Opioid-Related Toxicity Deaths Within Ontario Shelters:

Circumstances of Death and Prior Medication & Healthcare Use

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Background

Ontario is experiencing an ongoing opioid-related toxicity crisis, with 2,534 opioid-related toxicity deaths reported in the province in 2022, representing a 63% increase from 2019.[1] Shelters provide short-term accommodation for individuals or families experiencing homelessness, with 7,767 emergency shelter beds reported in Ontario 2022.[2] As evidence has suggested, people experiencing homelessness are disproportionately impacted by the current drug toxicity crisis.[3] Understanding the prevalence of opioid-related harms occurring within shelters, how these have changed over time, and what interventions can be introduced to support the safety of people who use drugs who access these services is imperative. This is particularly important as recent data has demonstrated that the COVID-19 pandemic has led to rising opioid toxicity deaths within shelter and supportive housing settings in Ontario, with the number of deaths more than doubling (from 20 to 46 deaths) in the first 9 months of the pandemic.[4] This trend has also been reported specifically in Toronto shelter settings, where opioid-related mortality more than tripled from 17 deaths in 2019 to 57 deaths in 2022,[5] causing opioid toxicities to be identified as the presumed leading cause of death in shelter settings in Toronto.[6] The observed increases in opioid-related toxicity deaths in shelter settings are likely attributable to pandemic-related factors that impacted the population as a whole (e.g., an increasingly toxic unregulated drug supply, increased social isolation and using drugs alone, and pandemic-related disruptions to harm reduction and treatment services) as well as specific changes that may have occurred within shelter settings.[7] Specifically, COVID-19-related disruptions had far-reaching impacts on shelters, including the displacement of residents due to physical distancing measures which may have led to accessing an unfamiliar and potentially more dangerous drug supply, decreased staff support, potential changes in overdose response, and reduced harm reduction services for shelter residents, all of which likely exacerbated opioid-related harms in this setting.

Importantly, opioid use and related harms among people accessing Ontario's shelter system are situated within the complex interplay of several factors including social-economic and housing instability, complex health needs, trauma, mental health, stigma, and various barriers to harm-reduction and treatment.[8-11] Within the context of increasing calls to address the growing opioid toxicity crisis within Ontario shelters, including improving access to harm reduction services,[12] there is an urgent need to better understand the circumstances surrounding opioid-related toxicity deaths in shelters to help improve evidence-based responses. Therefore, the objective of this report is to use linked coronial records and health administrative data capturing opioid-related toxicity deaths in shelters and health service use across Ontario to better understand the demographic characteristics, circumstances surrounding death, and types of healthcare encounters preceding opioid-related toxicity deaths within Ontario shelters. The goal of this work is to help support an evidence-informed expansion of services within the shelter system that will help to prevent avoidable deaths from substance use that have been observed in recent years.

Methods

Setting

We conducted a cross-sectional descriptive study of trends, characteristics, and patterns of healthcare use among people who died of an opioid-related toxicity within shelters in Ontario, Canada between January 1, 2018 and June 30, 2022 — a time frame that encompasses periods before and during the COVID-19 pandemic.

Opioid-related toxicity death	Defined as a **confirmed acute toxicity death that was of accidental manner** (as opposed to suicide or undetermined) and resulted from the direct contribution of consumed substance(s), where one or more of the substances was an opioid, regardless of how the opioid was obtained.
Opioid-related toxicity deaths within shelters	Defined as **deaths where the location of incident** (i.e., where a person initially experienced the opioid-related toxicity prior to death) **was at an Ontario shelter** (as determined by the investigating coroner), regardless of whether the individual's death occurred within the shelter or after being transported to hospital. Thus, the term 'opioid-related toxicity deaths within shelters' is consistently used throughout this report to denote such incidents.
Shelters	Defined as **facilities that provide emergency accommodation**, typically of a short-term nature, to individuals without housing.[13]

As a response to the COVID-19 pandemic, temporary shelter sites within hotels and motels were increasingly adopted across Ontario's municipalities to support physical distancing and isolation measures. We restricted our **primary analysis** to deaths occurring in conventional shelter spaces (i.e., not in hotels/motels), as classified by the coroner.[14,15] This restriction was implemented for several reasons:

- Our inability to consistently distinguish deaths within hotels acting as temporary shelters from those occurring in hotels more generally
- Closures of temporary hotel-based shelters across the province
- Potential differences in circumstances surrounding death
- The feasibility of integrated services between temporary and conventional shelters

In a **secondary analysis**, we also summarized general trends in opioid-related toxicity deaths in Ontario where the location of incident was identified as a hotel or motel to help provide a broader understanding of trajectories of opioid-related toxicities that occurred within temporary shelter sites.

Data Sources

This study used administrative health data from ICES, an independent, non-profit research institute whose legal status under Ontario's health information privacy law allows it to collect and analyze health care and demographic data, without consent, for health system evaluation and improvement.

Drug and Drug/ Alcohol Related Death Database (**DDARD**)	We identified opioid toxicity deaths within Ontario shelters and the circumstances surrounding these deaths using the DDARD. This contains records from investigations of opioid-related toxicity deaths completed by the Office of the Chief Coroner/Ontario Forensic Pathology Service, and captures information on the location of incident (i.e., opioid-related toxicity) as determined by the coroner during their investigation.
Registered Person Database (**RPDB**)	To capture sociodemographic characteristics such as sex and geographic location, we used the Registered Person Database (RPDB), which contains information on all Ontario residents eligible for the publicly-funded Ontario Health Insurance Plan (OHIP).

Narcotics Monitoring System (**NMS**)	To examine the history of prescription opioid dispensing prior to death, we used the Narcotics Monitoring System (NMS), a database that captures all claims for controlled medications, including opioids, benzodiazepines and stimulants, dispensed from community pharmacies in Ontario, regardless of payer.
Community Health Centre (**CHC**)	For information on visits for outpatient care, we used the OHIP Claims Database and the Community Health Centre (CHC) Database.
National Ambulatory Care Resporting System (**NACRS**)	To capture information on emergency department (ED) visits, we used the Canadian Institute for Health Information's National Ambulatory Care Reporting System (NACRS).
Discharge Abstract Database (**DAD**)	To capture information on acute hospital admissions, we used the Discharge Abstract Database (DAD).
Ontario Mental Health Reporting System (**OMHRS**)	To capture information on mental health-related hospital admissions, we used the Ontario Mental Health Reporting System (OMHRS).

All datasets were linked using unique encoded identifiers and analyzed at ICES. All analyses on trends and circumstances surrounding death were conducted regardless of whether individuals could be linked to other healthcare databases; with restrictions to those identified in the linked data only conducted for analyses relying on medication prescribing and healthcare utilization. Small cells (N<6) were suppressed in accordance with ICES privacy policies, and ranges were provided as needed to prevent back calculation of suppressed cells.

Measures

Study period: **January 1, 2018 - June 30, 2020**

January - March	April - June	July - September	October - December
Q1	**Q2**	**Q3**	**Q4**

We reported the number of opioid-related toxicity deaths within Ontario shelters during each quarter from January 1, 2018, to June 30, 2022. We also described the number and proportion of opioid-related toxicity deaths by age group (<24, 25-44, 45-64, and ≥ 65 years) and sex (female and male). We examined the geographic distribution of opioid-related toxicity deaths by public health unit (PHU) using the postal code in the coroner's report or postal code associated with health card, as available.

We noted the circumstances surrounding each death including the origin of opioids directly contributing to death (pharmaceutical only, non-pharmaceutical, and both) and the types of opioid and non-opioid substances (i.e., alcohol, stimulants, and benzodiazepines) identified in post-mortem toxicology. Due to a lack of standardized thresholds to determine whether benzodiazepines in the unregulated drug supply (e.g., etizolam, flualprazolam, flubromazolam) directly contributed to death, we also reported the percentage of opioid-related toxicity deaths where benzodiazepines were detected (but not necessarily direct contributors to death). More information on the classification and grouping of substances identified in post-mortem toxicology is included in **Appendix A**. We described the location of death (in a shelter or other settings), and expected mode of drug use (inhalation only,

injection only, both inhalation and injection, and no inhalation or injection). We also reported instances where an individual was present and in a position to intervene at the time of death, patterns of resuscitation attempts, and if naloxone was administered.

