



Hospitalizations and Emergency Department Visits Due to Opioid Poisoning in Canada



Canadian Centre
on Substance Abuse
Centre canadien de lutte
contre les toxicomanies



Canadian Institute
for Health Information
Institut canadien
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Key findings

The rise in harms associated with opioids is an issue of increasing public health importance in Canada. This report presents data on pan-Canadian hospitalizations and emergency department (ED) visits due to opioid poisoning, a costly and largely preventable harm.

Opioid poisonings result in more than 13 hospitalizations a day in Canada. They also lead to 7 ED visits in Ontario and 3 in Alberta every day.

- Hospitalization rates varied across the provinces and territories in 2014–2015, from a high of almost 21 per 100,000 population in Saskatchewan to a low of about 10 per 100,000 population in Quebec.
- In 2014–2015, one-third of hospitalizations for opioid poisonings were a result of purposely self-inflicted harm and almost half were considered accidental.
- The rate of ED visits for opioid poisoning was 57% higher in Alberta than in Ontario (27 versus 17 visits per 100,000 population) in 2014–2015.

Between 2007–2008 and 2014–2015, the rate of hospitalizations due to opioid poisoning increased more than 30% to almost 14 per 100,000 population. The rate of ED visits increased by 53% in Alberta and 22% in Ontario between 2010–2011 and 2014–2015.

- Hospitalization rates increased across all age groups, although the greatest change occurred among youth age 15 to 24; the rate for this age group increased by 62% from 6.5 to more than 10 per 100,000 population. The majority of poisonings among youth were intentional (52%).
- Alberta ED rates more than doubled among youth age 15 to 24 and among younger adults age 25 to 44. Ontario ED rates increased by almost one-third among these age groups.

Seniors have the highest rates of opioid poisoning hospitalizations.

- Seniors 65 and older consistently had the highest hospitalization rates, reaching 20 per 100,000 population in 2014–2015.
- Accidental poisonings accounted for the highest proportion of hospitalizations for seniors (55%). Poisonings that occurred during therapeutic use were more prevalent with older age, accounting for a quarter of poisonings among seniors.

Moving forward, this data could be used to provide better information to Canadians about the risks associated with opioids, to support evidence-informed initiatives aimed at reducing opioid-related harms and to fuel future collaborations between organizations at local, provincial/territorial and pan-Canadian levels in an effort to mitigate harms due to opioids.

Introduction

Opioids are psychoactive substances that influence one's perception of pain and can also induce a sense of euphoria. Some of the most commonly known opioids are fentanyl, oxycodone, morphine, codeine, hydromorphone, methadone and heroin. Many opioids are prescribed to treat various forms of pain, ranging from acute (e.g., post-surgical pain) to chronic (e.g., arthritis, back pain). Some opioids, such as methadone, are also prescribed to treat opioid dependence.¹ However, in some situations, use of opioids is associated with harms. For example, if used in a manner other than as prescribed by a medical practitioner or in combination with other substances such as alcohol or benzodiazepines, opioids can cause respiratory depression, coma or death.²

Across Canada, the dispensing rate for high-dose opioid formulations,ⁱ such as morphine, oxycodone and fentanyl, increased 23% between 2006 and 2011.³ More recently, in Health Canada's 2013 Canadian Tobacco, Alcohol and Drugs Survey, nearly 1 in 6 Canadians older than 14 reported opioid use in the past year.⁴ Worldwide, Canada is the second-largest per capita consumer of opioids, behind the United States.⁵

The rise in harms associated with opioids is an issue of increasing public health importance in Canada.⁶ Between 2009 and 2014, there were at least 655 deaths in Canada where fentanyl was determined to be a cause or a contributing cause, and at least 1,019 deaths where post-mortem toxicological screening indicated the presence of fentanyl.⁷

In response to increasing harms associated with prescription drugs, in 2013, the Canadian Centre on Substance Abuse (CCSA), together with more than 40 partners comprising the National Advisory Council on Prescription Drug Misuse, launched the 10-year strategy outlined in *First Do No Harm: Responding to Canada's Prescription Drug Crisis*.⁸ This pan-Canadian strategy aims to address the harms associated with psychoactive prescription drugs, including opioids. It outlines 58 concrete recommendations for collective action in key areas, including prevention, education, treatment, monitoring and surveillance, enforcement and legislation, and regulation. In its third year of implementation, CCSA continues to provide leadership and coordination to ensure the execution of this strategy.

Health Canada's 5-point Action on Opioid Misuse strategy aims to reduce the potential harm of opioids. One of the pillars of this strategy is to improve the evidence base around opioid use by facilitating improvements in data collection.⁹ A 4-year project of the Canadian Institute for Health Information (CIHI) is being funded under this program to improve the quality and comparability of available data, and to identify and publicly report key measures related to drug misuse.

i. High-dose opioid formulations are defined as doses greater than 400 morphine equivalents per day.

Measures that provide a better understanding of the harms associated with opioid use, such as numbers of deaths, hospitalizations and emergency department (ED) visits, are a high priority. These indicators of harm are not systematically reported at a pan-Canadian level and are highly fragmented.¹⁰ There is a need for better measures that offer the ability to compare trends, both within a jurisdiction and at the pan-Canadian level, over time.

