

Opioid-related deaths in Alberta in 2017: Review of medical examiner data

July 2019

Alberta 

Alberta Health, Government of Alberta

July 2019

Opioid-related deaths in Alberta in 2017: Review of medical examiner data

ISBN 978-1-4601-4342-1

© 2019 Government of Alberta

This document is made available under the [Open Government License](#) and is available online at:

<https://open.alberta.ca/publications/9781460143421>

For more information about this document, contact:

Analytics and Performance Reporting, Alberta Health

PO Box 1360 Stn Main

Edmonton, AB T5J 2N3

Email: Health.Surveillance@gov.ab.ca

Table of Contents

Executive summary	5
Data sources and limitations	6
Case inclusion	7
Findings	8
Demographics	8
Sex	8
Age	8
Race	9
Social History	10
Marital status	10
Housing situation	10
Employment status or income source	12
Occupation	12
Child and Family Services involvement	14
Recent life events or stressors	14
Corrections history	15
Medical history	19
Chronic pain	19
Psychiatric diagnoses.....	20
HIV and hepatitis C	21
Emergency department visits	21
Drug use history	23
Prescription opioid use	23
Previous drug overdose	24
Others' awareness of decedent's substance use.....	24
Substance use disorder and opioid use disorder	25
Treatment for substance use.....	26
Toxicology findings.....	28
Commonly detected substances	28

Source of opioids causing death	30
Route of opioid administration	31
Scene circumstances	33
Using alone or with others	33
Geographic distribution of opioid poisoning deaths	35
Setting of opioid poisoning leading to death	37
EMS contact, resuscitation attempt, and place of death	38
Naloxone administration	39
Other scene findings of note	40
Acknowledgements	41
Appendix A: Information from medical examiner case files	42
Appendix B: Administrative data sources and case definitions	43
Appendix C: National Occupational Classification 2016	48
Appendix D: Rural-Urban Continuum definitions	50

Executive summary

In an effort to learn more about the people dying opioid-related deaths and the circumstances of those deaths, Alberta Health undertook a review of the Chief Medical Examiner's case files on all unintentional opioid-related deaths in 2017. This information was supplemented by administrative data from Alberta Health. The results of the 653 cases reviewed give us a better picture of the people most at risk for opioid overdose and death.

In 2017, most of the people who died opioid-related deaths were male (77 per cent), had regular, stable housing (75 per cent) and had at least one family member or friend who was aware of their drug use (84 per cent). Previously being in provincial custody or medical diagnoses for psychiatric conditions or chronic pain were other common factors.

The aim of this review was to identify trends and inform potential interventions to help stem the increasing number of opioid-related deaths in this province. Stigma or negative views about people who use opioids can prevent them from speaking out or seeking supports or treatment. They may be more likely to use alone, overdose alone and die alone, as was the case in 66 per cent of deaths in 2017.

The Alberta government will continue to gather and share information about the opioid crisis in our province and the people dying opioid-related deaths, and will continue to make sure harm reduction services and treatment options are available to everyone who needs them all across the province.

Data sources and limitations

Findings are based on information from case files of the Office of the Chief Medical Examiner of Alberta, supplemental administrative data from Alberta Health and Vital Statistics, and corrections data from Alberta Justice and Solicitor General. Generally, only information that is deemed necessary to determine the cause of death for each decedent is collected by the Office of the Chief Medical Examiner. Therefore, the information available in each case file varies depending on the individual case circumstances, and not all case files contained information on all variables of interest for the present report. Detailed information on what data was available from the medical examiner files and on administrative data codes used are contained in Appendix A and Appendix B, respectively.

In using medical examiner data, all statements from bystanders and next-of-kin were taken as stated and assumed to be true. In the event of discrepancies in report (e.g., different information provided from the same bystander to police and to emergency medical services, or at different times), information was reconciled as best as possible or concluded as 'unable to be determined'.

Information on Indigenous status was compiled through partnership with and support from the Alberta First Nations Information Governance Centre, the Métis Nation of Alberta, and the Métis Settlements General Council.

The findings from this chart review are intended to supplement the ongoing work of the Alberta government in responding to Alberta's opioid crisis (alberta.ca/opioid). This report does not include data elements that are reported on in the quarterly and interim surveillance reports published by Alberta Health (alberta.ca/opioid-reports.aspx).

Case inclusion

Cases included in this chart review include all confirmed (closed) cases of opioid-related deaths in Alberta in 2017, with a manner determined as accidental (unintentional) or undetermined, as of September 24, 2018. Suicide (intentional) deaths are not included as the associated demographics, trends, and types of opioids used have been shown to be different compared to unintentional deaths^{1,2}. Opioid-related deaths are defined as drug poisoning deaths with an opioid (e.g., codeine, morphine, oxycodone, fentanyl, carfentanil, heroin, U-47700) included in the cause(s) of death listed under part 1 of the medical certificate of death. Two case files were unavailable for review at the time of writing. Therefore, this report includes information on 653 of 655 total confirmed opioid-related deaths in 2017.

Six individuals out of the 653 reviewed cases were not found to have a Personal Health Number (PHN) listed under the Alberta Health Care Insurance Plan registry (four individuals were from out-of-province), and were therefore not able to be linked to administrative health data. As a result, this report includes supplemental administrative health and occupation data on 647 decedents. A preliminary sample of 628 cases was linked to correctional involvement history by Alberta Justice and Solicitor General.

Although deaths are presented in this report in aggregate, it is important to keep in mind that each number represents an individual whose future was unintentionally cut short as a result of opioid use.

Grey boxes throughout this report present short case examples that aim to remind the reader of the lives behind each statistic, and the very real human cost of the opioid crisis.

¹ Chan EYL, McDonald BM, Brooks-Lim E, et al. At-a-glance – The role of opioid toxicity in suicide deaths in Alberta, 2000 to 2016. *Health Promot Chronic Dis Prev Can.* 2018;38(9):343-7.

² Hempstead K, Phillips J. Divergence in recent trends in deaths from intentional and unintentional poisoning. *Health Aff.* 2019;38(1):29-35.

Findings

Demographics

Demographics are helpful in characterizing those individuals who are dying from opioid-related deaths. Knowledge about who is most commonly dying from opioid poisoning can help inform and target preventative measures.

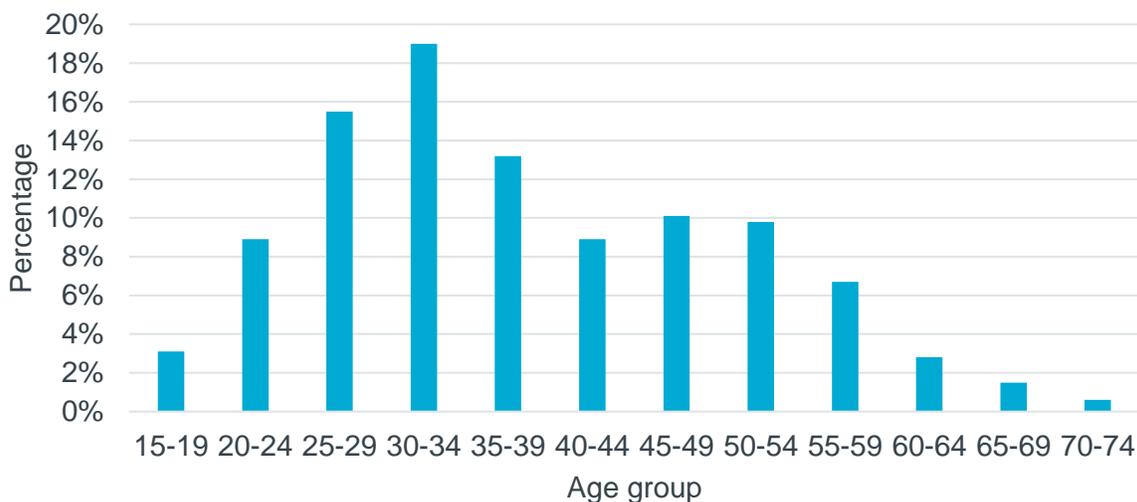
Sex

- 77% of decedents were male.

Age

- The mean age was 38.1 years (SD 12.2 years; range: 15-72). The most common age group of decedents was 30-34 years (Figure 1).
- Twenty individuals (3%) who died from opioid poisoning in 2017 were aged 19 years or younger at the time of death.

Figure 1. Age group distribution of individuals who died from opioid poisoning in 2017

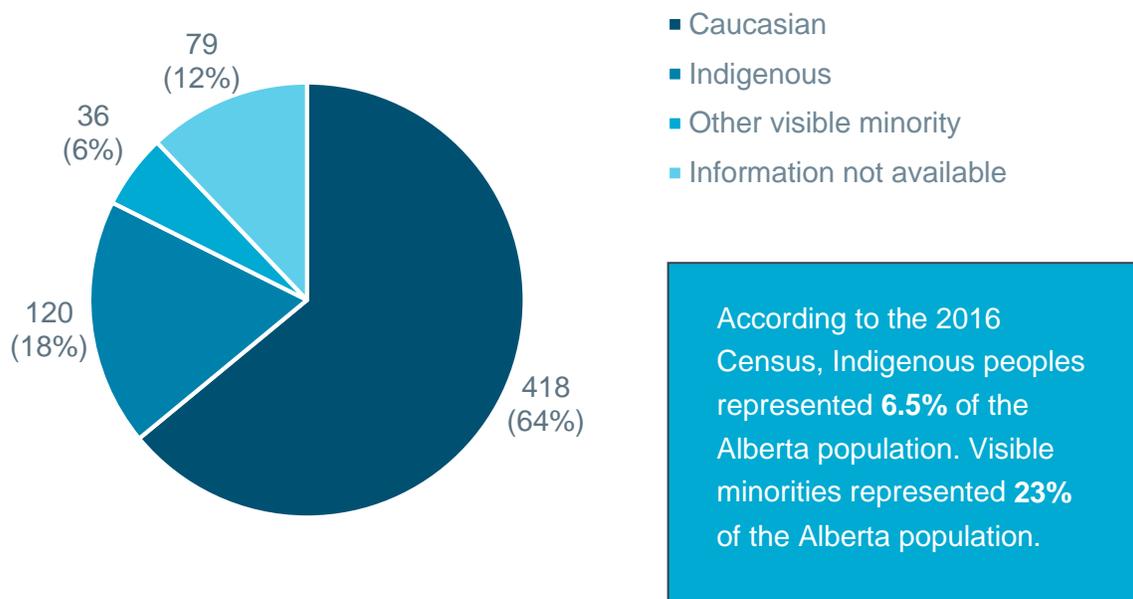


Note: Percentages are of the total number of decedents (n=653).

