

Investigating the Effect of COVID-19 to the Death of Homeless People in Toronto from 2017 to 2023*

Examining Trends in Age, Gender, and Causes of Death Among Toronto's Homeless Population from 2017 to 2023

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This study investigated mortality trends among Toronto's homeless population from 2017 to 2023. The findings suggest that the primary contributor to the elevated mortality rate during the pandemic was drug toxicity, rather than COVID-19. The objective of this research is to accurately identify the pressing issues and facilitate effective assistance for the homeless community.

Table of contents

1	Introduction	2
2	Data	3
2.1	Data source and background	3
2.2	Variables of interest	3
2.3	Data processing	3
2.4	Summarized analysis data	3
3	Data Analysis	5
3.1	Analysis on Causes of Death Based on Gender	5
3.2	Analysis on Causes of Death Based on Age	6
3.3	Analysis of the Distribution of Causes of Death Across Three Age Groups . . .	7
4	Conclusion	9

*Code and data are available at: <https://github.com/Selinayichenji/2024-Data-collection.git>.

1 Introduction

In recent decades, Toronto has witnessed an increasingly visible homelessness issue, with individuals seeking refuge on city streets becoming a common sight. In 2013, homeless people took 0.19% (Gaetz et al. 2013) of total population in Toronto, ranked the 8th city in Canada. In 2021, there was 7,347 (Hub 2021) homeless people in Toronto and the total population was 2,794,356 (Hub 2021). The percentage rose to 0.26%. This trend not only highlights a growing societal challenge but also underscores an urgent need for action.

As (Gaetz et al. 2013) said, “The goal of ending homelessness is to ensure housing stability...and includes required services as needed (supportive), in addition to income and supports.” In this paper, we are trying to figure out what caused the increase death of homeless people during pandemic in order to provide social service they needed by using R (R Core Team 2022) to analysis a dataset from opendatatoronto (Gelfand 2022), named “Homeless deaths by cause”.

And there are some limitations of this data listed on the City of Toronto Website we must know before using the data: “1. This data reflects only deaths that are reported to TPH by SSHA, community partners and the Coroner’s Office. 2. Cause of death is unknown or pending in approximately 25% of the reported deaths. 3. In 2019, TPH ceased reporting on location of death as this information is often unknown or unverified. 4. The data does not identify Indigenous status as this is reported as unknown or missing in 70% of the reported cases. With this high a percentage of missing information, accurate conclusions cannot be drawn, as such, it is standard epidemiological practice to suppress the release of data. 5. Cause of death for transgender people not shown due to small counts. 6. Cause of death is unknown in approximately 25% of the reports. To protect privacy, causes of death with less than 2% of the cases are included in the other category.” (Toronto 2023)

Through tables, plot graphs and bar graphs, our findings reveal a huge increase in deaths attributed to drug use during the pandemic, overshadowing even COVID-19 as a direct cause of death. This suggests a secondary crisis unfolding within the pandemic period. The precise reasons behind this appearance remain ambiguous and subject to further professional research, several hypotheses have been proposed. Dr. Hwang observed, “The disruption caused by the lockdown and by the real lack of availability of services caused people to change where they spend time and thus where they use drugs,” ... “I think that contributed to people using in higher risk situations that would more likely result in death.” (Ireland 2023). The experience may prove beneficial for the charity’s work with homeless individuals, particularly when critical times such as a pandemic come in the future.

2 Data

2.1 Data source and background

The data used through this paper was provided by the City of Toronto’s OpenDataToronto Library, was a cvs file named “Homeless deaths by cause”, under the category “Deaths of People Experiencing Homelessness”. The homelessness is defined as “the situation of an individual or family without stable, permanent, appropriate housing, or the immediate prospect, means and ability of acquiring it”(Toronto 2023). We retrieved the data from R package opendata-toronto(Gelfand 2022).We downloaded the data, cleaned it and renamed it as “analysis_data” in output/datam folder.

The data was measured and collected by Toronto Public Health (TPH), Support and Housing Administration (SSHA) and the Office of the Chief Coroner of Ontario (OCCO) since January 2017. The TPH tracked the deaths of homeless people to get accurate estimate of their number and causes of death. The TPH also leads the data collection, analysis and reporting. The SSHA and health and social service agencies that support homeless people share information about a death with TPH and the OCCO verifies some of the data. (Toronto 2023)

2.2 Variables of interest

Our population is divided by 4 categories: Year of death, Gender, Age group and Cause of death. The year of death covers from 2017 to 2023. The gender category has 3 types: Female, Male and Unknown. Age groups are divided as below: Under 20, 20-39,40-59,60+ and Unknown.Causes of death includes 10 types below: Accident, Cancer, Cardiovascular Disease, COVID-19, Drug Toxicity, Homicide, Other, Pneumonia, Suicide and Unknown/Pending.