In the linked analysis, we examined:

Opioid Use Disorder (**OUD**) Diagnosis	The proportion of people with an OUD diagnosis was defined as any hospital encounters (ED visits, inpatient hospitalizations [acute or mental-health related]) for an OUD, outpatient visit related to opioid agonist treatment (OAT), or OAT dispensed in the five years prior to death (**Appendix B, Table B1**).
Opioid Agonist Treatment (**OAT**) Dispensing	**Among people with an OUD diagnosis**, we also examined OAT dispensing (methadone and buprenorphine/naloxone) in the 30 days, 180 days, and 1 year prior to death.
Health Service Utilization	To examine health service utilization, we reported the prevalence of all-cause outpatient visits, ED visits, inpatient hospitalizations (acute), and hospital admissions for a non-fatal opioid-related toxicity in the 7 days prior to and including death (**Appendix B, Table B2**).
Healthcare Encounters	We also examined healthcare encounters **for a mental health-related diagnosis** in the 5 years prior to death including ED visits, hospitalizations, community health centre (CHC) visits, and other outpatient visits (see **Appendix B, Table B3**).
Outpatient Visits	For outpatient visits, we reported the **type of mental health disorder diagnosis** (psychotic, mood and anxiety, substance use, behavioural and neuro-developmental, and other).
Hospital Admissions	We reported hospital admissions **for any serious infection** (including infective endocarditis or invasive infections) in the prior 180 days (**Appendix B**, Tables **B4** and **B5**).

In all analyses, ED visits and inpatient hospitalizations that ended in death were excluded to avoid reporting on other events that were associated with death.

Analysis

We reported trends in opioid-related toxicity deaths within Ontario shelters in each quarter of the overall study period from January 1, 2018, to June 30, 2022 (Q1, January to March; Q2, April to June; Q3, July to September; Q4, October to December). We subsequently defined a pre-pandemic (January 1, 2018 to March 16, 2020) and COVID-19 pandemic (March 17, 2020 to May 31, 2022) period for descriptive analyses. The last month of the study period was excluded in the descriptive analyses to ensure equal-length intervals for the pre-pandemic and pandemic periods. We used descriptive statistics to summarize demographic characteristics, circumstances of death, prior opioid prescribing, health service utilization, and clinical characteristics in the pre-pandemic period and pandemic period. We used chi-square and t-tests (using a significance level of 0.05) to compare differences between periods.

In a secondary analysis, we reported the number of opioid-related toxicity deaths within hotels and motels in Ontario for each quarter of the study period.

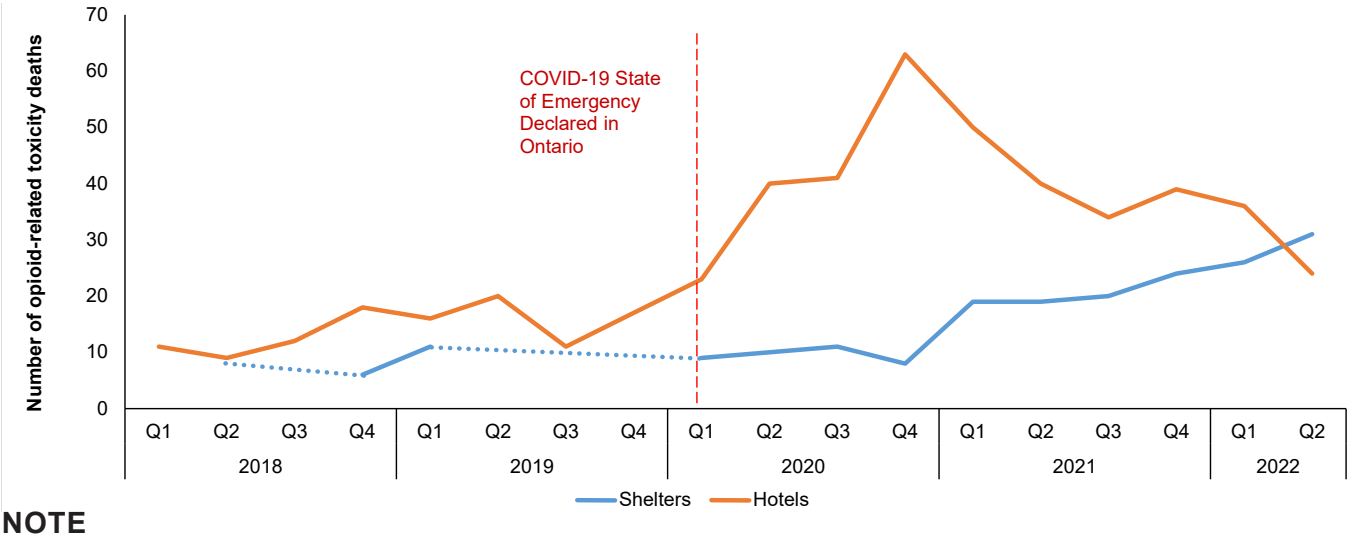
Key Findings

NOTES FOR ALL ANALYSES

- 'Opioid-related toxicity deaths within shelters' refers to deaths where the location of incident (i.e., where a person initially experienced the opioid-related toxicity prior to death) was an Ontario shelter (as determined by the investigating coroner). Note that the location of subsequent death could be at a non-shelter location, and that this excludes deaths within temporary shelters in hotels and motels during the pandemic.
- Red asterisk (*) indicates statistically significant (stat. sig) difference between pre-pandemic and pandemic periods (p<0.05).

Overall Opioid-Related Toxicity Deaths

Figure 1: Quarterly accidental opioid-related toxicity deaths within shelters and hotels



NOTE

- Dotted lines indicate cell suppression to preserve anonymity (i.e., counts <6).
- Opioid-related toxicity deaths within hotels refers deaths where the location of incident (i.e., where a person initially experienced the opioid-related toxicity prior to death) was a hotel in Ontario (as determined by the investigating coroner).

Between 2018 and 2022, the quarterly number of opioid-related toxicity deaths within shelters nearly quadrupled, rising from 8 deaths in Q2 2018 to 31 deaths in Q2 2022. Although we did not observe an immediate increase in opioid-related toxicity deaths in shelters in the early stage of the COVID-19 pandemic, there was a rapid increase in opioid-related toxicity deaths beginning in 2021, with 82 deaths occurring in that year, compared to 38 in the year prior (2020). Data suggests that the annual number of emergency beds in Ontario grew by only 14.8% (N=6,764 to 7,767) between 2018 and 2022.[2]

In our secondary analysis, we found that opioid-related toxicity deaths within hotels/motels followed a similar increasing pattern over the study period. However, in contrast to deaths occurring in conventional shelters, immediately following the COVID-19 state of emergency declaration in March 2020, the quarterly number of deaths in hotels/motels nearly tripled, increasing from 23 to 63 deaths between Q1 2020 and Q4 2020. In 2021, opioid-related toxicity deaths in hotels/motels began to decline, reaching 24 deaths in the last quarter of the study period (Q2 2022) whereas opioid-related toxicity deaths within shelters only began to increase in 2021. Although we are unable to distinguish opioid-related toxicity deaths occurring within hotel-based shelters from deaths in hotels more generally, our findings suggest a rise in deaths that is likely influenced by the rapid expansion of temporary hotel-based shelters used early during the COVID-19 pandemic.