Race

Information on race was predominantly taken from medical examiner data, as noted by medical investigators, medical examiners, or police. This determination of race may have been largely based on visual appearance of the decedent. Information on Indigenous status was supplemented by linkage to administrative health data and other registries, with the support of the Alberta First Nations Information Governance Centre, the Métis Nation of Alberta, and the Métis Settlements General Council.

Figure 2. Race breakdown of individuals who died from opioid poisoning in 2017



Note: Percentages are of the total number of decedents (n=653).

Table 1. Further breakdown of Indigenous status among individuals who died from opioid poisoning in 2017

	Percentage* of decedents identified as Indigenous
First Nations	69%
Métis	27%
Unspecified	10%

Note: Data based on medical examiner case files and linked administrative health data.

*Percentages do not add up to 100% as First Nations and Métis identifiers are not mutually exclusive – 7 individuals were identified as being both First Nations and Métis.

Social History

Examining the social history of decedents helps to identify factors that may act as risk factors for opioid poisoning death. Identifying these social factors helps to shed light on the individuals who are dying from opioid poisoning, including their life circumstances, and identify areas in which additional supports might help in preventing new deaths. In regards to social history, decedents' marital status, housing situation, employment status or income source, Child and Family Services involvement, and recent life events or stressors were reviewed.

Marital status

Table 2. Marital status of individuals who died from opioid poisoning in 2017

	Frequency	Percentage
Single	324	50%
Married or Common Law	101	15%
Divorced	47	7%
Separated	32	5%
Widowed	6	1%
Information not available	143	22%

Note: Percentages are of the total number of decedents (n=653). Data based on medical examiner case files.

- At least half of decedents were single at the time of death.

Housing situation

Housing situation at the time of death was first categorized as being either stable or unstable, with further breakdown of stable housing into additional categories:

- **Stable housing:** has an address
 - **Regular housing:** living in a rented or owned house/apartment/room/trailer home, permanently living with family, or staying in a hotel/motel room due to travel but has a permanent address

- **Socially supported housing:** low-income housing or housing support programs (e.g., Keys to Recovery, John Howard Society, Pathways to Housing)
- **Medically supported housing:** mental health group home, addiction recovery facility or residential drug treatment facility, assisted living/independent living with home care for seniors or individuals with chronic medical conditions, or nursing home/long-term care facility
- **Other facility-based housing:** halfway house/community-based residential facility, or work housing lodge
- **Unstable housing:** no fixed address (e.g., couch surfing between friends’/family members’ residences, staying in shelters, staying in a hotel/motel room without a known permanent address)

For shorter-term living situations at the time of death (i.e., hospital, remand centre, and hotel/motel room stays), the underlying housing situation was used for the determination of housing situation. For example, individuals who were admitted to hospital at the time of death but were generally of no fixed address were categorized as having unstable housing, and individuals who were admitted to hospital at the time of death but had a home of their own were categorized as having regular stable housing.

Table 3. Housing situation of individuals who died from opioid poisoning in 2017

	Frequency	Percentage
Stable housing	526	81%
Regular housing	492	75%
Socially supported housing	18	3%
Medically supported housing	11	2%
Other facility-based housing	5	1%
Unstable housing	121	18%
Unable to determine	6	1%

Note: Percentages are of the total number of decedents (n=653). Data based on medical examiner case files.

- The majority of individuals who died from opioid poisoning in 2017 had regular, stable housing.

Employment status or income source

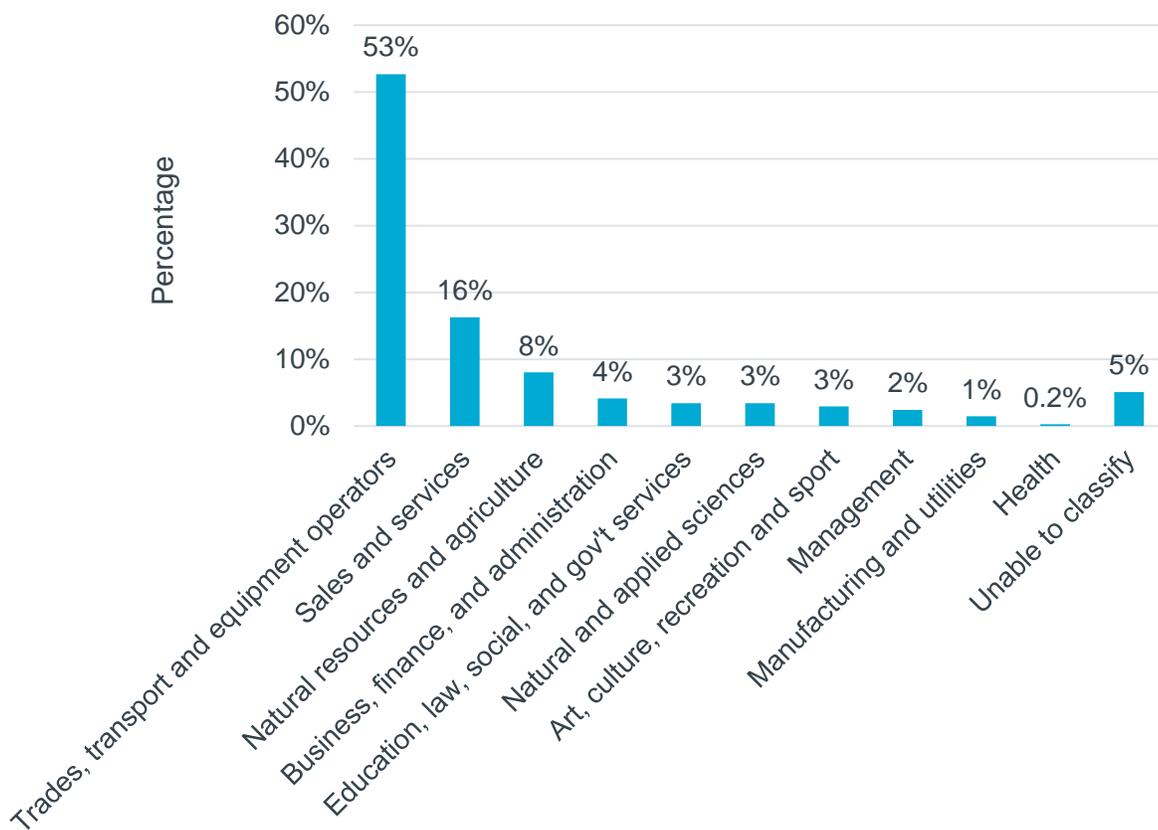
- Data on employment status within the medical examiner case files was fairly sparse. There was no information available on employment status for approximately 63% (n=414) of decedents.
 - At least 14% of all individuals who died from unintentional opioid poisoning in Alberta in 2017 (n=91) were reported as being employed at their time of death.
 - At least 22% of all decedents (n=142) were thought to be unemployed and/or on income support/disability benefit at their time of death.

Based on administrative data only, **34%** of individuals who died from opioid poisoning in AB in 2017 had been on **some form of income support or disability benefit in the past year**, compared to **5%** of the general population of AB in 2017.

Occupation

- From linked Vital Statistics data, 64% of decedents (n=412) had an employment occupation listed on their death certificate as reported by next-of-kin. However, this listed occupation could reflect either the decedent's current or last known occupation, and therefore does not accurately represent the proportion of decedents holding employment at the time of death.
 - The most common occupational classification for decedents with an employment occupation reported on their death certificate was 'Trades, transport and equipment operators', with 53% (n=217) having been employed in this occupation group (Figure 3). The next most common occupation group was 'Sales and services' (16%).

Figure 3. Occupational classifications for decedents with an employment occupation listed on their death certificate, as reported by next-of-kin



Note: Percentages are of those decedents who had an employment occupation listed by next-of-kin on their death certificate (n=412). Occupational classifications are based on Statistics Canada's National Occupational Classification (NOC) 2016 Version 1.2 (see Appendix C for details).

According to the 2016 Census, approximately **18%** of the employed Albertan population worked in the Trades, transport and equipment operators occupation group.

Child and Family Services involvement

- Based on both medical examiner case files and linked administrative health data (see Appendix B for details), 5% of decedents of any age (n=31) had some Child and Family Services involvement in their lifetime.
- Of the 20 decedents who were aged 19 years or younger at the time of death, 9 (or 45%) had some Child and Family Services involvement in their lifetime (based on both medical examiner case files and linked administrative health data).

Recent life events or stressors

The following life events or stressors were also noted in the medical examiner case files (categories are not mutually exclusive):

- New or change in opioid or opioid agonist therapy (OAT) prescription in the 3 months prior to death: **2% of cases**
- Other change in treatment (i.e., recent change in non-opioid medication or pending start of treatment for substance use in the days following death): **1% of cases**
- Discharged from residential treatment for drug use in the month prior to death: **2% of cases**
- Release from correctional facility in the month prior to death: **5% of cases**
- Accident, health issue, traumatic injury, or bleak diagnosis that had a substantial negative impact on the decedent's life in the 6 months prior to death: **3% of cases**
- Other life events or social stressors (e.g., recent move, being laid off from work, school or job change, relationship issues, legal matters, death or serious illness of friend or family member, financial stress, birthday party, vacation): **24% of cases**

Case example 1

Sarah* was a young mother with a long history of drug addiction. She lived with her own mother, who would check on Sarah every morning to make sure she had not overdosed during the night. Sarah also suffered from depression. On the evening prior to her death, Sarah had discussed her plans to go to rehab with her mother and had said that she was ready. Sarah's mother found her deceased in the morning, with the paperwork for rehab on the table next to her bed – she was to start rehab that day. Toxicology results indicated the presence of fentanyl, heroin, methamphetamine and clonazepam.
(*name changed)

Corrections history

Individuals who use drugs who have recently been released from correctional facilities have been shown to be at higher risk for drug poisoning-related death, especially in the two weeks following release.³ This increase in mortality risk is associated with a loss of physiological tolerance while in custody.³