2.3 Data processing

We used R(R Core Team 2022) to process the whole paper, packages include `tidyverse`(Wickham et al. 2019), `dplyr`(Wickham et al. 2023), `tidyr`(Wickham, Vaughan, and Girlich 2023), `knitr`(Xie 2023), `kableExtra`(Zhu 2021) and `ggplot2`(Wickham 2016).

2.4 Summarized analysis data

Then there are basic distributions of population in gender, age and causes of death.

Table 1: Gender Distribution by Year

year_of_death	Female	Male	Unknown	Sum
2017	25	75	0	100
2018	21	73	0	94
2019	34	92	1	127
2020	28	115	0	143
2021	50	161	6	217
2022	39	146	4	189
2023	9	69	1	79
Total	206	731	12	949

The referenced table Table 1 shows gender-specific mortality among the homeless over seven years. The ‘Sum’ column totals annual deaths, with males constituting 731 cases, or 78% of all deaths. Females accounted for about a third of male deaths, and the ‘Unknown’ category was minor, with 12 cases.

Table 2: Age Distribution by Year

year_of_death	20-39	40-59	60+	Unknown	<20
2017	20	47	26	7	0
2018	21	44	23	6	0
2019	29	54	38	4	2
2020	36	53	48	5	1
2021	70	90	45	9	3
2022	45	64	60	17	3
2023	19	35	20	5	0
Total	240	387	260	53	9

Table 2 reveals the 40-59 age bracket had the highest mortality at 387, while under-20s had the fewest at 9. The “20-39” and “60+” groups had 240 and 260 deaths, respectively, peaking in 2021 for the former and 2022 for the latter. The under-20 category had 3 deaths in both 2021 and 2022.

A seven-year trend from Table 1 shows a dip in deaths from 2017 to 2018, a surge through 2022, and a decline to below 80 in 2023. This period coincides with the COVID-19 pandemic, suggesting a potential link to homeless mortality; however, age and gender had minimal impact on death numbers.

Table 3: Death Causes Distribution by Year - first half

year_of_death	Accident	Cancer	Cardiovascular Disease	Drug Toxicity
2017	5	9	14	32
2018	5	1	14	33
2019	9	9	15	39
2020	1	3	14	75
2021	9	7	15	127
2022	6	10	22	90
2023	2	4	1	36
Total	37	43	95	432

Table 4: Death Causes Distribution by Year - second half

year_of_death	Homicide	Other	Pneumonia	Suicide	Unknown/Pending	COVID-19
2017	1	8	3	3	25	0
2018	5	10	4	4	18	0
2019	7	11	8	2	27	0
2020	4	9	2	4	27	4
2021	1	12	2	7	34	3
2022	1	4	1	7	47	1
2023	1	2	1	2	30	0
Total	20	56	21	29	208	8

Drug toxicity is the leading death cause, as shown in Table 3 and Table 4, accounting for half of the deaths, peaking in 2021. Unknown causes and cardiovascular diseases followed, the latter spiking to 22 in 2022 and then falling to 1 in 2023. COVID-19 related deaths were the lowest at 8, with half in 2020. Other causes ranged between 20 to 60 deaths.

The data suggest COVID-19 indirectly influenced mortality through increased drug toxicity and cardiovascular deaths rather than direct impact. Further analysis of the interplay between gender, age, and mortality causes is needed to substantiate secondary hypotheses.

3 Data Analysis

3.1 Analysis on Causes of Death Based on Gender

Figure 1 illustrates that across ten death causes, gender distribution is fairly consistent, with drug toxicity as the primary cause and COVID-19 the least for all genders. Female deaths are