We restricted the remainder of our analyses to deaths occurring within conventional shelters (i.e., not in hotel/motels) and stratified our cohort into two time periods of equal length; a pre-pandemic period and a pandemic period

Pre-Pandemic Period
January 1, 2018 – March 16, 2020
N = 48

Pandemic Period
March 17, 2020– May 31, 2022
N = 162

Geographic Distribution

Table 1: Opioid-related toxicity deaths by Public Health Unit (PHU), prior to and during the pandemic

Public Health Units	Pre-pandemic period (N, rate per 100,000) (N=48)	Pandemic period (N, rate per 100,000) (N=162)	Stat. sig.
Hamilton Public Health Services	≤5 (≤0.87)	10 (1.70)	*
Ottawa Public Health	≤5 (≤0.50)	20 (1.92)	*
Peel Public Health	≤5 (≤0.33)	10 (0.65)	
Region of Waterloo Public Health	≤5 (≤0.87)	8 (1.34)	*
Toronto Public Health	19 (0.67)	62 (2.16)	*
Northern Health Units†	≤5 (≤0.61)	6 (0.72)	
Other PHUs	15 (0.21)	35 (0.48)	*
Missing	0	11	

NOTE

†Northern Health Units constitute of the following PHUs: Algoma Public Health Unit, North Bay Parry Sound District Health Unit, Northwestern Health Unit, Porcupine Health Unit, Sudbury & District Health Unit, Timiskaming Health Unit, and Thunder Bay District Health Unit.

Generally, the population-adjusted rate of opioid-related toxicity deaths increased over time in all geographic regions (characterized by PHUs) in the province. Toronto Public Health had the highest population-adjusted rate of opioid-related toxicity deaths during the pandemic (N=62, 2.16 per 100,000 population) followed by Ottawa Public Health (N=20, 1.92 per 100,000 population), Hamilton Public Health Services (N=10, 1.70 per 100,000 population), and Region of Waterloo Public Health (N=8, 1.34 per 100,000 population). The absolute number of deaths doubled or more than doubled across large urban centres in the province including Toronto (N=19 to 62), Ottawa (N≤5 to 20), Hamilton (N≤5 to 10), and Peel (N≤5 to 10). Northern Health Units generally had lower number of deaths in shelters both prior to and during the pandemic (N≤5 vs N=6). Although, the absolute number of deaths more than doubled in other PHUs (N=15 to 35), population-adjusted rates of opioid-related toxicity deaths were generally lower.

Demographic Characteristics and Circumstances Surrounding Deaths

Table 2: Descriptive characteristics of opioid-related toxicity deaths prior to and during the pandemic

	Pre-pandemic period (N=48)	Pandemic period (N=162)
Median age (N, IQR)	41 (30-53)	38 (31-49)
Age categories		
<25	≤5 (≤10.4%)	14 (8.6%)
25-44	24 (50.0%)	89 (54.9%)
45-64	18 (37.5%)	54 (33.3%)
≥65	≤5 (≤10.4%)	≤5 (3.1%)
Sex		
Female	9 (18.8%)	37 (22.8%)
Male	39 (81.3%)	124 (76.5%)

NOTE

- None of the comparisons between the pre-pandemic and pandemic periods were statistically significant.
- Age and sex was missing for 0.6% of opioid-related toxicity deaths during the pandemic.

There was no significant change in the age and sex distribution of opioid-related toxicity deaths within shelters during the pandemic period. Across the two periods, the highest proportion of people who died of an opioid-related toxicity were between the ages of 25 to 44 years (50.0% vs 54.9%), followed by 45 to 64 years (37.5% vs 33.3%). Only a small proportion of deaths occurred among people <25 years old (≤10.4% vs 8.6%) and ≥65 years (≤10.4% vs ≤3.1%). More than three-quarters of deaths were among males both prior to and during the pandemic (81.3% vs 76.5%).

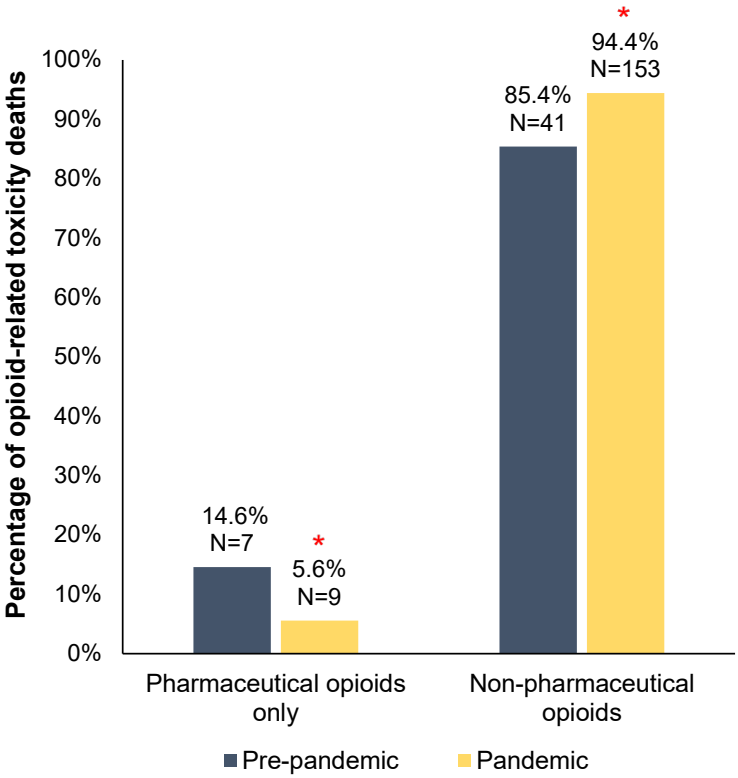
Among opioid-related toxicity deaths where the toxicity event occurred within a shelter during the pandemic,

69.8%

of people died in the shelter, thus indicating that shelters are the primary location of these deaths.

No significant differences in location of death were observed across the pre-pandemic and pandemic period.

Figure 2: Origin of opioids directly contributing to opioid-related toxicity deaths prior to and during the pandemic



The majority of opioid-related toxicity deaths in shelters involved non-pharmaceutical opioids such as fentanyl (alone or combined with pharmaceutical opioids) as direct contributors, and this proportion significantly increased in the pandemic period (85.4% [N=41] to 94.4% [N=153]; p=0.04). Approximately 1 in 20 deaths involved pharmaceutical opioids only (without combined involvement of non-pharmaceutical opioids) during the pandemic, a significant decrease from about 1 in 7 prior to the pandemic (from 14.6% [N=7] to 5.6% [N=9]; p=0.04). Less than 5 deaths (≤10.4%) involved both pharmaceutical and non-pharmaceutical opioids as direct contributors in the pre-pandemic period, with the proportion remaining relatively consistent in the pandemic period (13.6% [N=22]; p>0.05).

NOTE

- See **Appendix A** for definitions.
- In order to create mutually exclusive subgroups according to the source of opioids, we categorized deaths as pharmaceutical opioid-related toxicity deaths if they involved only pharmaceutical opioids. Cases where non-pharmaceutical opioids alone or a combination of pharmaceutical and non-pharmaceutical opioids contributed to death were categorized as non-pharmaceutical opioid deaths.

Table 3: Types of opioids directly contributing to opioid-related toxicity deaths, prior to and during the pandemic

	Pre-pandemic period (N=48)	Pandemic period (N=162)	Stat. sig.
Non-pharmaceutical opioids			
Fentanyl and fentanyl analogues	41 (85.4%)	153 (94.4%)	*
Heroin	≤5 (≤10.4%)	≤5 (≤3.1%)	*
Nitazene	0 (0.0%)	0 (0.0%)	
Opioids indicated for pain			
Any	6 (12.5%)	18 (11.1%)	
Hydromorphone	≤5 (≤10.4%)	10 (6.2%)	
Morphine	≤5 (≤10.4%)	11 (6.8%)	
Other	≤5 (≤10.4%)	≤5 (≤3.1%)	*
Opioid agonist treatment (OAT)			
Methadone	≤5 (≤10.4%)	15 (9.3%)	
Buprenorphine	0 (0.0%)	0 (0.0%)	

NOTE

Categories are not mutually exclusive. Some deaths were attributed to multi-drug toxicity where more than one substance can contribute to an individual death.