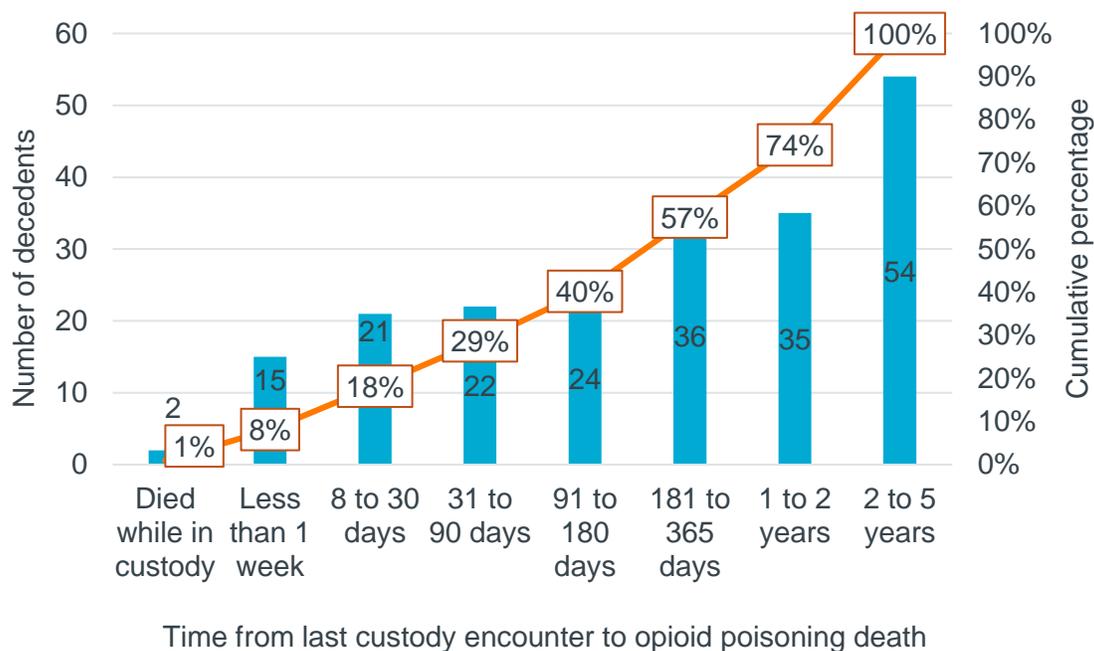
From data supplied by Alberta Justice and Solicitor General, on a sample of 628 cases, 41% of decedents (n=257) had either been admitted to provincial custody or had come under provincial community supervision (conditional sentence, probation, peace bond, or recognizance order) within 5 years of their death.

Based on data from Alberta Justice and Solicitor General, **41%** of individuals who died from opioid poisoning in AB in 2017 had contact with either custody or community corrections within 5 years of death. In comparison, approximately **3%** of the general population of AB aged 15 years or older had contact with either custody or community corrections in the 5-year period from 2013 to 2017.

- 81% of these individuals (n=209) had been admitted to provincial custody within 5 years of death. Of these individuals:
 - 58 (28%) were last released from a correctional centre
 - 149 (71%) were last released from a remand centre
 - 2 (1%) were last released from a young offender centre

³ Binswanger IA, Stern MF, Deyo RA, et al. Release from prison--a high risk of death for former inmates. *N Engl J Med.* 2007;356(2):157-65.

Figure 4. Time from most recent custody encounter to death, for decedents who had been admitted to provincial custody within 5 years of death

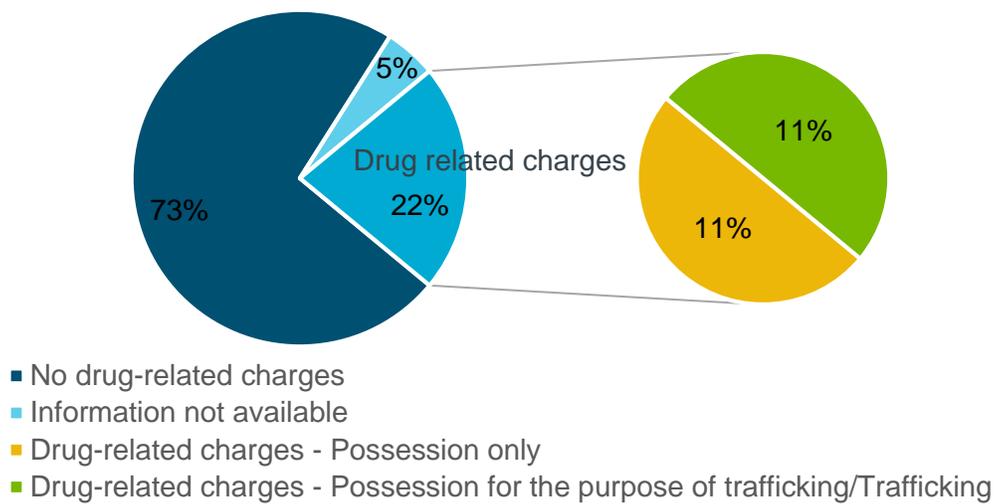


Note: Percentages are of the decedents who had been admitted to provincial custody within 5 years of death (n=209).

- The vast majority of decedents (99%) who had been admitted to provincial custody within 5 years of death died after being released from custody. One per cent of decedents (n=2) died while still in custody. Those individuals who died while still in custody were staying in remand centres at their time of death; there were no decedents in longer-term provincial correctional centres at the time of death.
- 7% of individuals who died from opioid poisoning in 2017 who had been admitted to provincial custody within 5 years of death, and did not die while in custody, died within one week of their release from custody.
- 57% of individuals who died from opioid poisoning who had also been admitted to provincial custody within 5 years of death died within one year of their last custody encounter.

For those decedents who had been under some kind of provincial community supervision (i.e., conditional sentence, probation, peace bond, or recognizance order) within 5 years of death (n=199; may include those who were also in provincial custody), 79 individuals (40%) died of opioid poisoning while still under community supervision.

Figure 5. Charges at last custody encounter for decedents who had been admitted to provincial custody within 5 years of death



Note: Percentages are of the decedents who had been admitted to provincial custody within 5 years of death (n=209). Individuals may have been incarcerated on other charges as well.

- The majority of decedents (73%) who had been admitted to provincial custody within 5 years of death did not have drug-related charges at their last custody encounter.
- For the 22% of decedents who did have drug-related charges at their last custody encounter, cases were evenly split between having charges for “Possession only” and charges for “Possession for the purpose of trafficking/Trafficking”.

Table 4. Zone of last release from custody for decedents who had been admitted to provincial custody within 5 years of death

Zone of centre of last release from custody	Percentage
North	2%
Edmonton	35%
Central	5%
Calgary	46%
South	12%

Note: Percentages are of the decedents who had been admitted to provincial custody within 5 years of death (n=209).

- Calgary and Edmonton Zones were the place of last release from custody for the majority of decedents who had been admitted to provincial custody within 5 years of death.

Table 5. Length of time in correctional custody at last custody involvement, for decedents who had been admitted to provincial custody within 5 years of death

Length of time in custody at last custody involvement	Frequency	Percentage
1 to 7 days	77	37%
8 to 30 days	66	32%
31 to 180 days	49	23%
181 to 364 days	12	6%
365 to 729 days	5	2%

Note: Percentages are of the decedents who had been admitted to provincial custody within 5 years of death (n=209).

- For the majority (69%) of decedents who had been admitted to provincial custody within 5 years of death, their length of time in custody at their last custody involvement was 30 days or less.

Case example 2

Tom* was an individual with chronic pain who had just been released from a remand centre. He met up with some friends downtown to stay with them overnight. While they were drinking and catching up, one of his friends provided Tom with pills such as GHB, gabapentin and Tylenol. Tom was later noted that night to be snoring in a particularly strange manner. His friends checked on him during the night due to his snoring, but when they tried to wake him, Tom rolled over and appeared to be alright so they went back to sleep. Tom was found deceased in the morning. Toxicology detected fentanyl and a variety of other substances.

(*name changed)

Medical history

Examining medical history helps to identify health-related factors or comorbid conditions that may act as risk factors for opioid poisoning, such as chronic pain and mental or psychiatric disorders, or that may accompany opioid use. Previous emergency department visits act as an indicator of decedents' overall health status as well as their frequency of interaction with the healthcare system.

Chronic pain

- 36% of individuals who died from opioid poisoning in 2017 (n=233) either had mention of chronic pain in the medical examiner case file (per family/friend report or included medical history), or met criteria for chronic pain in the linked administrative health data (see Appendix B for case definition).

Table 6. Causes of or conditions noted to worsen chronic pain for individuals who died from opioid poisoning in 2017

	Frequency	Percentage
Injury or accident (e.g., motor vehicle accident, occupational injury, fall)	53	34%
Chronic condition, disease, or disorder (e.g., arthritis, fibromyalgia, degenerative disc disease, neuralgia, cystic fibrosis, Crohn's disease, irritable bowel syndrome, ulcerative colitis)	63	41%
Information not available	54	35%

Note: Percentages are of the individuals for whom chronic pain was noted in the medical examiner case file (n=154). Categories are not mutually exclusive.

Based on administrative data only, **27%** of individuals who died from opioid poisoning in AB in 2017 had **chronic pain**, compared to **9%** of the general population of AB in 2017.

Case example 3

Kevin* suffered from chronic pain and had developed a dependency on prescription opioids. Kevin's family physician had gradually weaned his narcotic dosage over the past three years –he had successfully come off hydromorphone and oxycodone and was maintained on a low dose fentanyl patch – however, Kevin reported no pain improvement and was still suffering from severe pain.

The day prior to his death, Kevin was found unresponsive by his father. EMS attended and was able to successfully reverse his overdose following the administration of naloxone. Kevin was brought to the emergency department and discharged later that night with new recommendations for pain management. When Kevin's father checked on him in the morning, he was unresponsive. EMS attended once again, but unfortunately, Kevin was unable to be resuscitated. Multiple fentanyl patches were found on Kevin's body.

(*name changed)

Psychiatric diagnoses

- 83% of individuals who died from opioid poisoning in 2017 (n=543) either had mention of a psychiatric condition in the medical examiner case file (per family/friend report or included medical history), or had a diagnosed anxiety disorder, mood disorder (e.g., depression, bipolar disorder), or psychotic disorder (e.g., schizophrenia) in the linked administrative health data (see Appendix B for diagnostic codes used).

Based on administrative data only, **81%** of individuals who died from opioid poisoning in AB in 2017 had a lifetime diagnosis of **anxiety, mood, or psychotic disorder**, compared to **42%** of the general population of AB in 2017.