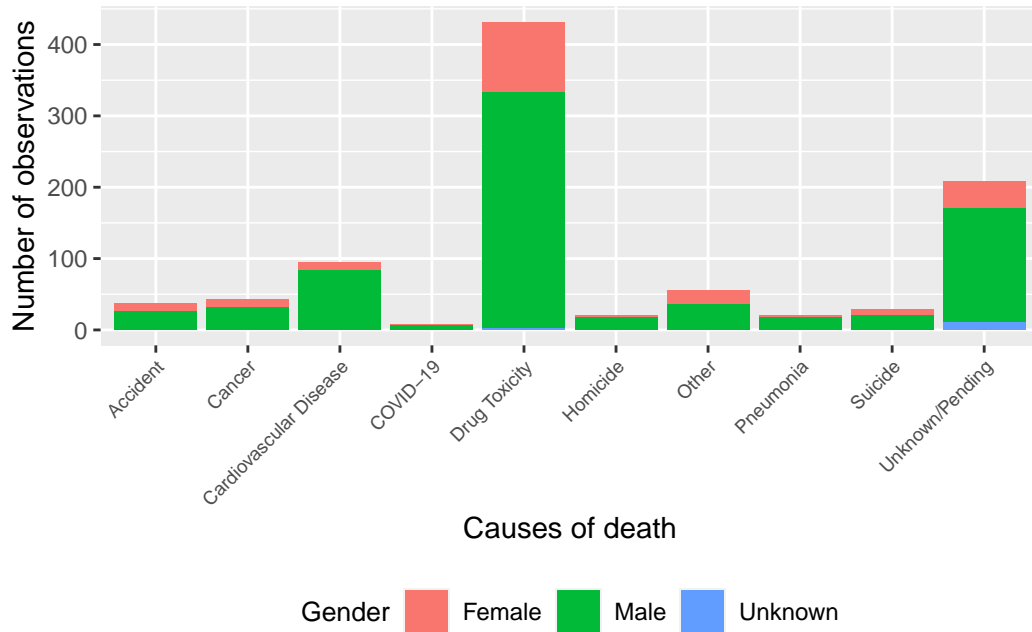


Figure 1: Correlation between gender and 10 causes of death

about a third of male deaths, aligning with data from Table 1.

3.2 Analysis on Causes of Death Based on Age

Age-related death causes, shown in Figure 2, indicate that the under-20 group is too small for analysis, and the unknown group lacks clear trends. The focus thus is on the 20-39, 40-59, and 60+ groups. Drug toxicity dominates in the 20-59 brackets, while unspecified causes, cancer, and cardiovascular diseases are more common in the 60+ group, with drug-related deaths less prevalent.

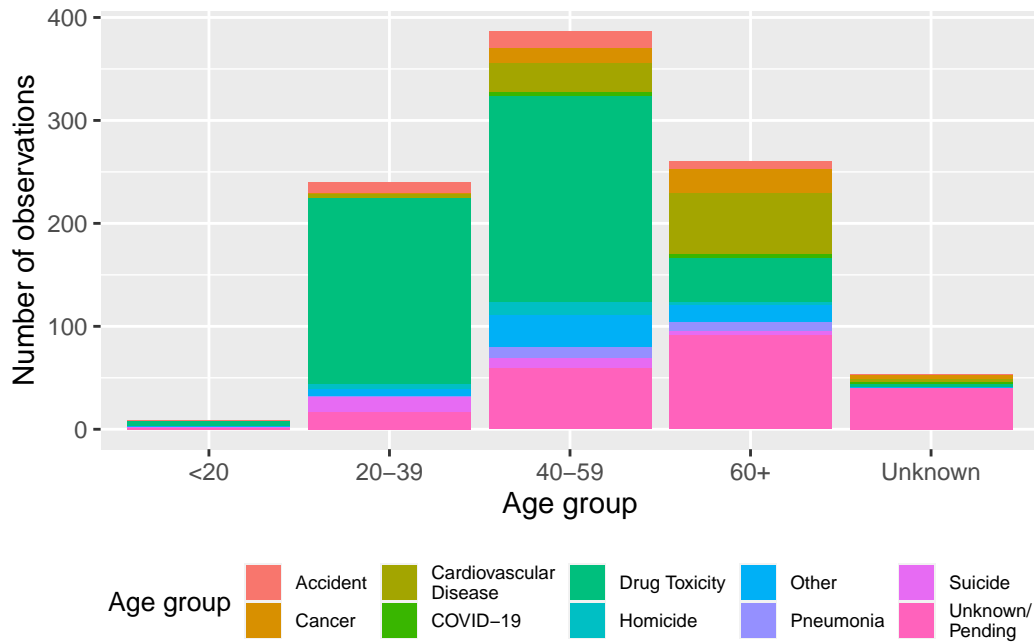


Figure 2: Correlation between age and 10 causes of death

3.3 Analysis of the Distribution of Causes of Death Across Three Age Groups

Age shows a stronger link to death causes than gender, prompting a shift to analyze temporal trends in these age groups. Trends indicate a surge in drug toxicity deaths from 2017 to 2021, especially in the 20-39 and 40-59 groups, with a decline afterward. The 40-59 group also shows a notable number of deaths from unknown causes.

