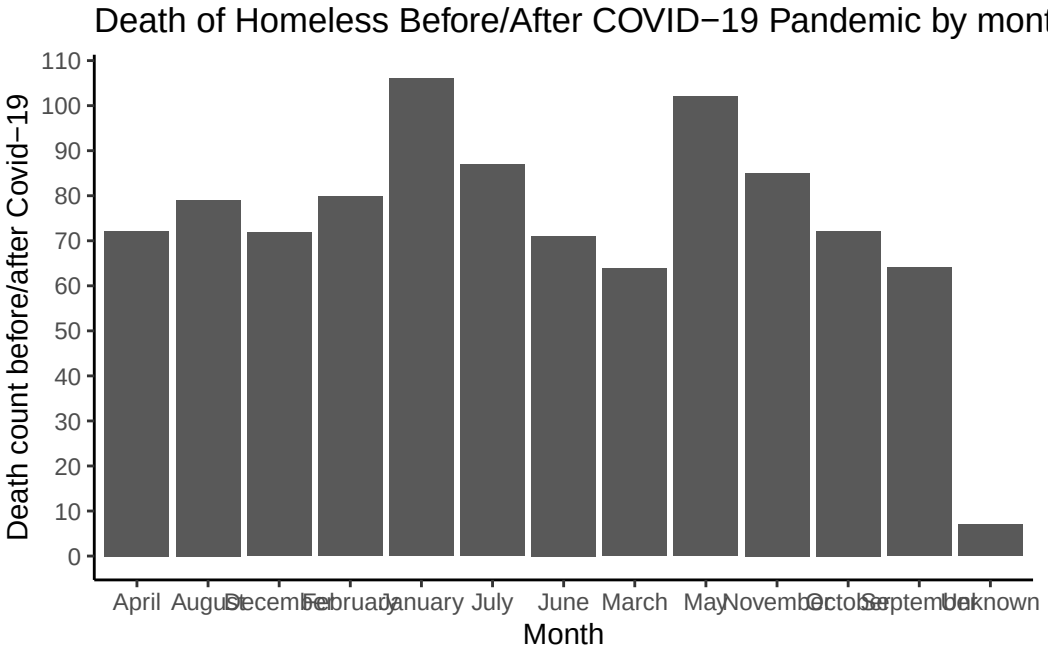

Figure 2: Death of Homeless Before/After COVID-19 Pandemic by month

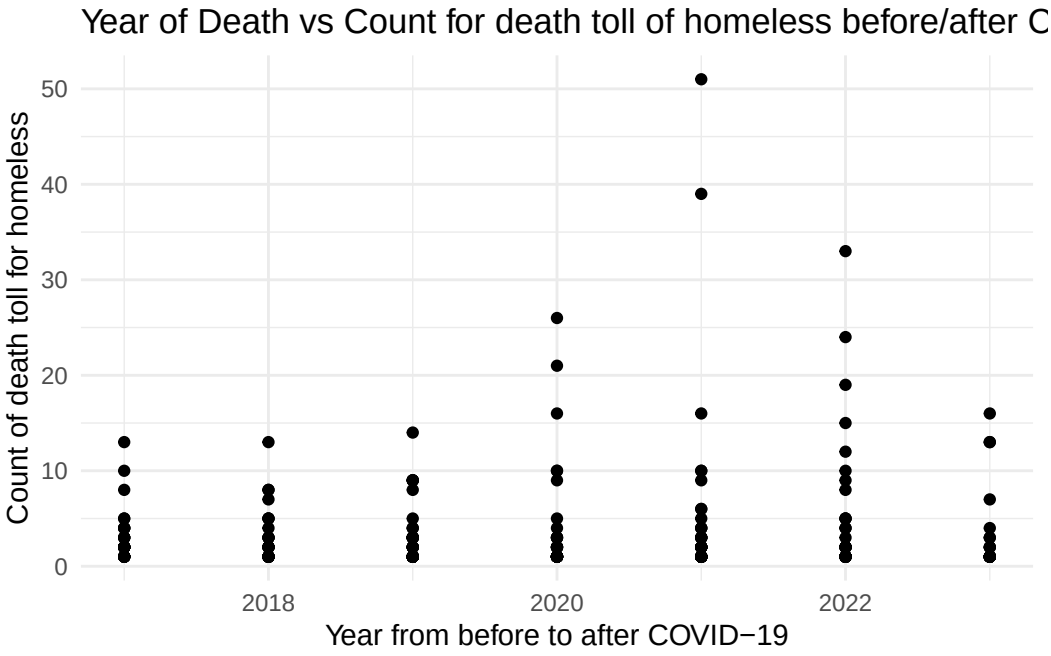

Figure 3: Correlation between year and death roll count before/after COVID-19

4 Discussion

Overall, summarizing up the previous tables and graphs gathered by the data provided with the three different CSV files, it shows that there is a positive correlation between the death tolls of people experiencing homelessness in Toronto and before and after COVID-19 pandemic divided into the year and month for detail, particularly looking up the table of the month and cause of death tables that present briefly about the arguments. It illustrates in Figure 1 and Figure 2 as the graph to visualize more clearly and easier to see the comparison with the year and month vs. death toll of people who experienced homelessness before/after COVID-19.