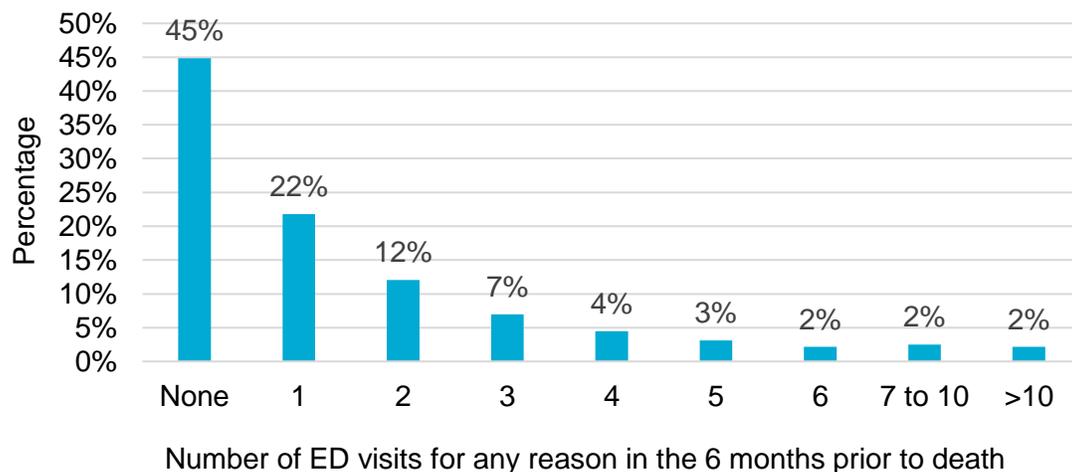
HIV and hepatitis C

- 1% of individuals who died from opioid poisoning in 2017 (n=9) were either mentioned to be HIV positive in the medical examiner case file (per family/friend report or medical history), or were noted to be HIV positive in the linked administrative health data.
- 20% of individuals who died from opioid poisoning in 2017 (n=132) were either mentioned to be hepatitis C positive in the medical examiner case file (per family/friend report or included medical history), or were noted to be hepatitis C positive in the linked administrative health data.

Emergency department visits

- 55% of individuals who died from opioid poisoning in 2017 had at least one recorded emergency department visit in the 6 months prior to death (Figure 6).
- 21% of decedents had 3 or more recorded emergency department visits in the 6 months prior to death.

Figure 6. Number of emergency department (ED) visits in the 6 months prior to death, for individuals who died from opioid poisoning in 2017



Note: Percentages are of the individuals linked to administrative health data (n=647). For those individuals who died in hospital, the last emergency department visit is excluded from these totals. The number of emergency department visits ranged from 0 to 48 in the 6 months prior to death.

- The most common reasons for emergency department visits were:
 - Injury or poisoning: 30% of visits
 - Mental or behavioural disorders: 20% of visits
 - Other symptoms (e.g., headaches, chest and abdominal pain): 10% of visits

Based on administrative data only, **55%** of individuals who died from opioid poisoning in AB in 2017 had **at least one emergency department visit for any reason** in the 6 months prior to death, whereas **16%** of the general population of AB had at least one emergency department visit for any reason in the last 6 months of 2017.

Based on administrative data only, **21%** of individuals who died from opioid poisoning in AB in 2017 had **3 or more emergency department visits for any reason** in the 6 months prior to death, whereas **2%** of the general population of AB had 3 or more emergency department visits for any reason in the last 6 months of 2017.

Case example 4

Michael* was a widower with no fixed address who had been estranged from his family for years. He was known to use drugs intravenously by both shelter staff and family. Although he had tried to battle his addiction with opioid agonist therapy, Michael would always find himself using again. Michael was found in a public washroom accompanied by syringes and other drug paraphernalia, and was declared deceased upon EMS arrival. Michael had been to the emergency department earlier the same day due to a heroin overdose. Post-mortem testing detected fentanyl, heroin, hydromorphone, and methamphetamine.

*(*name changed)*

Drug use history

Past history of opioid use and known problematic substance use are indicators of risk of death from opioid poisoning. For individuals who died from opioid poisoning in 2017, history of prescription opioid use, previous drug poisoning or overdose, and others' awareness of problematic substance use were examined. History of treatment for drug use, such as through opioid agonist therapy (OAT) or specialized treatment programs, were also looked at to ascertain the extent to which decedents had previously sought treatment for their substance use.

Prescription opioid use

- From the linked administrative health data, 30% of individuals who died from opioid poisoning in 2017 met criteria for long-term prescription opioid use in the year prior to death (see Appendix B for definition).
- 33% of decedents had an opioid prescription with a concurrent benzodiazepine, gabapentin, or pregabalin prescription in the year prior to death.
- 8% of individuals who died from opioid poisoning in 2017 had a prescribed daily oral morphine equivalent (OME) ≥ 90 mg in the year prior to death.
- 3% of decedents had a prescribed daily OME ≥ 200 mg in the year prior to death.
- 5% received an opioid prescription from 3 or more providers in the 3 months prior to death.

Case example 5

Megan* had a long history of chronic pain. Although she was prescribed opioids, she felt like her prescribed medications were never enough to manage her pain. Megan also developed depression and anxiety. Megan would ask her physician for more pain medication, but when she was repeatedly declined, informed her physician that she would go to the streets to buy morphine as needed. Megan was found deceased in bed by her teenage daughter. Fentanyl, methamphetamine, morphine, and other prescription medications (antidepressants, benzodiazepines, and gabapentin) were detected on post-mortem toxicology testing.

(*name changed)

Previous drug overdose

- 37% of individuals who died from opioid poisoning in 2017 had at least one previous drug overdose in their lifetime, based on either information contained within the medical examiner case file (per family/friend report or included medical history) or per linked administrative health data.
- From the linked administrative health data only, 27% had a past emergency department visit related to a drug poisoning (ICD-10 T36-50; see Appendix B for further detail). Of these individuals:
 - 61% had one past emergency department visit related to a drug poisoning
 - 20% had two past emergency department visits related to a drug poisoning
 - 19% had three or more past emergency department visits related to a drug poisoning

Note: For those individuals who died in hospital, the last visit is excluded from these totals. The highest number of emergency department visits related to a drug poisoning per individual was 16.

Based on administrative data only, **27%** of individuals who died from opioid poisoning in AB in 2017 had a **past emergency department visit related to a drug poisoning**, compared to **0.4%** of the general population of AB in 2017.

Others' awareness of decedent's substance use

- In the majority of cases (84%), at least one family member or friend was aware of the decedent's drug use (Table 7).
- Family and friends who were interviewed reported not being aware of any drug use in approximately 6% of cases.

Table 7. Family or friend awareness of drug use among individuals who died from opioid poisoning in 2017

	Frequency	Percentage
Known drug use	548	83.9%
Current regular or problematic drug use	482	73.8%
Current occasional drug use	24	3.7%
Past regular or problematic drug use, but thought to be currently not using drugs	42	6.4%
No known current or past drug use, but drug use suspected	3	0.5%
No known drug use	42	6.4%
Unable to determine	60	9.2%

Note: Percentages are of the total number of decedents (n=653). Data based on medical examiner case files only.

- In 41 of the 60 cases (68%) where family/friend awareness of drug use was unable to be determined based on information contained within medical examiner case files, there was known current or previous drug use as per police or medical records.
- 36% of individuals who died from opioid poisoning in 2017 had current or previous problematic alcohol use mentioned in the medical examiner case file (per family/friend report or included medical history) (includes reports of binge or “heavy” drinking).

Substance use disorder and opioid use disorder

- From the linked administrative health data, 71% of individuals who died from opioid poisoning in 2017 had a diagnosed substance use disorder (see Appendix B for diagnostic codes used).
- 40% of individuals who died from opioid poisoning in 2017 had either noted opioid dependency in the medical examiner case file (per family/friend report or included medical history), or had diagnosed opioid use disorder in the linked administrative health data (Appendix B).

Based on administrative data only, **71%** of individuals who died from opioid poisoning in AB in 2017 had **diagnosed substance use disorder**, compared to **6%** of the general population of AB in 2017.

Based on administrative data only, **38%** of individuals who died from opioid poisoning in AB in 2017 had **diagnosed opioid use disorder**, compared to **1%** of the general population of AB in 2017.

Treatment for substance use

- 16% of individuals who died from opioid poisoning in 2017 had received opioid agonist therapy (OAT) in their lifetime, based on either information contained within the medical examiner case file (per family/friend report or medical history) or linked administrative health data (data on OAT included records going back to 2013; Appendix B).
- Data on treatment history for substance use within the medical examiner case files was sparse. There was no information on history of inpatient or outpatient treatment programs for substance use for around 80% of decedents (Table 8).

Table 8. Lifetime history of outpatient, detoxification, or residential treatment for substance use among individuals who died from opioid poisoning in 2017

	Frequency	Percentage
Information not available	515	78.9%
Current or previous residential treatment for drug use	62	9.5%
Previous detox for drug use	16	2.4%
Current or previous outpatient addictions services for drug use	8	1.2%
Current or previous residential treatment for alcohol use only	12	1.8%
Previous detox for alcohol use only	1	0.2%
Current or previous outpatient addictions services for alcohol use only	1	0.2%
None	38	5.8%

Note: Percentages are of the total number of decedents (n=653). Data based on medical examiner case files only. If individuals attended residential treatment as well as detox and/or outpatient treatment, they are only included in the residential treatment category. If individuals attended detox and outpatient treatment, they are only included in the detox category. Residential treatment includes instances where next-of-kin reported decedent had attended “rehab”, with no additional detail given. Percentages should be interpreted with caution due to the high proportion of cases for whom information was not available.

- Approximately 10% of individuals who died from opioid poisoning in 2017 were noted to have attended residential treatment for drug use in their lifetime.
- At least 6% of decedents had never attended any type of inpatient or outpatient treatment for substance use.

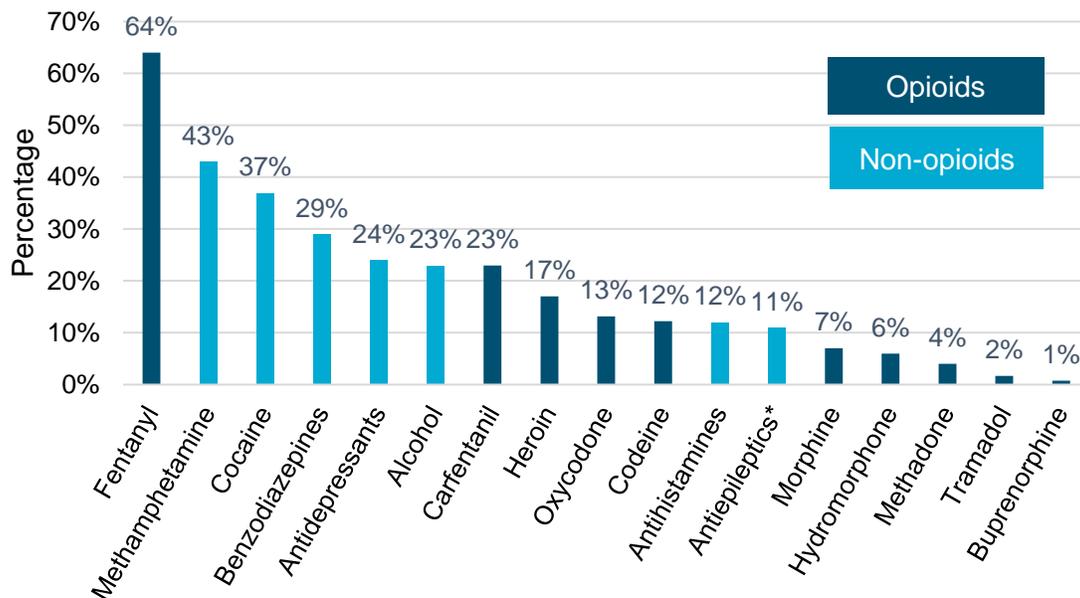
Toxicology findings

Information on substances detected in post-mortem toxicology, the likely source of the opioids causing death, and the routes of administration shed light on what opioid and non-opioid substances decedents were using at their time of death, where the opioids that are causing death originate from, and how they were being used. This knowledge is helpful in informing methods of prevention, as, for example, strategies differ depending on whether deaths are due to pharmaceutical or non-pharmaceutical opioids.