For the over-60s, as per Figure 5, drug toxicity and unspecified deaths dipped in 2021 but rebounded in 2022, with cancer deaths peaking that year, forming an “M”-shaped trend. Cardiovascular deaths have increased, peaking in 2022, while other causes remain below five.

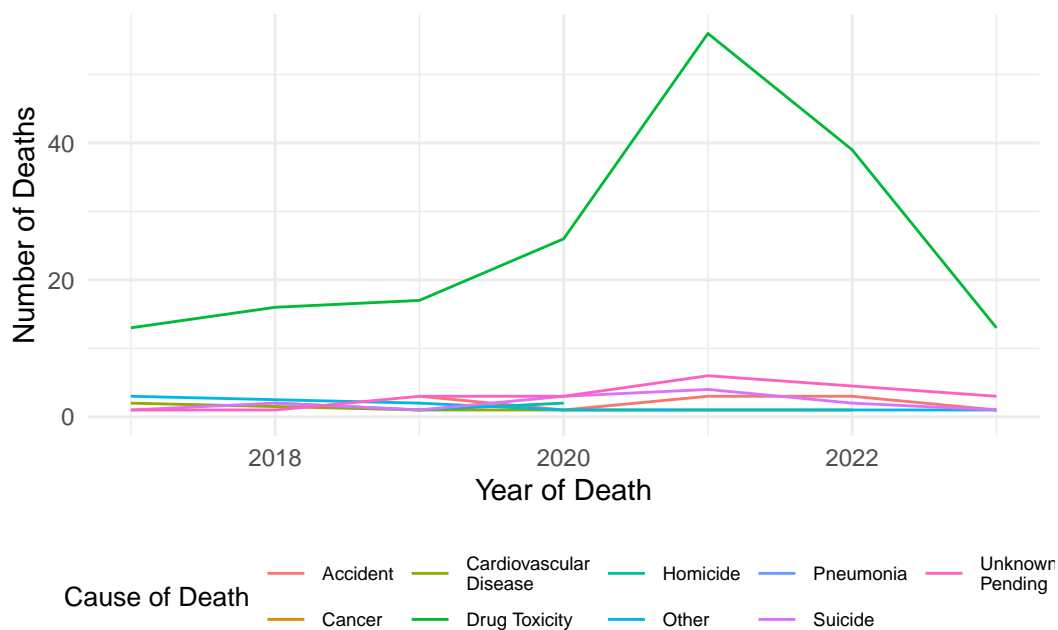


Figure 3: Trends in causes of death among age group “20-39”

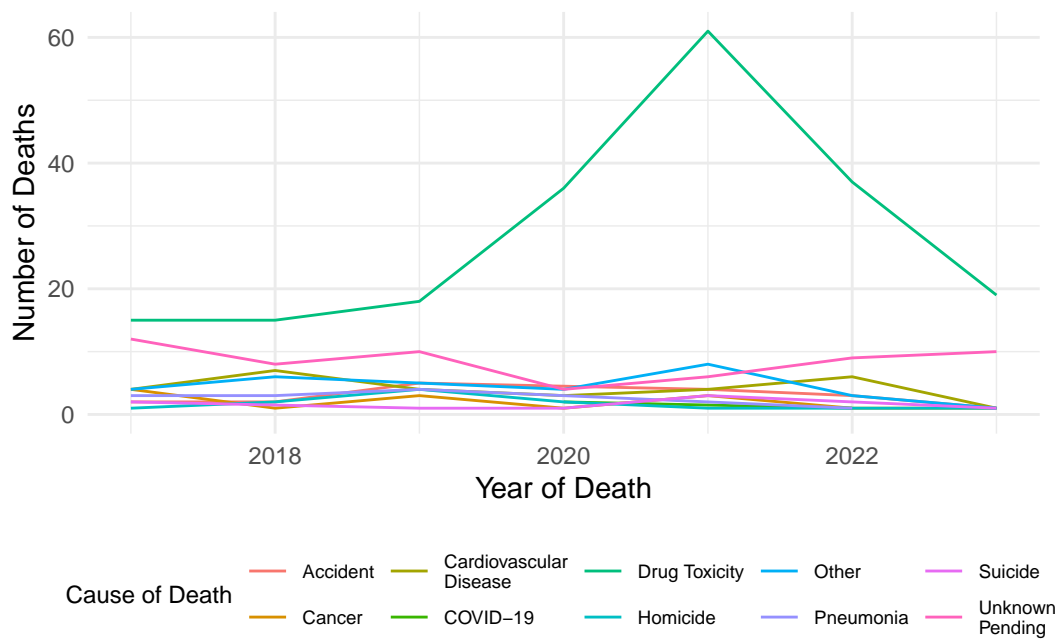


Figure 4: Trends in causes of death among age group “40-59”