Fentanyl (and its analogues) directly contributed to the majority of deaths, and its role as a direct contributor to death rose during the pandemic (85.4% vs 94.4%; p=0.04). In contrast, the proportion of deaths involving opioids indicated for pain as direct contributors did not substantially differ (12.5% vs 11.1%; p=0.79). The role of methadone (used for OAT) in opioid-related toxicity deaths occurring in shelters did not change during the pandemic, contributing to ≤10% of deaths in both periods (≤10.4% [N≤5] vs 9.3% [N=15]; p>0.05).

Table 4: Non-opioid substances involved in opioid-related toxicity deaths, prior to and during the pandemic

	Pre-pandemic period (N=48)	Pandemic period (N=162)	Stat. sig.
Other substances that directly contributed to opioid-related toxicity death			
Alcohol	10 (20.8%)	25 (15.4%)	
Stimulants	21 (43.8%)	115 (71.0%)	*
Cocaine	12 (25.0%)	64 (39.5%)	
Methamphetamines	14 (29.2%)	77 (47.5%)	*
Benzodiazepines	≤5 (≤10.4%)	11 (6.8%)	
Other substances detected in opioid-related toxicity death			
Benzodiazepines	13 (27.1%)	92 (56.8%)	*

NOTE

Categories are not mutually exclusive. Some deaths were attributed to multi-drug toxicity where more than one substance can contribute to an individual death.

The role of stimulants as a direct contributor to opioid-related toxicity deaths within shelters significantly increased during the pandemic, rising from 43.8% to 71.0% (p<0.01), leading to a 5-fold increase in the absolute number of these deaths (N=21 vs N=115). Specifically, both cocaine and methamphetamine involvement in death increased during the pandemic period. Cocaine directly contributed to 39.5% (N=64) of deaths, compared to 25.0% (N=12) pre-pandemic; although this increase was not significant. Methamphetamine directly contributed to a significantly higher proportion of opioid-related toxicity deaths during the pandemic, rising from 29.2% [N=14] to 47.5% [N=77] (p=0.02).

Although the involvement of benzodiazepines as a direct contributor to opioid-related toxicity deaths in shelters did not significantly change during the pandemic (≤10.4% [N≤5] vs 6.8% [N=11]), more than half (56.8%; N=92) of deaths had a benzodiazepine detected, compared to just over one quarter (27.1%; N=13) prior to the pandemic (p<0.001).

The coroner determined that there was an individual present and in a position to intervene in

1 in 7 **opioid-related toxicity deaths within Ontario shelters during the pandemic (13.6%, N=22).**

Table 5: Resuscitation attempts and naloxone administration where an individual was present and in a position to intervene, prior to and during the pandemic

	Individual present and in a position to intervene pre-pandemic period (N=8)	Individual present and in a position to intervene pandemic period (N=22)	Stat. sig.
Resuscitation attempt	6 (75.0%)	18 (81.8%)	
Naloxone administered during resuscitation	≤5 (≤62.5%)	17 (77.3%)	*

During the pandemic period, 1 in 7 opioid-related toxicity deaths within shelters (13.6%, N=22 of 162) occurred where an individual was present and in a position to intervene at the time of the incident, a small, but significant decrease from 16.7% during the pre-pandemic period (N=8 of 48; p=0.04).

The majority of deaths where an individual was present and in a position to intervene led to resuscitation attempts both in the pre-pandemic period (75.0%; N=6) and the pandemic period (81.8%; N=18; p=0.68). Importantly, naloxone administration rose significantly over this time, from ≤62.5% to 77.3% (p<0.05).

Table 6: Likely mode of drug use, prior to and during the pandemic

Likely mode of drug use	Pre-pandemic period (N=48)	Pandemic period (N=162)	Stat. sig.
Evidence of injection only	14 (29.2%)	21 (13.0%)	
Evidence of inhalation only	≤5 (≤10.4%)	58 (35.8%)	
Evidence of inhalation and injection	≤5 (≤10.4%)	24 (14.8%)	*
No evidence of inhalation or injection	24 (50.0%)	55 (34.0%)	
Pending	0 (0.0%)	≤5 (≤3.1%)	

NOTE

Categories are mutually exclusive.

We observed a significant change in the distribution of the likely mode of drug use among deaths within shelters during the pandemic (p<0.01). Specifically, there was a shift away from injection only (29.2% vs 13.0%), towards inhalation only (rising from ≤10.4% to 35.8%). Evidence of both injection and inhalation also increased during the pandemic period from ≤10.4% to 14.8%.

Interactions with the Healthcare System Prior to Opioid-Related Toxicity Deaths

We restricted subsequent analyses to individuals identified in linked data

Pre-Pandemic Period
January 1, 2018 – March 16, 2020
N = 47

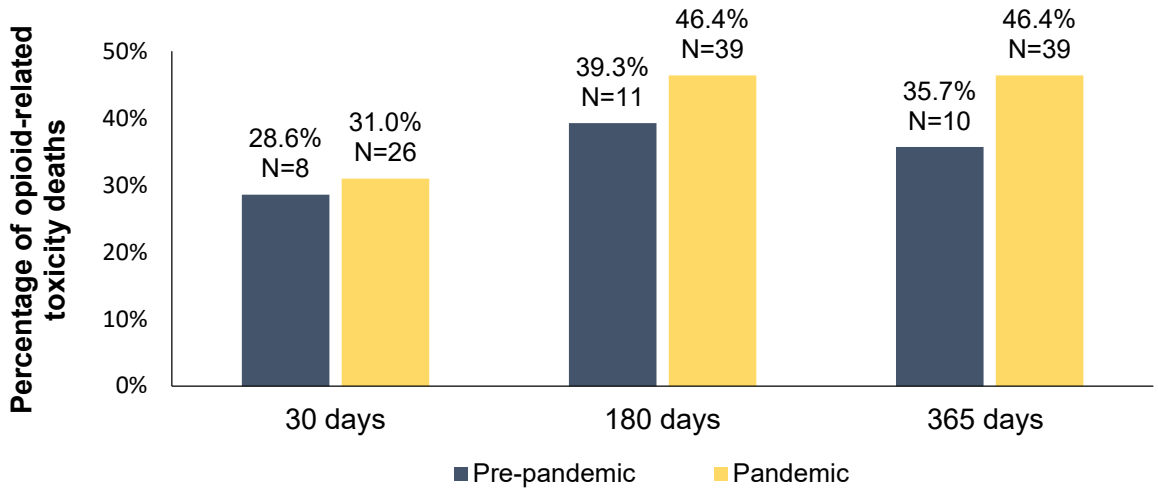
Pandemic Period
March 17, 2020– May 31, 2022
N = 157

In the 5 years prior to death, more than 1/2

of opioid-related toxicity deaths within Ontario shelters occurred among people who had a diagnosis of OUD

There was no significant change in the prevalence of OUD across the pre-pandemic and pandemic period (59.6% vs 53.5%; p=0.46).

Figure 3: Receipt of OAT† among those with OUD who died from opioid-related toxicity, pre-pandemic (N=28) and pandemic period (N=84)



NOTE

†OAT includes methadone, buprenorphine containing products and/or slow-release oral morphine (SROM).

Patterns of OAT dispensing did not significantly change during the pandemic. Among the 84 people with a prior OUD diagnosis who died of an opioid-related toxicity in a shelter during the pandemic, 31.0% (N=26) were dispensed OAT in the month prior to death, 46.4% (N=39) were dispensed OAT in the 180 days prior to death.

Table 7: Recent healthcare encounters in the 7 days prior to opioid-related toxicity death, pre-pandemic and pandemic period

	Pre-pandemic period (N=47)	Pandemic period (N=157)
Any healthcare encounters† (prior 7 days)	22 (46.8%)	69 (43.9%)
Any outpatient visit§	11 (23.4%)	46 (29.3%)
ED visits	16 (34.0%)	39 (24.8%)
Inpatient hospitalization (acute)	0 (0.0%)	≤5 (≤3.2%)
Hospitalizations or ED visits for opioid-toxicity (prior 7 days)	7 (14.9%)	13 (8.3%)

NOTE

- None of the comparisons between the pre-pandemic and pandemic periods were statistically significant.
- † Includes outpatient visits (including primary care), ED visits, or hospital admissions. Excludes any inpatient hospitalization or ED visit that resulted in an opioid-related toxicity death.
- § Includes visits with any provider type (including physicians and nurse practitioners) in an outpatient setting.