Commonly detected substances

Toxicology testing was performed on samples taken from decedents near the time of death, either pre-mortem (typically for individuals who were taken to hospital and later died) or post-mortem. Toxicology testing results indicate substances that were present at death, but may not necessarily have contributed to causing death.

Figure 7. Common opioid and non-opioid substances detected in toxicology testing at death for individuals who died from opioid poisoning in 2017



Note: Percentages are of the total number of decedents (n=653).

*Anatomical Therapeutic Chemical (ATC) code N03A antiepileptics or anticonvulsants, excluding benzodiazepines and barbiturates (e.g., gabapentin, pregabalin, topiramate, valproic acid, phenytoin, carbamazepine)

- Fentanyl (including analogues other than carfentanil) was the most commonly detected substance, found in 66% of cases. Fentanyl was detected in 64% of cases, while fentanyl analogues other than carfentanil (e.g., cyclopropylfentanyl, 3-methylfentanyl, acetylfentanyl, furanylfentanyl) were detected in 5% of cases.
- Carfentanil was detected in 23% of cases. Overall, either fentanyl or carfentanil was found in 81% of cases.
- The second most commonly detected substance was methamphetamine, detected in 43% of cases, followed by cocaine, detected in 37% of cases.
- Fentanyl and methamphetamine together was the most common combination of substances, being found in 32% of cases.
- Methadone was detected in 4% of cases, and buprenorphine was detected in 1% of cases.
- The vast majority (95%) of individuals who died from opioid poisoning in 2017 had more than one substance detected in toxicology testing at death.
- Xylazine, a common adulterant, was present in 24% of cases where fentanyl was detected in toxicology testing.

Case example 6

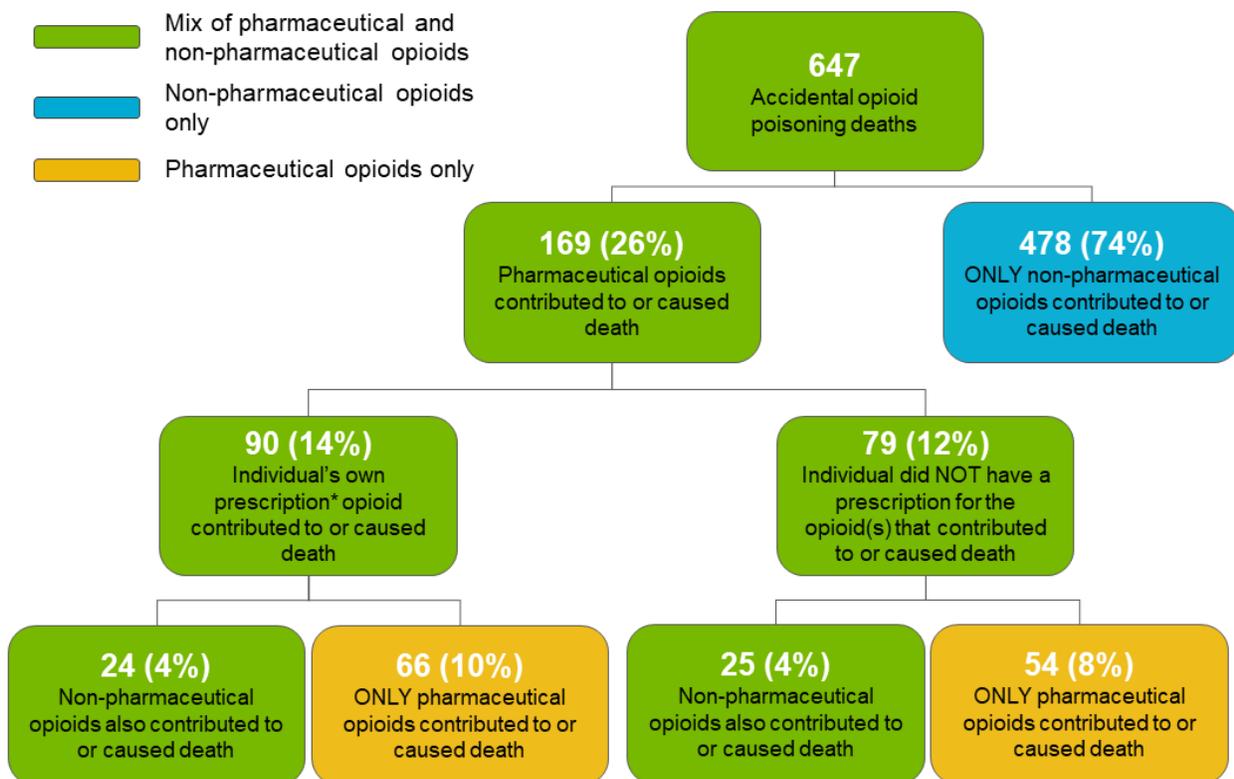
Dylan* had a longstanding history of drug and alcohol use, and had been in and out of rehab for years. Dylan lived alone and had told his family that he was suffering from depression recently and was thinking about going back to rehab after the holidays. Unfortunately, Dylan died a few days before New Years', after being found unresponsive by a friend. His friend reported that Dylan had been snorting what they thought was crystal meth and Xanax. Toxicology detected carfentanil in addition to other substances.

(*name changed)

Source of opioids causing death

This section looks at the source of opioids that are found to have caused or contributed to death. Pharmaceutical opioids are defined as opioids available through a pharmacy or prescription for human use, such as oxycodone, hydromorphone, codeine, tramadol, or fentanyl patches. However, pharmaceutical opioids include both prescription opioids used by the individual to whom they were prescribed, and prescription opioids that have been diverted (e.g., stolen, sold on the street, or given to a friend). Non-pharmaceutical opioids are opioids not available through a pharmacy, such as illegally produced fentanyl (including carfentanil and other analogues), heroin, or other designer opiates (e.g., U47700) (i.e., sourced from the street or bought online).

Figure 8. Source of opioid causing fatal poisoning among individuals who died from opioid poisoning in 2017



Note: Though pharmaceutically produced fentanyl is available through prescription, among accidental fentanyl poisoning deaths, nearly all fentanyl is of non-pharmaceutical origin.

*An individual's own prescription was considered to have contributed to or caused death if the individual had a matching pharmacy record for the same type of opioid that contributed to/caused death in the three months prior to death.

- Approximately three-quarters (74%) of unintentional opioid poisoning deaths in 2017 were associated with only non-pharmaceutical opioids. In other words, the majority of opioid poisoning deaths in 2017 were caused by non-pharmaceutical or illicit opioids.
- The remaining deaths (26%) involved pharmaceutical opioids contributing to or causing death, and these were further split into:
 - 14% where the individual had a matching prescription for any pharmaceutical opioid causing death (in the three months prior to death), and
 - 12% where individuals did not have a matching prescription for any pharmaceutical opioid determined as contributing or causing death (i.e., likely a diverted prescription opioid).

Route of opioid administration

The route of opioid administration impacts the bioavailability (amount of) and speed at which opioids affect the body. The same dosage can have different effects on the same individual depending on how the opioid is ingested or administered.

Route of opioid administration was determined through a combination of:

- findings at the scene (e.g., findings on the body such as powder under the nose or a needle in an arm, interviews with bystanders),
- paraphernalia found at the scene (e.g., needles/syringes, pipes, powder, burnt tin foil), and
- toxicology testing of paraphernalia and of samples from the decedent.

For example, the route of opioid administration was determined as injection if the decedent was found with a syringe/needle in their pocket and track marks on their arms, and toxicology testing detected the same opioid in both the syringe/needle and blood samples. However, if a decedent was found in a room with many different types of drug paraphernalia and toxicology testing of selected paraphernalia did not match toxicology testing results of samples from the decedent, then the route of opioid administration was recorded as “unable to determine”. Many situations were not clear cut, and therefore, the route of opioid administration was unable to be conclusively determined for around half of cases (Table 9).

Table 9. Route of opioid administration among individuals who died from opioid poisoning in 2017

	Frequency	Percentage
Inhalation (e.g., snorting, smoking)	149	23%
Injection	105	16%
Oral (e.g., pill/tablet, liquid)	90	14%
Patch	4	1%
Unable to determine	313	48%

Note: Percentages are of the total number of decedents (n=653). Eight individuals had more than one route of opioid administration (i.e., oral and injection, or oral and inhalation). Percentages should be interpreted with caution due to the high proportion of cases that were unable to be determined.

Scene circumstances

Examining the circumstances under which opioid poisoning deaths occur is essential in better understanding where and how individuals are dying from opioid poisoning in Alberta. Examining whether individuals were using alone or with others, in what setting, where these deaths were located across the province, and other notable scene findings helps to inform prevention opportunities. Information on what lifesaving measures were taken by bystanders and first responders (e.g., naloxone administration) are important in determining what preventative steps are currently being taken and how these can be improved. Overall, knowledge about scene circumstances helps in the identification of more immediate or short-term prevention opportunities and informs harm reduction campaigns.

Case example 7

Daniel* was a young man of no fixed address who had previously been in foster care. He and a friend were using drugs together in a public area well known to police for drug use when he experienced an overdose. Without a phone or a Narcan kit, Daniel's friend went to a nearby fast food restaurant to contact 911. Upon arrival, EMS administered naloxone and attempted resuscitation, but they were ultimately unable to revive him. Toxicology testing revealed that Daniel died from carfentanil and methamphetamine toxicity. Medical records showed that Daniel had experienced multiple overdoses in the months leading up to death.