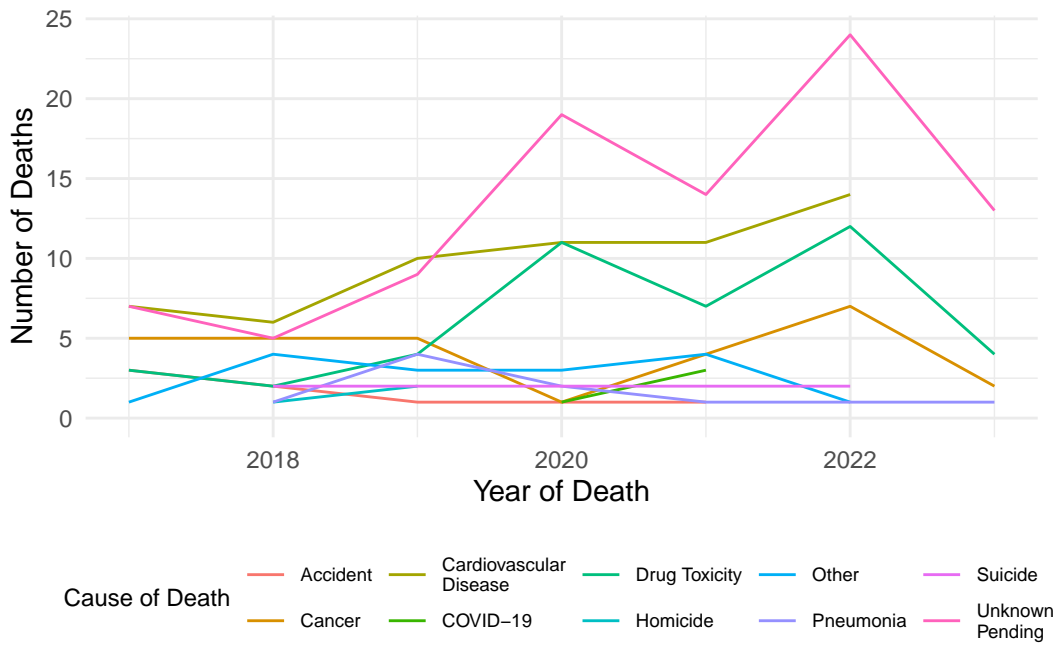


Figure 5: Trends in causes of death among age group “60+”

4 Conclusion

In conclusion, our data analysis uncovers a distinct trend and points to potential factors behind the increase in drug toxicity-related deaths among Toronto’s homeless population from 2017 to 2023. The evidence, drawn from Table 1, Figure 3, Figure 4, and Figure 5, shows a sharp rise in death among the young and middle-aged homeless segments. In contrast, the older homeless population appears to be less affected by drug-related issues, with cardiovascular disease being their leading cause of mortality. While our data does not provide evidence of the underlying causes of these trends, experts have speculated that the lockdowns may have compelled individuals to use drugs in riskier and stranger circumstances, potentially leading to higher death number related to drug toxicity. (Ireland 2023)

5 Appendix

We cleaned the data by cancelling the Count column, which represents the number of deaths in the specified category(Toronto 2023). For the convenience of counting specific population group, we copied the particular line a couple of times according to the number in the count. And all characters in columns’ names were transformed into lowercase.

Here is the sample of cleaned data.

Table 5: Sample of Data

id	year_of_death	cause_of_death	age_group	gender
1	2017	Accident	40-59	Male
2	2017	Accident	40-59	Male
3	2017	Accident	60+	Male
4	2017	Accident	60+	Male
5	2017	Accident	60+	Male
6	2017	Cancer	60+	Female
7	2017	Cancer	40-59	Female
8	2017	Cancer	40-59	Female
9	2017	Cancer	40-59	Male
10	2017	Cancer	40-59	Male

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