Overall, there were no significant changes in recent healthcare encounters among people who died of an opioid-related toxicity within a shelter during the pandemic. However, a large percentage of people had an encounter with the healthcare system in the week before death in both periods (46.8% vs 43.9%; p=0.73). Patterns across specific types of healthcare encounters varied, with the most common engagements with the healthcare system in outpatient settings (23.4% and 29.3%) and ED settings (34.0% and 24.8%). Notably, approximately 15% of people who died of an opioid-related toxicity before the pandemic had been treated in a hospital setting for a non-fatal opioid-related toxicity in the week prior to death (N=7); this proportion was 8.3% (N=13) during the pandemic.

Table 8: Health service utilization prior to opioid-related toxicity death, pre-pandemic and pandemic period

	Pre-pandemic period (N=47)	Pandemic period (N=157)
Any healthcare encounter for mental health-related diagnosis in prior 5 years	44 (93.6%)	148 (94.3%)
ED visit or hospitalization	36 (76.6%)	124 (79.0%)
CHC visit	10 (21.3%)	25 (15.9%)
Other outpatient visit (OHIP)	42 (89.4%)	141 (89.8)
Psychotic disorders	13 (27.7%)	54 (34.4%)
Mood and anxiety disorders	35 (74.5%)	114 (72.6%)
Substance use disorders	31 (66.0%)	123 (78.3%)
Behavioural and neuro-developmental disorders	≤5 (≤10.6%)	13 (8.3%)
Other mental health-related disorders	16 (34.0%)	62 (39.5%)
Health Conditions		
Any serious infection† (prior 180 days)	6 (12.8%)	8 (5.1%)

NOTE

- None of the comparisons between the pre-pandemic and pandemic periods were statistically significant.
- † Includes any hospitalization for infective endocarditis or any invasive infection. See Appendix B, Tables B4 and B5 for definitions.

More than 90% of people who died of an opioid-related toxicity within a shelter both before and during the pandemic had a healthcare encounter for a mental health diagnosis in the 5 years prior to death, with a high prevalence of encounters in both outpatient settings (89.8%) and hospital settings (79.0%). However, there were no significant changes in the patterns of mental healthcare encounters during the pandemic. Similarly, there was no significant change in the prevalence of prior infections, with 12.8% and 5.1% of people diagnosed with an infection in the six months prior to death in the pre-pandemic and pandemic periods, respectively (p=0.07).

Limitations

1. Location of incident for opioid-related toxicity deaths is determined by the investigating coroner during their investigation. Although we anticipate misclassification of location to be rare, it cannot be externally validated. Also, it is important to note that opioid-related toxicity deaths within shelters may constitute a location of incident inside a shelter or on shelter property.
2. In our primary analyses, we did not capture opioid-related toxicity deaths in temporary-emergency shelter sites (i.e., within hotels) for several reasons, including the inability to consistently differentiate deaths within hotels acting as temporary shelters from those occurring in hotels more generally, closures of many pandemic-era hotel shelter sites across the province, potential differences in circumstances surrounding death and the feasibility of integrated services between temporary and conventional shelters.
3. In our analyses of coronial records, we only included confirmed opioid-related toxicity deaths. Therefore, some deaths that may later be determined to be opioid-related are not included in our study, although we anticipate that this difference is small. Furthermore, the final determination of the role of opioids and/or other substances in toxicity deaths and mode of substance use relies both on post-mortem toxicology findings and on the coroner's investigation.
4. There is no validated definition of OUD diagnoses in administrative health data, thus we relied on healthcare encounters related to OUD, prior receipt of OAT, or fee codes specific to OAT provision to define this measure (using ICES data). We did not capture individuals with OUD who had not engaged in the healthcare system related to this diagnosis and those who may have accessed residential treatment for an OUD but had no related diagnosis identified in other healthcare records. Additionally, some people with substance use disorder may not present in healthcare settings due to fear of stigma. Therefore, we may have underestimated the prevalence of OUD in this analysis.
5. We expect some misclassification regarding the origin of the opioid involved in death, despite the steps taken to exclude potential metabolites (see **Appendix A**).
    a. We anticipate underreporting of heroin-attributable deaths. To demonstrate, some deaths that were classified as morphine in our analysis may be caused by heroin, which metabolizes into morphine. 6-MAM (a metabolite of heroin) is quickly eliminated from the body, and thus may not be detected in post-mortem toxicology analysis.
    b. It is possible that some non-pharmaceutical opioid-related toxicity deaths involve the use of prescription fentanyl; however, we expect this to be very rare as previous research using the same dataset found that fentanyl patches at the scene of the incident or evidence of prior fentanyl prescriptions were only found in about 1% of fentanyl-related deaths.[16]
6. Routine toxicity for nitazene and xylazine during coronial investigations of opioid-related toxicity deaths were not consistent over study period and thus the involvement of either substance in deaths was not reported.
7. Prescribing data is based on records of prescriptions dispensed from pharmacies. We are unable to determine whether people who were dispensed medications took the medication as prescribed.

Discussion

Rising Opioid-Related Toxicity Deaths in Shelters During the Pandemic

Opioid-related toxicity deaths within Ontario shelters have grown considerably during the COVID-19 pandemic, with the number of these deaths more than tripling in the province in the first 14 months of the pandemic (48 pre-pandemic up to 162 during the pandemic period). This finding mirrors a prior report of heightened opioid-related toxicity deaths within emergency shelter settings in Toronto, where the number of deaths also tripled across a similar period.[5] Moreover, we found that the number of fatal opioid-related toxicities within shelters has risen disproportionately compared to broader Ontario trends, where the number of accidental opioid-related toxicity deaths rose by 13% (N=1,530 to N=1,734) between 2020 and 2021[17] compared to a 116% increase (from N=38 to N=82) within Ontario shelters over the same period. Although we did not capture opioid-related toxicity deaths in temporary emergency shelter sites in our primary analyses, we found rapidly increasing opioid-related toxicity deaths in hotels early in the pandemic that likely reflected fatalities within temporary hotel shelters. While hotel-based shelter models were a necessary response within the shelter system amidst the COVID-19 pandemic, the transition from congregate spaces to private accommodations may have introduced unique risks of drug toxicity (e.g., given increased likelihood of using drugs alone in isolated spaces).[18] The number of opioid-related deaths within hotels began declining in Q1 2021, likely in response to the closure of many hotel shelters, with people moving back to primarily accessing conventional shelter spaces. At this time, opioid-related toxicity deaths within conventional shelters began to rise, with a more gradual sustained increase in deaths in this setting over the remainder of the study period. Taken together, these findings suggest a need to consider unique risks for people who use drugs within temporary hotel shelters, especially considering the continued presence of temporary emergency shelter sites in some communities,[19] as well as the implications of hotel shelter closures on risks for people transitioning back to conventional shelters.

Fentanyl and Evolving Substance Patterns

Similar to trends observed more generally in Ontario, we found that the vast majority (94%) of opioid-related toxicity deaths within shelters directly involved fentanyl, with the unregulated opioid supply increasingly driving deaths during the pandemic.[16,17] Further, there was a significant decrease in opioid-related toxicity deaths directly involving pharmaceutical opioids alone. We also observed rising stimulant involvement and increasing benzodiazepine detection in deaths, mirroring patterns observed in the broader Ontario population during the pandemic.[16] This rising prevalence of involvement and detection of non-opioid substances in opioid-related toxicity deaths further highlights the importance of increasing the availability of overdose response tools and supports within shelters. For example, having oxygen available can support people experiencing substance-related toxicities that may only partially respond to naloxone—which reverses the effects of opioids only.[20] However, oxygen is not accessible widely within shelters across Ontario, which likely reflects challenges in obtaining a medical directive for oxygen and the need for additional training of staff in these settings.[20] Importantly, we found an increased involvement of methamphetamines as a direct contributor to opioid-related toxicity deaths within shelters during the pandemic (48%), a prevalence that is much higher than previous findings in the general Ontario population (27%).[16] This aligns with previous reports of higher methamphetamine use among people experiencing homelessness,[21] which is likely influenced by its lower price (compared to cocaine)[22] and the frequent use of stimulants by people experiencing homelessness to help them remain awake at night to protect themselves and their belongings. Together, our findings reaffirm the enormous role that the unregulated drug supply plays in fatal opioid-related toxicities in shelters, as well as the increasingly unpredictable nature of this toxic supply that continues to drive changing patterns of drug use and risks of harm.