*(*name changed)*

Using alone or with others

The ability of an individual who experiences an opioid poisoning or overdose to obtain lifesaving measures relies very heavily on whether they are alone or with others who can recognize an overdose and provide assistance at the time of the incident.

- Among individuals who died from opioid poisoning in 2017, 96% were found unresponsive (versus having a witnessed collapse), regardless of whether there were others in the vicinity.

Table 10. Alone or with others at overdose leading to death, for individuals who died from opioid poisoning in 2017

	Frequency	Percentage
Using alone, or nobody knew of drug use at that particular instance in time	433	66%
No one around ¹	169	26%
Others around (private/low traffic space) ²	181	28%
Others around (public/shared space) ³	83	13%
Initially using with others or others knew about particular instance of drug use, but decedent then alone	55	8%
Using with others or others knew about particular instance of drug use, and were around	109	17%
Others also using	35	5%
Others not also using	41	6%
Unknown if others also using	33	5%
Unable to determine	56	9%

Note: Percentages are of the total number of decedents (n=653) unless otherwise stated.

¹No one around e.g., lives alone or home alone; alone in motel/hotel room; private/locked suite or room in shared house; car parked on side of highway.

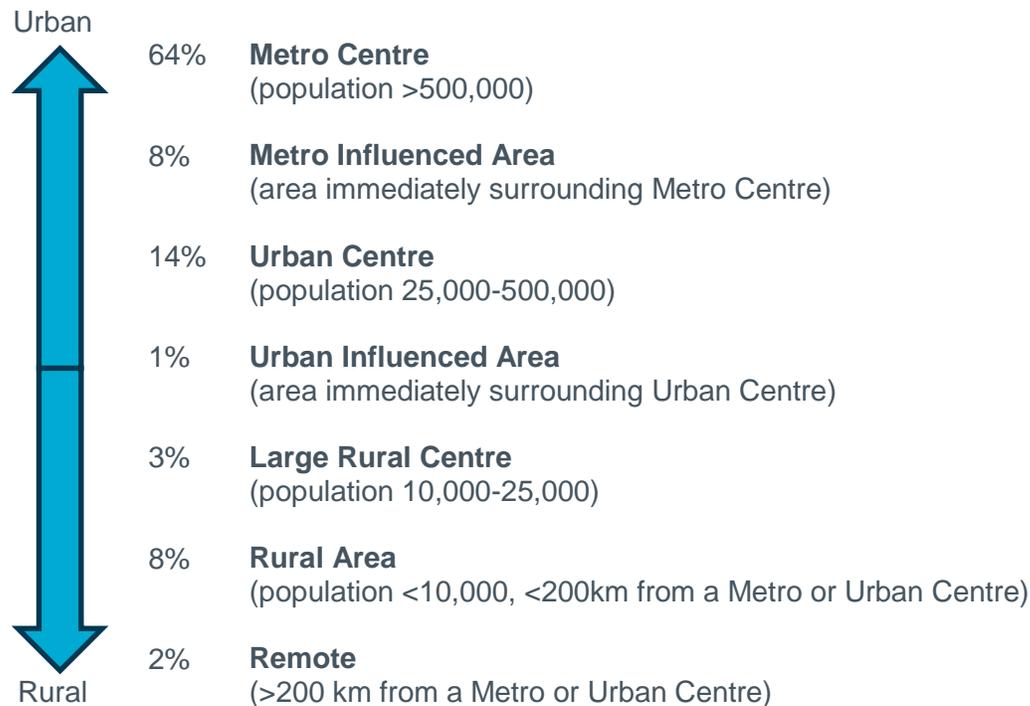
²Private/low traffic space e.g., bedroom, washroom, or garage in a home with other people also at home; car parked in a parking lot; public bathroom.

³Public/shared space e.g., living room or shared bedroom in a home; sidewalk.

- The majority (66%) of individuals who died from opioid poisoning in 2017 were using alone at the time of death. In 26% of cases, the decedent was using alone and no one was around. In 41% of cases, there were others in the vicinity near where the decedent was using alone, but they were unaware of the decedent's drug use.

Geographic distribution of opioid poisoning deaths

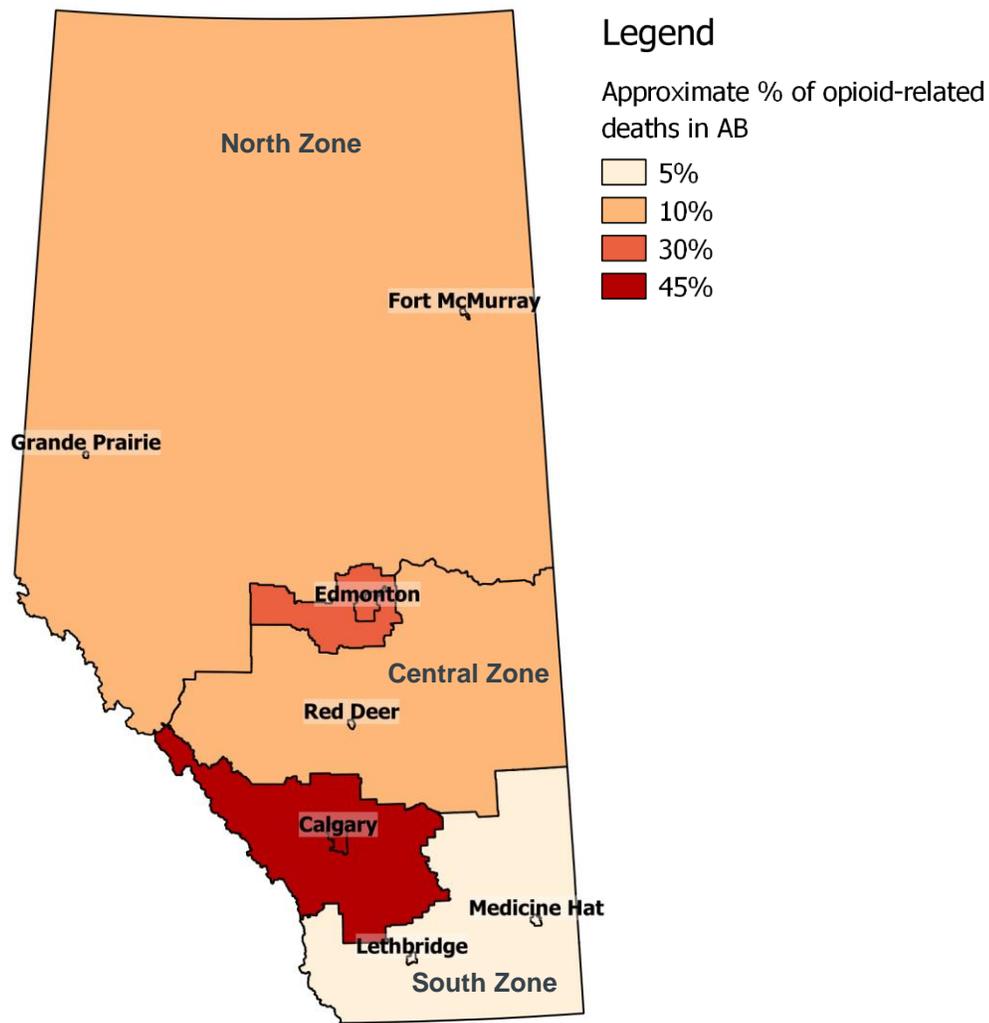
Figure 9. Percentage of opioid-related deaths in Alberta in 2017, by rural-urban continuum classification for local geographic areas



Note: Percentages are of the total number of decedents linked to administrative data (n=647). See Appendix D for more information on Rural-Urban Continuum definitions.

- In 2017, the majority of opioid-related deaths in Alberta occurred in metro centres (Edmonton and Calgary) and metro-influenced areas (e.g., Spruce Grove, Leduc, Airdrie, Chestermere). This finding reflects, in part, the residential distribution of the population of Alberta.

Figure 10. Zone distribution of opioid-related deaths in Alberta in 2017



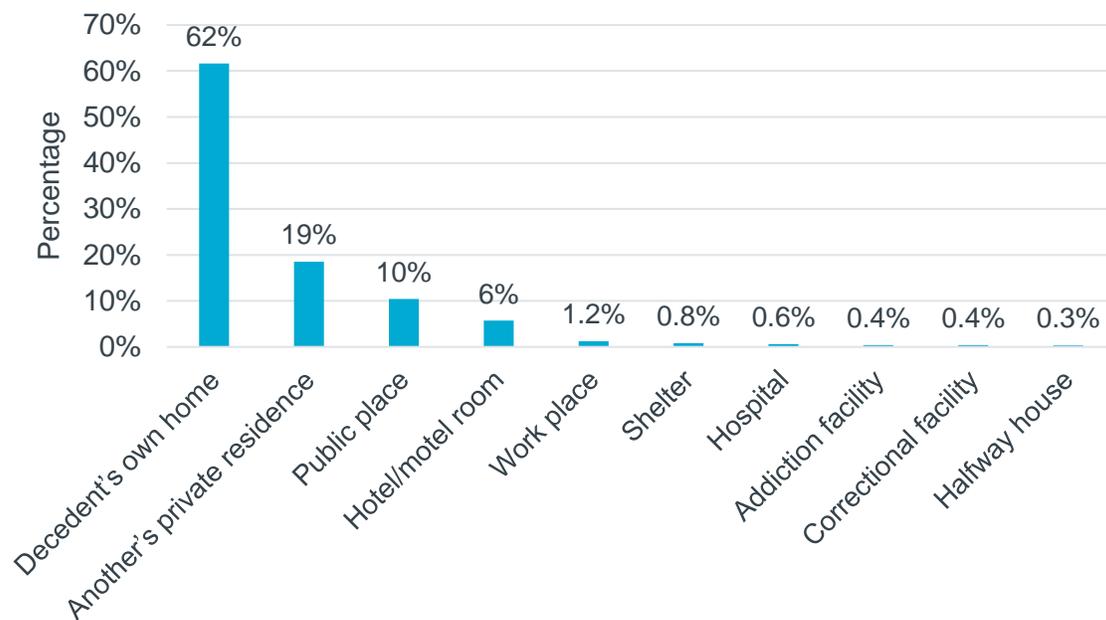
Note: Percentages are of the total number of decedents linked to administrative data (n=647).