Based on what is written both in Figure 1 and Figure 2, most of the death tolls happened during the pandemic from 2020 to 2021 which was the highest year of death counts for the homeless while 2017-2019 - before COVID-19 happened the lowest year to count the death of homeless. Even in the correlation with the month, it presents November and January for the death tolls which are the late fall to the winter, when the number of COVID-19 increased compared to the summer season between 2020 to 2022. The result is shown well about positive correlation with the year, month and the death toll before/after the pandemic. See Figure 3 for the detailed data that was made as the scatter plots but since month is characteristic which unable to make the correlation with scatter plot unlike the correlation of year and count which is numeric in the data sets.

Even though it includes cleared data sets provided by Toronto Public Health (TPH) from

OpenDataToronto, it has errors with the measurement and not enough data with visualization. Firstly, the data from this open source is not enough and is vague to write and draw the cleared graph and scatterplot with the survey from Toronto Public Health (TPH) since there may be the possibility of human error. For example, there are unknown sections in the cleaned month data that some of the death counts do not know about the month that the homeless passed away, also, the total death toll counts from the year data set and month data set are slightly different which is unreliable and incredible to use it as the data (Gelfand 2022). Third, the visualization of the graphs and scatterplot are overlapped and hard to see which months/or years show the number of counts; it distributed the readers seeing the correct data and comparing the data with the year/or month for the COVID-10 pandemic. These errors make unclarity of the diagrams and the overall of the reports.

Since it has some errors, there are limitations to conducting this analysis. The clarity of the data source of the month of death for the homeless as named as unknown, lacks uncleared transparency as that where TPH got consent from families of those homeless. Also, there were no total dataset files including ID, cause, year, month, demographic and counts of death that will help to understand the readers and provide the visualizations of the whole picture of the data. In addition, another limitation is as mentioned in the previous paragraph that it will be inaccurate due to not same total count of death. For instance, according to Toronto Public Health (TPH), the total number of death of homeless is 223 reported in 2021 ("Toronto Public Health Releases 2022 Data for Deaths of People Experiencing Homelessness" 2023), but what it presented in this opendatatoronto data set was 217 which is a lower number and presents differences (Gelfand 2022).

For future analysis, these limitations and errors should be covered with clear and well-enough data sets to show and explain towards the audience for a better understanding without any differences in the total numbers/counts to compare with more transparent so that audiences and readers know the cleared correlations between the year/or month and the death counts of the people experiencing homelessness.

5 Conclusion

This paper explores the correlations between the year, and month of death and the death tolls of counts for the homeless from 2017 to 2023 when was before and after the COVID-19 pandemic to figure out the number of differences with those years based on data provided from Toronto Public Health and Open Data Toronto Portal. As it expected, the results presented what it thinks the death numbers of people with homelessness correspond to the COVID-19 pandemic year or not. This analysis helps to extend the data sets already existing in the Open Data Toronto Portal with the visualization. Further analysis with new data that are updated every semi-annually, the City of Toronto and Toronto Public Health should continue to work on investigating the unknown section and other data for better and clearer sets.

Appendix

.1 Death of homeless by year Overview

Here is a table 1 to show death of homeless by year in Toronto. It shows that the simple table of cleaned data of death of homeless by year based on cleaned_cause_data set that will help the readers to understand what will be talked in this paper. This suggests the basic figure/picture towards the audiences to present what this paper will show.

Id	Year of Death	Cause of Death	Age group	Gender	Counts
1	2017	Accident	40-59	Male	2
2	2017	Accident	60+	Male	3
3	2017	Cancer	60+	Female	1

.2 Death of homeless by month Overview

Below, it is a table 2 to explain the death of homeless people by counts in month through the cleaned month data. This table suggests the specific number of death counts in every month from 2017 to 2023 about homeless people.

Id	Year of Death	Cause of Death	Counts
1	2017	Accident	2
2	2017	Accident	3
3	2017	Cancer	1
4	2017	Cancer	2

.3 Death of homeless by cause Overview

Below this, it is shown the cause of death of people experiencing homelessness to correlate with the death tolls counts of them which suggests and presents how homeless people died and relates with COVID-19 situations.

Id	Year of Death	Cause of Death	Counts
1	2017	Accident	2
2	2017	Accident	3
3	2017	Cancer	1
4	2017	Cancer	2

.4 Death of homeless by demographic Overview

Here is the additional table to present which gender and age_gap had been suffered and loss their life as the homeless and how does it relates to the COVID-19 even though it was not deeply talk into this paper but it has year and death counts specifically and easier to compare with others.

Id	Year of Death	Age Group	Gender	Counts
1	2017	Unknown	Female	1
2	2017	20-39	Female	6
3	2017	60+	Female	6
4	2017	40-59	Female	12
5	2017	Unknown	Male	6

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