Circumstances and Active Responses within Shelters

It is important to note that, during the pandemic, almost 90% of opioid-related toxicity deaths within shelters occurred in the absence of another person who was in a position to intervene, representing a small, but significant increase from before the pandemic. However, despite this high frequency of using substances alone, when there was a person present and in a position to intervene at death, naloxone was administered over three-quarters of the time (77%). Together, these findings demonstrate a high prevalence of drug use when alone within shelters that worsened during the pandemic, but also highlight active response by shelter staff or residents when they encounter a toxicity. While shelters provide a valued and necessary response to homelessness across the province, the influence of diverse policies and approaches towards substance-use and harm reduction in shelters on opioid-related harms warrant review and discussion. Policies that prohibit and punish substance use or possession on shelter sites encourage concealment of drug use which can contribute to increased risk of toxicity, especially in the absence of safe spaces for substance use within most shelter settings.[9,13] Additionally, it is not uncommon for shelter staff to have varying degrees of knowledge regarding the permissibility of drug use within shelters as policies often present "grey areas" resulting in potentially arbitrary implementation.[18] As a result, shelter washrooms are known common sites for drug consumption and toxicity incidents, serving as unsupervised, and therefore often unsafe, consumption sites.[9]

While Urgent Public Health Need Sites (UPHNS) have been introduced on a temporary basis to provide supervised consumption services (SCS) in some shelter locations since the pandemic, these findings reinforce the need for widespread permanent implementation of SCS within shelters across the province. Furthermore, even in shelters where SCS has been implemented, barriers to their access continue to exist, including limited operating hours, experiences of stigma, general distrust in staff, lack of inhalation spaces, and preferences for using drugs in private areas.[18] In addition, with the observed shift towards evidence of the inhalation of opioids (mirroring national trends in changing modes of drug use),[4,23,24] there is also a need to improve connections to supervised inhalation and smoking sites for people who use drugs within shelters. Finally, the implementation of regular wellness checks became increasingly adopted within shelters during the pandemic to address toxicities resulting from drug use alone or in isolated areas. However, an evaluation of these practices revealed that wellness checks are often executed inconsistently and implemented in a manner that stigmatizes shelter residents (especially those who use substances) and potentially exposes them to abuse and discrimination.[18] Instead, collaborative safety plans that take into account the needs and preferences of shelter residents who use drugs have proven successful.[18] Therefore, although wellness checks can be important part of a comprehensive overdose response when executed in a way that builds trust between shelter staff and residents, further consideration of the manner in which these checks are implemented within shelters is warranted.

Harm Reduction Approaches and Support

Recognizing the importance of moving away from abstinence-only models to address rising opioid mortality, some regions have introduced a range of harm reduction services into specific shelters during the COVID-19 pandemic. For example, in the City of Toronto, this has included UPHNS, wellness checks, peer-witnessing programs, harm reduction outreach workers, and mental health case management outreach.[7,18] While the expansion of embedded harm reduction services in shelters since the pandemic is a positive development, several challenges have been identified with its implementation, including discrepancies between theoretical policies governing shelters and practice, accessibility of services to residents, and a lack of standardized overdose response.[18] Overall, despite progress in some settings, there is a need to continue to improve and expand existing harm reduction approaches in shelter settings throughout the province and ensure tailoring of responses toward the needs of people residing within shelters.

Importantly, our findings did suggest a high prevalence of naloxone administration when there was a person present and in a position to intervene in a toxicity within a shelter setting. This may reflect efforts made to

increase the availability and accessibility of naloxone in shelters, as well as a recognition of the importance of staff training on naloxone use in these settings, representing a crucial step towards expanding harm reduction services and supports within shelters. Although policies requiring mandatory training for overdose prevention may exist within shelter systems, they can be unenforced in practice, and shelter staff often lack the necessary supports to effectively implement practices.[18] Additionally, heavy reliance on temporary agency staff in shelters (especially during the weekends) has been identified as a significant challenge due to their unfamiliarity with shelter policies and lower access to minimum training on overdose response and harm reduction practices.[18] Thus, there is a need to provide resources to shelters to address staff shortages, ensure adequate training of all staff, and expand available overdose response tools (e.g., provision of oxygen) while also supporting routine access to healthcare professionals with medical training to respond to overdoses.[9,18] Further, while shelter staff and residents continue to play a crucial role in the overdose response, it is imperative to ensure that adequate support is provided to address the trauma and emotional burden that can result from frequently responding to toxicities, especially for staff who have not been specifically hired or trained to take on this role.[9]

OUD Diagnoses and Access to OAT

Over half of people who died of an opioid-related toxicity within a shelter had a diagnosis of an OUD in the 5 years prior to death. Importantly, this remained consistent both before and during the pandemic, which aligns with national data suggesting that the prevalence of OUD has not changed appreciably across Canada over the past decade,[25] and suggests that rising harms in this population are not being driven by increased prevalence of OUD, but instead by the increasingly unpredictable unregulated drug supply. Furthermore, among those with an OUD, only one-third were dispensed OAT in the month before death during the pandemic, a finding that is comparable to provincial-level findings.[26] These findings reflect the need for low-barrier access to OAT that may require adaptation to best support treatment retention among people experiencing homelessness. In particular, people experiencing homelessness may face unique challenges such as difficulties meeting daily observed OAT dose requirements in pharmacy locations due to the precarity of their housing as well as barriers to receiving take-home doses due to lack of safe spaces to securely store OAT.[11,27] Approaches that help mitigate barriers to OUD treatment may include mobile and street-outreach OAT clinics, expanding access to extended-release longer-acting forms of OAT, adopting treatment models that reduce heavy reliance on physical appointments with providers, shelter-based OAT programs that provide access to treatment on-site, as well as secure on-site OAT storage options for take-home doses in shelters.[11] Furthermore, it is important to recognize that a large number of people who use substances do not have an OUD (and so are not eligible for treatment) and/or also use other substances.[26] This reinforces the need to continue to support varied responses to the substance toxicity crisis that encompass both harm reduction and treatment-focused services for people who use substances.

Previous Healthcare Interactions

In this report, we found a higher prevalence of healthcare interactions within outpatient and hospital settings in the week before opioid-related toxicity death (44%), compared to the general Ontario population (24%),[16] representing potential missed opportunities for engagement and connection to services in this population. Additionally, 8% of people who died of an opioid-related toxicity had an interaction in a hospital setting for a non-fatal opioid-related toxicity in the week prior to death, further highlighting a vital window for healthcare professionals within hospital settings to support individuals at risk of substance-related harms. Research indicating that people experiencing homelessness may be more likely to seek OUD treatment via hospital visits rather than in outpatient setting,[11] coupled with the high prevalence of ED visits in the week before death observed in this report (25%), indicates an opportunity to integrate comprehensive strategies to support people who use substances within hospital settings, including referral to OAT, improved transitions of care, and connection with community-based supports.[28] This gap in the hospital system is highlighted by a recent study showing that only 1 in 18 people initiated OAT following an opioid-related toxicity in Ontario.[29] Additionally, special consideration is warranted to ensure that services are

tailored towards the preferences and needs of precariously housed individuals whose hospital discharge plans may look different than those with stable housing.