- The majority of opioid-related deaths in Alberta in 2017 occurred in the Edmonton (31%) and Calgary (45%) Zones.
- In terms of rural-urban distribution of opioid-related deaths within the Zones, the majority of deaths occurred in metro or urban centres within the North Zone (Fort McMurray or Grande Prairie), Edmonton Zone (Edmonton), Calgary Zone (Calgary), and South Zone (Lethbridge or Medicine Hat) (see Appendix D for more information on Rural-Urban Continuum definitions). In the Central Zone, 47% of deaths occurred in an urban centre (Red Deer), while 31% of deaths occurred in rural areas.

Setting of opioid poisoning leading to death

Individuals who use drugs may feel more comfortable using in their own homes, but this can also represent a higher risk of death upon overdose, especially if using alone.

Figure 11. Setting of overdose leading to death, for individuals who died from opioid poisoning in 2017



Note: Percentages are of the total number of decedents (n=653).

- The most common setting of overdose was a decedent's own home (62% of cases). The second most common setting of overdose was another individual's private residence (19% of cases). Taken together, over 80% of individuals who died from opioid poisoning in 2017 had a fatal overdose that occurred in a private residence.
- The third most common setting of overdose was a public place (10% of cases) – the most common public settings of overdose were public washrooms and vehicles parked in a parking lot or on the side of the road.

EMS contact, resuscitation attempt, and place of death

Emergency medical services (EMS) was contacted in relation to the fatal opioid poisoning (at any time) in the majority (96%) of cases. In the remaining 4% of cases, EMS was either not contacted (e.g., individual found clearly deceased by police, or overdose incident occurred at the hospital) or it is unknown whether EMS was contacted (no indication in the medical examiner case file).

- EMS was contacted soon enough for EMS to attempt resuscitation in 36% of all cases.
- In 2% of cases where EMS was contacted, the call to EMS was delayed (e.g., bystanders attempting to first put individuals into a cold shower, or asking neighbours/friends for a naloxone kit).
- In 0.3% of cases where EMS was contacted, the call to EMS was placed by the decedent themselves prior to becoming unresponsive.

Table 11. Place of death for individuals who died from opioid poisoning in 2017

	Frequency	Percentage
Pronounced deceased on scene	545	83%
No resuscitation attempt by EMS ¹	415	63.6%
Following resuscitation attempt by EMS	130	19.9%
Pronounced deceased in hospital	108	17%
Transported to the emergency department ²	104	15.9%
Admitted to hospital at time of death	4	0.6%

Note: Percentages are of the total number of decedents (n=653) unless otherwise stated.

¹Includes those who were pronounced deceased on initial assessment, and those who were pronounced deceased on scene for whom it is unknown whether EMS was contacted (n=21).

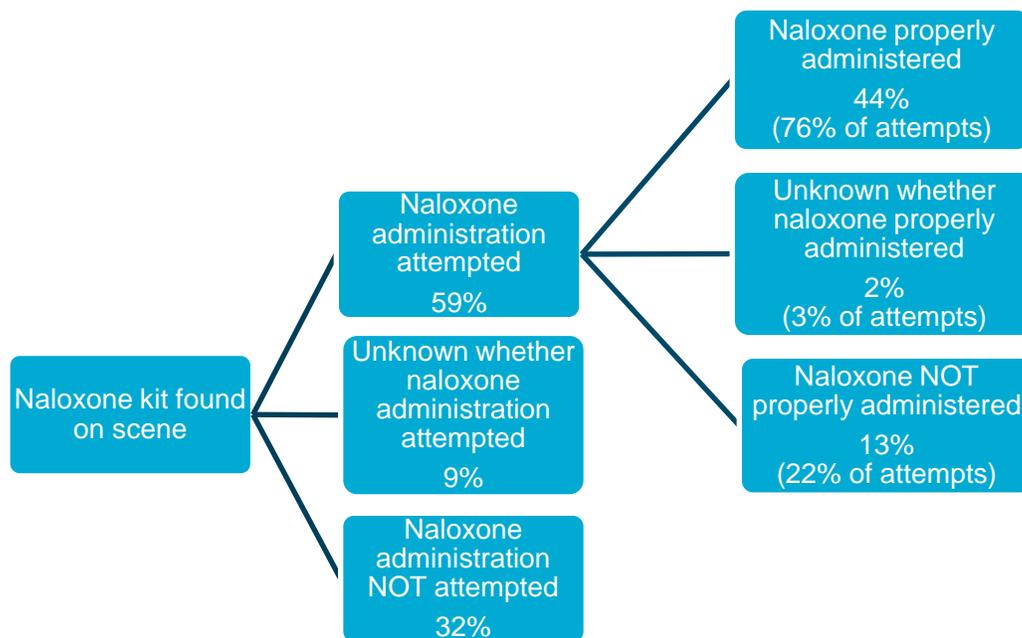
²The majority of those pronounced deceased in hospital (95%) were taken to the emergency department by EMS; one individual was taken to emergency by an acquaintance.

- 83% of individuals who died from opioid poisoning in 2017 were pronounced deceased at the scene of the overdose incident. Approximately one quarter (24%) of these individuals were pronounced following attempted resuscitation by EMS.
- 17% of individuals who died from opioid poisoning in 2017 were pronounced deceased in hospital. The majority of these decedents (95%) were transported to the emergency department by EMS.

Naloxone administration

- A naloxone kit was noted to be found on the scene in 10% of cases (n=63). For these cases, Figure 12 shows the proportion where naloxone administration was found to be attempted, and of these, the proportion where naloxone was properly administered.

Figure 12. Naloxone administration attempts by others on the scene, for opioid poisoning deaths in 2017 where a naloxone kit was found on scene



Note: Percentages are of the total cases where a naloxone kit was found on the scene (n=63), unless otherwise stated.

- Examples of cases where naloxone administration was attempted but not properly administered include cases where:
 - An individual was using drugs with their friends who were also under the influence of drugs when they had an overdose. Their friends attempted to administer naloxone while waiting for EMS to arrive, but although the naloxone vials in the kit were punctured, EMS on scene reported that the vials were still full of liquid upon their arrival.
 - An individual was using drugs alone. When their mother found them unresponsive, she got out the naloxone kit she made sure to keep at home and tried to draw naloxone up into the syringe to administer, but because of poor eyesight, was unable to puncture the vials.

- An individual was using drugs alone. When their roommate found them unresponsive, he brought out their naloxone kit and anxiously tried to prepare the syringe to administer naloxone, but accidentally broke the needle in the process.
- Overall, naloxone was administered in 24% of cases (includes administration by first responders or by individuals on the scene). In these cases, naloxone was first administered by:
 - A first responder (EMS/Fire/Police): 71%
 - An individual on the scene: 15%
 - Emergency department or hospital staff: 11%
 - Staff/security at a shelter or treatment centre: 3%
- Naloxone was not administered in 66% of cases. Information on whether naloxone was administered was unavailable in 10% of cases.

Other scene findings of note

- Approximately 10% of decedents had been checked on multiple times and thought to be sleeping with noted snoring or “gurgling” noises prior to being found unresponsive.
- In 6% of cases, there was evidence of diverted prescription medication use at the scene (e.g., prescription bottles with scratched out names or an unknown individual’s name, or known use of a friend or family member’s prescription drugs).

Case example 8

Justin* worked in the oil industry and lived with his grandparents. Justin’s grandparents were aware of his drug use history – Justin had attended rehab the year before and was thought to be currently not using drugs. However, when Justin returned home the night prior to his death, his grandparents found him acting strange and incoherent. They checked on Justin every hour until they went to sleep, each time thinking he was breathing. During the night, his grandfather awoke and went to check on him again to discover that he was cold. Toxicology detected carfentanil, cocaine, and other drugs.

(*name changed)

Acknowledgements

Alberta Health would like to acknowledge the invaluable support and assistance of the following groups and organizations in the completion of this work:

- Alberta First Nations Information Governance Centre
- Alberta Justice and Solicitor General
 - Office of the Chief Medical Examiner of Alberta
- Métis Nation of Alberta
- Métis Settlements General Council
- Minister's Opioid Emergency Response Commission
- Public Health Agency of Canada

Appendix A: Information from medical examiner case files

Information contained within Office of the Chief Medical Examiner (OCME) case files include the following:

- Autopsy or external exam report, if performed
- Toxicology results
- Medical investigator's summary report of findings from the scene and from interviews with next-of-kin and other interested parties
- Medical certificate of death
- Continuation notes

The following may or may not be included in the case files, depending on each case:

- Police incident report, or Preliminary Report of Death completed by police
- Emergency medical services (EMS) record
- Recent medical history, if requested by OCME on the context of the investigation
- Scene photos
- Other correspondence/paperwork from stakeholders and interested parties (e.g., next-of-kin, police, family physician, Office of the Child and Youth Advocate, Workers' Compensation Board, parole office, Correctional Service Canada)

Appendix B: Administrative data sources and case definitions

Overall administrative data source(s) for report

1. Emergency department data - National Ambulatory Care Reporting System (NACRS) (records from 1997 to present)
2. Hospitalization data - Discharge Abstract Database (DAD) (records from 1993 to present)
3. Physician claims data - Supplemental Enhanced Service Event (SESE) (records from 1983 to present)
4. Communicable Disease Reporting System (CDRS)
5. Alberta Health Care Insurance Plan (AHCIP) Quarterly Population Registry Files
6. Pharmaceutical Information Network (PIN)
7. Office of the Chief Medical Examiner (OCME) data
8. Alberta Blue Cross data
9. Alberta Corrections data
10. Vital Statistics data

Emergency department visits

Emergency department visits are defined by the Alberta MIS chart of accounts. Specifically, the three Functional Centre Accounts used to define any ACCS (Alberta Care Classification System) visits into an emergency visit are:

1. 71310 – Ambulatory care services described as emergency
2. 71513 – Community Urgent Care Centre (UCC). As of 2014, the UCCs in Alberta are listed below:
 - Airdrie Regional Health Centre, Cochrane Community Health Centre, North East Edmonton Health Centre, Health First Strathcona, Okotoks Health and Wellness Centre, Sheldon M Chumir Centre, South Calgary Health Centre
3. 71514 – Community Advanced Ambulatory Care Centre (AACC). As of 2014, the only AACC in Alberta is La Crete Health Centre

Community pharmacy drug dispensing

1. The Pharmaceutical Information Network (PIN) Database is used to estimate dispensation events for the province **only from community pharmacies**. Variability can be dependent on the way the drug is prescribed.
2. The PIN database is up-to-date; to date. PIN records can change due to data reconciliations, which may affect results. Results are more stable with older data.

Opioid and opioid agonist therapy (OAT) dispensing from community pharmacies

Opioid dispensing data is obtained from the Pharmaceutical Information Network (PIN) (2007 onwards). PIN does not have information on the specific condition the opioid was prescribed for. Opioids types are defined by ATC Code, as given in the table below.