Finally, we found that the majority (94%) of people who died from an opioid-related toxicity within shelters had a mental health-related healthcare encounter in the previous 5 years, slightly higher than previous population-level findings in Ontario (89%).[16] Importantly, almost 8 in 10 (79%) people had a hospital-based encounter for a mental health diagnosis, which is notably higher than what has been reported broadly across the province (56%).[16] Therefore, better integration of mental-health support programs for people who use drugs within our healthcare system, especially within hospital settings, would help improve access to these services, particularly for people experiencing homelessness.

Conclusion

The findings of this report reinforce the disproportionate impact of the opioid toxicity crisis on the population of people who are vulnerably housed, demonstrating the rising trends of these deaths occurring within shelters, and highlighting the need for a comprehensive response. The number of opioid-related toxicity deaths within Ontario shelters has more than tripled over the COVID-19 pandemic, with the unregulated opioid supply and polysubstance use driving the vast majority of these preventable deaths. Given our findings, there is an urgent need to further expand access to services to support people who use drugs who are experiencing homelessness and to ensure that shelters are adequately resourced to integrate these services into their sites whenever possible. This may include expansion of harm reduction approaches and services such as naloxone and oxygen training and availability, drug checking, supervised consumption, lower barrier access to OAT, safer drug supplies, and improved access to healthcare providers with substance use training, approaches which are already underway in some regions across the province. Finally, it is pivotal to recognize that many of the risks related to substance use and barriers to treatment and community-based services can be improved by addressing upstream factors that impact people's social determinants of health, including more accessible permanent and transitional housing solutions, income and employment supports, mental health services, and community-based social supports.

Contributors

Ontario Drug Policy Research Network

The Ontario Drug Policy Research Network (ODPRN) is a province-wide network of researchers who provide timely, high quality, drug policy relevant research to decision-makers, clinicians and communities. The ODPRN houses the Ontario Opioid Drug Observatory (OODO) which is funded through a grant from the Canadian Institutes of Health Research (CIHR). This observatory aims to measure, assess, and evaluate the changing circumstances of substance use (including opioids) and substance-related harms by leveraging large, population-level data sources to inform drug policy. For more information, visit **odprn.ca**.

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Public Health Ontario is a Crown corporation dedicated to protecting and promoting the health of all Ontarians and reducing inequities in health. Public Health Ontario links public health practitioners, frontline health workers and researchers to the best scientific intelligence and knowledge from around the world. Public Health Ontario provides expert scientific and technical support to government, local public health units and health care providers relating to the following:

- communicable and infectious diseases
- infection prevention and control
- environmental and occupational health
- emergency preparedness
- health promotion, chronic disease and injury prevention
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Office of the Chief Coroner – Privacy Statement

Personal information used in developing this report was collected under the authority of the Coroners Act, R.S.O. 1990, C. C.37, as amended. Questions about this collection should be directed to the Chief Coroner, 25 Morton Shulman Avenue, Toronto ON M3M 0B2, Tel.: 416 314-4000 or Toll-Free: 1 877 991- 9959.

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Appendix A: Glossary

Opioids:
A family of substances that include pharmaceutical opioids available through prescription for the treatment of pain and opioid use disorder (e.g., oxycodone) and non-pharmaceutical opioids (e.g., heroin).

Opioid-Related Death:
An acute intoxication/toxicity death resulting from the direct contribution of consumed substance(s), where one or more of the substances was an opioid, regardless of how the opioid was obtained.

Opioid Use Disorder (OUD):
A medical condition associated with cravings for opioids that may lead to chronic use of opioids and behaviours that may interfere with the activities of daily life. Further information on the definition we used for this report, is summarized in Appendix B below.

Opioid Agonist Treatment (OAT):
A treatment recommended in the care of people with OUD. The OAT types that are examined in this report, are methadone and the combination product buprenorphine/naloxone (commonly known by its brand name Suboxone®) and slow-release oral morphine (SROM). We also included longer-acting buprenorphine formulations (Sublocade® and Probuphine®). These medications are opioids that aid in the prevention of opioid withdrawal and cravings and can block the euphoric effect of other opioids.

Origin of opioids:
- Opioids with **primarily unregulated and non-pharmaceutical origins** include:
  - Heroin, heroin metabolites (morphine where monoacetylmorphine (6-MAM) was also detected)
  - Fentanyl, fentanyl analogues (including carfentanil)
- Opioids with **primarily regulated and pharmaceutical origins** include:
  - Buprenorphine, codeine, hydrocodone, hydromorphone, methadone, morphine where 6-MAM was not detected, oxycodone, oxymorphone, or tramadol. This category may include opioids that were prescribed to the deceased person or that were prescribed to someone else (i.e., diverted).

Metabolites:
- We undertook the following steps to exclude potential metabolites from post-mortem toxicology throughout our analyses:
  - Removing the indication of morphine and flagging as heroin in instances where there was a presence of both morphine and 6-monoacetylmorphine (6-MAM);
  - Removing the indication of oxymorphone (which is not prescribed in Ontario) and flagging as oxycodone if its metabolite oxymorphone was present; and
  - Removing the indication of hydrocodone if both hydrocodone and codeine were present, as there are few deaths with both hydrocodone and codeine as either a direct contributor or detected.

Benzodiazepines:
A class of sedative and anti-anxiety drugs that are widely prescribed for the treatment of anxiety, sleep disorders (e.g., insomnia), certain forms of epilepsy, and alcohol withdrawal. Currently, 14 different benzodiazepines are approved for use in Canada. Benzodiazepines that are not approved for medical use in Canada, such as etizolam, are increasingly being found in the unregulated drug supply.

Stimulants
A class of drugs used for the treatment of attention-deficit/hyperactivity disorder and sleeping disorders (e.g., narcolepsy). These drugs act on the central nervous system to increase alertness, attention and energy. This category also includes stimulants that are used occasionally and primarily available from the unregulated market, such as cocaine and methamphetamine.

Substance involvement in opioid toxicity deaths:
- **Detected:** Substances detected in toxicology testing, which may or may not have directly contributed to the death.
- **Directly contributing to death:** Substances determined by the pathologist and/or coroner to have directly contributed to the death based on the complete investigative findings, i.e., toxicology findings and the information obtained during the death investigation.

Rate:
The frequency with which an event or circumstance occurs per unit of time, population, or other standard of comparison. Example: Based on a rate of 1.5 deaths per 10,000 people, we can expect approximately 15 deaths in a community of 100,000.

Appendix B: Diagnosis Codes Used to Identify Healthcare Encounters and Health Conditions

Table B1: Health Conditions: History of Opioid Use Disorder (OUD)

History of OUD was defined as meeting any one of the criteria below in the 5 years prior to death:

Criteria	Data source	Codes
Any outpatient OAT feecodes in the 5 years prior to death	OHIP Claims Database	**OHIP feecodes:** K682, K683, K684
Any emergency department visit or acute hospital admission with a diagnosis code for opioid-related dependence	NACRS, DAD	**ICD-10 diagnosis code:** F11
Any mental health-related hospital admission with a diagnosis code for OUD	OMHRS	**DSM diagnosis codes:** 304.0, 305.5 or **ICD-10 diagnosis code:** F11
Received a prescription for OAT (methadone, the combination product buprenorphine/ naloxone, Probuphine, Sublocade, or SROM)	NMS	N/A

OHIP: Ontario Health Insurance Plan NACRS: National Ambulatory Care Reporting System; DAD: Discharge Abstract Database; OMHRS: Ontario Mental Health Reporting System; NMS: Narcotics Monitoring System.

Table B2: Health Encounters

Any healthcare encounters include:

Type of Encounter/ Condition	Criteria	Data Source	Codes
Any healthcare encounters include:			
Acute inpatient hospital admission	Any acute care-related hospital admission. • Excludes admissions to adult-designated mental health beds. • Includes admissions related to mental health care for children and adolescents (i.e., people less than 18 years of age).	DAD	N/A
Emergency department visit	Any visit to an emergency department. Includes visits related to mental health diagnoses.	NACRS	N/A
Outpatient care	Any visit (with any provider type) in an office, home care, virtual, long-term care, or community health centre setting.	OHIP Claims Database, CHC	N/A
Opioid toxicity-related emergency department visits and hospitalizations	Emergency department visit or hospital admission for opioid-related toxicity.	NACRS, DAD	**ICD-10 diagnosis codes:** T40.0, T40.1, T40.2, T40.3, T40.4, T40.6

DAD: Discharge Abstract Database; NACRS: National Ambulatory Care Reporting System; OHIP: Ontario Health Insurance Plan; CHC: Community Health Centre.

Table B3: Health Conditions: History of a Mental Health-Related Healthcare Encounter

History of a mental health-related healthcare encounter was defined as meeting any one of the criteria below:

Criteria	Data Source	Codes	
Outpatient visits (in settings other than community health centres) for mental health-related reasons			
Any visit with a diagnosis code for **psychotic disorders** in the 5 years prior to death	OHIP Claims Database	**OHIP diagnosis codes:** 295, 297, 298	
Any visit with a diagnosis code for **mood and anxiety disorders** in the 5 years prior to death	OHIP Claims Database	**OHIP diagnosis codes:** 296, 300, 311	
Any visit with a diagnosis code for **substance use disorders** in the 5 years prior to death	OHIP Claims Database	**OHIP diagnosis codes:** 291, 292, 303, 304	
Any visit with a diagnosis code for **behavioural and neuro-developmental disorders** in the 5 years prior to death	OHIP Claims Database	**OHIP diagnosis codes:** 299, 313, 314, 315	
Any visit with a diagnosis code for **other mental health-related disorders** in the 5 years prior to death	OHIP Claims Database	**OHIP diagnosis codes:** 301, 302, 306, 307, 309	
Outpatient visits in community health centres for mental health-related reasons			
Any visit with a diagnosis code for **any mental health condition or disorder** in the 5 years prior to death	CHC Database	Any ICD-10 diagnosis code between F06 and F99 in the primary diagnostic position, excluding dementia and delirium-related diagnoses	
Emergency department visit or acute hospital admission for mental health-related reasons, or admission in adult-designated mental health bed			
Any emergency department visit, acute hospital admission, or admission to an adult-designated mental health bed with a diagnosis code for the following:			
Any mental health and addictions	NACRS, DAD, OMHRS	**ICD-9-CM codes (OMHRS DSM-V):** DSM5CODE_DISCH1 = Any OMHRS (includes missing; excludes 290.x, 294.0x-). Exclude if DSM5CODE_DISCH 1 missing and Provisional = 17	**ICD-10-CA codes (DAD/NACRS):** DX10CODE1= F06-F99 or DX10CODE2-DX10CODE10 = X60-X84, Y10-Y19, Y28 when DX10CODE1 ne F06-F99
Anxiety disorders	NACRS, DAD, OMHRS	**ICD-9-CM codes (OMHRS DSM-V):** DSM5CODE_DISCH1 = 293.84, 300, 300.0x, 300.2x, 309.21, 313.23. Provisional = 5	**ICD-10-CA codes (DAD/NACRS):** DX10CODE1 = F06.4, F40, F41, F93.0-2, F94.0
Substance-related and addictive disorders	NACRS, DAD, OMHRS	**ICD-9-CM codes (OMHRS DSM-V):** DSM5CODE_DISCH1 = 291.x (all 291 codes), 292.x (all 292 codes), 303.x (all 303 codes), 304.x (all 304 codes), 305.x. Can be split into sub-groups: a. 291.x,303.x,3050 = **Alcohol** b. 3040,3047,3055 = **Opioids** c. 292.x, 304 [excl 3040, 3047], 305 [excl 3050, 3055] = **Other drugs** Provisional = 16	**ICD-10-CA codes (DAD/NACRS):** DX10CODE1 = F10-19, F55 Can be split into sub-groups: a. F10 = **Alcohol** b. F11 = **Opioids** c. F12, F13, F14, F15, F16, F18, F19 = **Other drugs** d. F17, F55 = **Other**

Criteria	Data Source	Codes	
Schizophrenia spectrum and other psychotic disorders	NACRS, DAD, OMHRS	**ICD-9-CM codes (OMHRS DSM-V):** DSM5CODE_DISCH1 = 293.81, 293.82, 295.x (all 295 codes), 297.x (all 297 codes), 298.x (all 298 codes). Provisional = 2	**ICD-10-CA codes (DAD/NACRS):** DX10CODE1 = F06.0-2, F20, F22-F29, F53.1
Mood disorders	NACRS, DAD, OMHRS	**ICD-9-CM codes (OMHRS DSM-V):** DSM5CODE_DISCH1 = 293.83, 296.x (all 296 codes), 300.4x, 301.13, 311.x, 625.4. Provisional = 3, 4 Can be split as follows: **Bipolar** [296.0x, 296.4x, 296.5x, 296.6x, 296.7x, 296.8x, 301.13. provisional = 3], **Depressive** [296.2x, 296.3x, 296.9x, 300.4x, 311.x, 625.4x. provisional = 4], **Other mood** [293.83]	**ICD-10-CA codes (DAD/NACRS):** DX10CODE1 = F06.3, F30.x-F34.x, F38.x, F39.x, F53.0 Can be split as follows: **Bipolar** [F30.x, F31.x, F34.0], **Depressive** [F32.x, F33.x, F34.1,], **Other mood** [F06.3, F38.x, F39.x, F53.0, F34.8, F34.9]
Trauma/stressor-related disorders	NACRS, DAD, OMHRS	**ICD-9-CM codes (OMHRS DSM-V):** DSM5CODE_DISCH1 = 308.3x, 309, 309.0x, 309.24, 309.28, 309.3x, 309.4x, 309.81, 309.89, 309.9x, 313.89. Provisional = 7	**ICD-10-CA codes (DAD/NACRS):** DX10CODE1 = F43.x, F94.1, F94.2
OCD & related disorders	NACRS, DAD, OMHRS	**ICD-9-CM codes (OMHRS DSM-V):** DSM5CODE_DISCH1 = 300.3x, 300.7x, 312.39, 698.4x. Provisional = 6	**ICD-10-CA codes (DAD/NACRS):** DX10CODE1 = F42.x, F45.2, F63.3
Personality disorders	NACRS, DAD, OMHRS	**ICD-9-CM codes (OMHRS DSM-V):** DSM5CODE_DISCH1 = 301, 301.0x, 301.2x, 301.4x, 301.5x, 301.6x, 301.7x, 301.81-3, 301.89, 301.9x 310.1. Provisional = 18	**ICD-10-CA codes (DAD/NACRS):** DX10CODE1 = F07, F21, F60, F61, F62. F68, F69
Deliberate self-harm	NACRS, DAD, OMHRS	**ICD-9-CM codes (OMHRS DSM-V):** N/A (DAD/NACRS)	**ICD-10-CA codes (DAD/NACRS):** DX10CODE2-10 (NACRS)/ DXCODE2-25(DAD) = X60-X84, Y10-Y19, Y28 when DX10CODE1 ne F06-F99

NACRS: National Ambulatory Care Reporting System; DAD: Discharge Abstract Database; OMHRS: Ontario Mental Health Reporting System.

Table B4. Health Conditions: Recent Healthcare Encounter for Infective Endocarditis

Criteria	Data Source	Codes
Any acute hospital admission with a diagnosis code for **infective endocarditis** in the 180 days prior to death	DAD	**ICD-10 diagnosis codes:** I33.0, I33.9, I38, I39, B37.6

DAD: Discharge Abstract Database.

Table B5: Health Conditions: Recent Healthcare Encounter for an Invasive Infection

Criteria	Data Source	Codes
Any acute hospital admission with a diagnosis code for a **skin or soft tissue infection** in the 180 days prior to death	DAD	**ICD-10 diagnosis codes:** L03, L02, M76.2
Any acute hospital admission with a diagnosis code for a **non-vertebral bone infection** in the 180 days prior to death	DAD	**ICD-10 diagnosis codes:** M86, M00
Any acute hospital admission with a diagnosis code for a **spinal infection** in the 180 days prior to death	DAD	**ICD-10 diagnosis codes:** G06.1, M46.2, M46.3, M46.4, M46.5

DAD: Discharge Abstract Database.