ATC CODE	DRUG NAME	ATC NAME
N02AA59, N02AA79, R05DA04, R05DA20 ¹ , R05FA02 ² , M03BA53, M03BB53, N02BE51, and N02BA51	CODEINE	CODEINE
R05DA03, R05DA20 ³ , R05FA02 ⁴	HYDROCODONE	HYDROCODONE
N02AB03, N01AH01	FENTANYL	FENTANYL
N02AA03	HYDROMORPHONE	HYDROMORPHONE
N02AA01	MORPHINE	MORPHINE
N02AA05, N02AA55, N02BE51, and N02BA51	OXYCODONE	OXYCODONE
N02AX02, N02AX52	TRAMADOL	TRAMADOL
N07BC02	METHADONE	METHADONE
N02AA	NATURAL OPIUM ALKALOIDS	OTHER
N02AA02	OPIUM	OTHER
N02AB02	PETHIDINE	OTHER
N02AC04, N02AC54	DEXTROPROPOXYPHENE	OTHER
N01AH03	SUFENTANIL	OTHER
N01AH06	REMIFENTANIL	OTHER
N01AX03	KETAMINE	OTHER
R05DA20	NORMETHADONE	OTHER
N02AD01	PENTAZOCINE	OTHER
N02AE01, N04BC51	BUPRENORPHINE	OTHER
N02AF01	BUTORPHANOL	OTHER
N02AF02	NALBUPHINE	OTHER
N02AX06	TAPENTADOL	OTHER

The following DINs are excluded from the opioid dispensing data because they have been identified as drugs used to treat opioid dependence: 02244290, 02247374, 02394596, 02394618, 02295695, 02295709, 02408090, 02408104, 02424851, 02424878.

¹ The ATC name for R05DA20 is “combinations” which include drugs that contain codeine, hydrocodone, and normethadone hydrochloride. Classifications of codeine and hydrocodone were based on both drug identification number and ATC code.

² The ATC name for R05FA02 is “opium derivatives and expectorants” which include drugs that contain codeine and hydrocodone. Classifications of these drugs were based on both drug identification number and ATC code.

³ See footnote #1.

⁴ See footnote #2.

Administrative data on OAT included records going back to 2013. Opioid dependency drugs are defined by the ATC (Anatomical Therapeutic Chemical) code, as given in the table below:

ATC Code	Drug Name	ATC Grouping
N07BC51	Buprenorphine, combinations	Drugs used in opioid dependence
N07BC02	Methadone	Drugs used in opioid dependence

Note: the following DINs were excluded since they are indicated for pain relief by Health Canada: 02247701, 02247700, 02241377, 02247699, 02247698, 02247694.

Income support programs

Claim for a drug/service on an Alberta Health (AH) income support program (Adult health benefit, income support, or Assured Income for the Severely Handicapped (AISH)) in the year prior to death. 626 decedents were linked to administrative data for any claims for a drug/service on an AH income support program.

Child and Family Services involvement

An individual was identified as having been involved with Child and Family Services if they had a subsidy code at any time on the Alberta Health Care Insurance Registry file indicating that health benefits were covered by Child Intervention Services.

Case Definitions

Chronic pain

Chronic pain diagnosis was based on hospitalization data (1993 to present), physician claims data (1983 to present), and ambulatory/emergency department data (1997 to present). Chronic pain was defined as two hospitalizations, two physicians claims, or two ambulatory claims within 30 days or less with the following ICD-10 codes:

F45.4, M08.1, M25.50, M25.51, M25.55 - M25.57, M43.2 - M43.6, M45, M46.1, M46.3, M46.4, M46.9, M47, M48.0, M48.1, M48.8, M48.9, M50.8, M50.9, M51, M53.1 - M53.3, M53.8, M53.9, M54, M60.8, M60.9, M63.3, M79.0 - M79.2, M79.6, M79.7, M96.1

Reference: Tonelli M, Wiebe N, Fortin M, et al. Methods for identifying 30 chronic conditions: application to administrative data. BMC Med Inform Decis Mak. 2015;15:31. doi: 10.1186/s12911-015-0155-5.

Psychiatric diagnoses

Anxiety disorders: at least one physician claims record with the following codes:

- ICD-09-CM: 300,309.8, 309.81, 309.82, 309.83, 309.89

First diagnosis code in physician claims records.

Affective and mood disorders: at least one physician claims record with the following codes:

- ICD-09-CM: 296, 300.4, 301.1, 309.0, 309.1, 311

First diagnosis code in physician claims records.

Non-organic psychosis: at least one physician claims record with the following codes:

- ICD-09-CM: 295, 297, 298

First diagnosis code in physician claims records.

Organic Psychosis: at least one physician claims record with the following codes:

- ICD-09-CM: 291, 292, 293, 294

First diagnosis code in physician claims records.

Long-term opioid use

Long-term prescription opioid use was defined as receiving >120 days' supply of prescription opioids dispensed or having ≥ 10 opioid prescriptions filled over ≥ 90 days. Long-term prescription opioid use was based on data on prescription opioids dispensed at community pharmacies (records going back to 2007).

Reference: Von Korff M, Saunders K, Ray GT, et al. Defacto Long-term Opioid Therapy for Non-Cancer Pain. Clin J Pain. 2008;24(6):521-527.

doi:10.1097/AJP.0b013e318169d03b.

Previous drug overdose

At least one ambulatory/emergency department record (1997 to present) with the following codes:

- ICD-10-CA: T36*-T50*

Any diagnosis field.

Substance use disorder

At least one physician claims record with the following codes:

- ICD-09-CM: 303,305.2, 305.3, 305.4, 305.5, 305.6, 305.7, 305.8, 305.9, 304
- ICD-10: F10-F19

First diagnosis code in physician claims records.

Opioid use disorder

Opioid use disorder diagnosis was based on hospitalization data (1993 to present), physician claims data (1983 to present), and ambulatory/emergency department data (1997 to present). At least one physician, ambulatory, or hospitalization record with the following codes:

- ICD-09-CM: 304.0, 304.7, 305.5
- ICD-10-CA: F11.1, F11.2

Any diagnosis field.

Appendix C: National Occupational Classification 2016

Occupation classifications are based on Statistics Canada's National Occupational Classification (NOC) 2016 Version 1.2

(<http://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=1204813>).

The 10 broad occupational categories are:

Management occupations

- legislators and both middle and senior management occupations

Business, finance and administration occupations

- occupations in financial and business services, administration and clerical supervision and support services (e.g., accountants, investment brokers, human resources specialists)

Natural and applied sciences and related occupations

- occupations in sciences, engineering, architecture, and information technology

Health occupations

- occupations that provide health care services directly to patients and that provide technical support to medical staff (e.g., physicians, veterinarians, optometrists, nurses, dental hygienists, massage therapists, pharmacists, dietitians, medical laboratory technologists and technicians)

Occupations in education, law, and social, community and government services

- occupations concerned with law, teaching, counselling, conducting social science research, developing government policy, and administering government and other programs, as well as occupations providing religious services and leadership (e.g., teachers, lawyers, correctional service officers, home support workers, psychologists, social workers, policy researchers, consultants and program officers)

Occupations in art, culture, recreation and sport

- occupations in art and culture, recreation and sports (e.g., librarians, curators, writers, translators, artists, designers, actors, dancers, photographers, athletes, coaches, referees)

Sales and service occupations

- retail and wholesale sales occupations and customer and personal service occupations in a range of industries including accommodation and food services, travel, tourism, and cleaning services (e.g., real estate agents, insurance brokers, customer service and sales representatives and supervisors, restaurant hosts/hostesses, bartenders, servers, security guards, estheticians, pet groomers, flight attendants, janitors, cleaners)

Trades, transport and equipment operators and related occupations

- trades supervisors and contractors, construction and mechanical tradespersons, operators of transportation and heavy equipment, and trades helpers (e.g., bus drivers, truck drivers, electricians, carpenters, welders, mechanics, construction workers)

Natural resources, agriculture and related production occupations

- supervisors and equipment operators in the natural resource-based sectors of mining, oil and gas production, forestry and logging, agriculture, horticulture and fishing

Occupations in manufacturing and utilities

- supervisory, production and labouring occupations in manufacturing, processing and utilities

Appendix D: Rural-Urban Continuum definitions

The Rural-Urban Continuum definitions used are taken from the *Official Standard Geographic Areas* document published jointly by Alberta Health Services and Alberta Health (<https://open.alberta.ca/dataset/a14b50c9-94b2-4024-8ee5-c13fb70abb4a/resource/70fd0f2c-5a7c-45a3-bdaa-e1b4f4c5d9a4/download/Official-Standard-Geographic-Area-Document.pdf>).

Metro Centre: population >500,000. Calgary and Edmonton proper.

Metro Influenced Area: areas immediately surrounding Calgary and Edmonton. These are deemed as commuter communities (live outside of Calgary/Edmonton but commute to Calgary/ Edmonton for work and business).

Calgary metro-influenced area includes the towns of:

- Cochrane
- Airdrie
- Okotoks
- Priddis
- Chestermere Lake
- Springbank area

Edmonton metro-influenced area includes the towns of:

- St Albert
- Fort Saskatchewan
- Stony Plain & Spruce Grove
- Sherwood Park
- Leduc

Urban Centre: 5 major urban centres with populations greater than 25,000 but less than 500,000 (Grand Prairie, Fort McMurray, Red Deer, Lethbridge, Medicine Hat).

Urban Influenced Area: Local geographic areas surrounding the 5 urban centres. These areas are typically considered rural given that their populations are low and the local geographic areas do not define these areas properly (refer to note below).

Large Rural Centres (and Surrounding Areas): 10,000 to less than 25,000 population (Brooks, Canmore, Wetaskiwin, Camrose, Lloydminster, Cold Lake). These areas are considered rural but are defined for the purpose of special studies. All 5 areas have unique populations and industries that belong to the rural area.

Rural Areas: populations less than 10,000 and up to 200 kilometres from a Metro or Urban centre. These include towns, villages, hamlets, and agricultural areas.

Remote: greater than 200 kilometres from a Metro or Urban centre. Industries tend to include oil & gas, forestry, hunting/trapping, tourism and sometimes pockets of agriculture.

Note: The areas surrounding the 5 major cities (moderate urban influence), excluding Calgary and Edmonton, are too small at this time to separate from the surrounding rural areas. Hence these areas are considered rural for the purpose of analysis and planning. A redesign of moderate urban influenced areas is under redevelopment. Moderate Metro influenced areas around Edmonton are undergoing redesign to demarcate the rural areas.