This report begins to address this information gap by presenting data on pan-Canadian hospitalizations and ED visits due to opioid poisoning — costly and largely preventable harms.¹¹ A joint collaboration between CIHI and CCSA, this report is intended for federal, provincial and territorial policy-makers and other audiences interested in understanding the harms caused by opioid misuse.

“I’ve had a lot of friends — and people who I’ve worked with — who have been hospitalized. My best friend went because of a fentanyl overdose, and they found out he had a heart infection. 3 days later, he died from a morphine overdose in hospital. Overdose is something my community faces every day. There are a lot of people at risk.” — Sean, public health worker and former drug user

Data sources

Hospital Morbidity Database

The Hospital Morbidity Database (HMDB) captures administrative, clinical and demographic information on inpatient separationsⁱⁱ (referred to here as “hospitalizations”) from acute care hospitals. Hospitals in all provinces and territories (except Quebec) submit data directly to CIHI. Quebec data is submitted by the ministère de la Santé et des Services sociaux du Québec.

National Ambulatory Care Reporting System

The National Ambulatory Care Reporting System (NACRS) contains data on hospital-based and community-based ambulatory care — including day surgery, outpatient and community-based clinics, and EDs — for approximately 60% of the country: all of Ontario and Alberta, and some facilities in Prince Edward Island, Nova Scotia, Manitoba, Saskatchewan, British Columbia and Yukon. CIHI receives data directly from participating facilities, or from regional health authorities and ministries of health.

ii. Hospital separations represent departures from inpatient hospital stays due to discharge or death. These records are distinct from patient-level data in that an individual can have more than 1 separation recorded in a given year.

Methods

To identify opioid poisonings that resulted in hospital and ED visits, this study used ICD-10-CA codes (the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada; developed by the World Health Organization and enhanced by CIHI to meet Canadian morbidity data needs). Please refer to Appendix A for the list of ICD-10-CA codes used for the analysis.

This study includes HMDB acute care hospitalizations for fiscal years 2007–2008 to 2014–2015 across all provinces and territories for “significant opioid poisoning” — cases in which opioid poisoning was considered influential to the time spent and treatment received by the patient while in hospital (diagnosis types (M), (1), (2), (W), (X), (Y), (6) or (C) in CIHI’s classification system; descriptions of these diagnosis types can be found in Appendix A). For some analyses, Yukon, the Northwest Territories and Nunavut are grouped together and reported as “Territories” due to low volumes.

The analysis of NACRS data was limited to Ontario and Alberta for fiscal years 2010–2011 to 2014–2015. Although CIHI collects NACRS data from other jurisdictions, these submissions do not include the level of detail required for this analysis. Only Ontario and Alberta submit the fully coded diagnosis data necessary to identify opioid poisonings. This report includes ED abstracts where opioid poisoning was noted as the “main problem” — cases in which opioid poisoning was the primary diagnosis responsible for the majority of the time spent or treatment provided in the ED.

Opioid poisoning hospitalizations and ED visits were categorized based on the following ICD-10-CA categories:

- Accidental: The poisoning was considered to be non-intentional in nature. Includes accidental poisoning of drug, wrong drug given or taken in error, and drug taken inadvertently.
- Intentional: The poisoning occurred as a result of purposely self-inflicted harm.
- Therapeutic: The poisoning occurred as a result of an adverse effect when the medication was taken as directed.
- Unknown: Categorization of the poisoning was not possible due to unclear or insufficient information.

Of note, the HMDB and NACRS do not contain data on how the patient obtained the opioid that led to the poisoning. Thus this study likely includes poisonings due to prescription opioids as well as illegally produced or obtained opioids.

For analysis by age, the following age groups were used: younger than 15 (children); 15 to 24 (youth); 25 to 44 (younger adults); 45 to 64 (older adults); and 65 and older (seniors).

To calculate standardized rates, the direct standardization process was used with the 2011 Canadian population as the reference year.

The analysis presented in this report uses fiscal year data, from April 1 of one year to March 31 of the next.

Limitations

The coding of diagnoses using ICD-10-CA is based on patients' chart documentation. Deficiencies in chart documentation and/or the failure to provide coders with appropriate documents can affect data quality and lead to under-reporting.¹²

Information on the type of opioid poisoning is extracted from patient charts by trained coders. This assessment of opioid type may be based on patient self-report, toxicological analysis or both, which may also affect data quality.

The reason for opioid poisoning is also based on patients' chart documentation and relies on disclosures by the patient or witness accounts. An investigation of the validity of intentional poisoning codes from Canadian hospitals has shown that the data can be subject to under-reporting.¹³

Further, it is worth noting that the data presented in this report includes only opioid poisonings for which an individual was admitted to the hospital (or the ED in Ontario and Alberta) and does not capture cases that did not receive treatment in these environments. Therefore, these figures represent an underestimate of the extent of opioid poisonings in Canada; the magnitude of this underestimate, however, is unknown.

Analysis

This section describes opioid poisoning hospitalization trends in Canada and will address the following questions:

- How many opioid poisoning hospitalizations are there in Canada?
- How does the rate of opioid poisoning hospitalizations differ by province?
- What types of opioids are responsible for poisoning hospitalizations?
- Who is being hospitalized for opioid poisonings?
- What was the reason behind these opioid poisonings?
- Are there differences in opioid poisoning reasons by age or gender?
- What are common co-occurring poisonings?

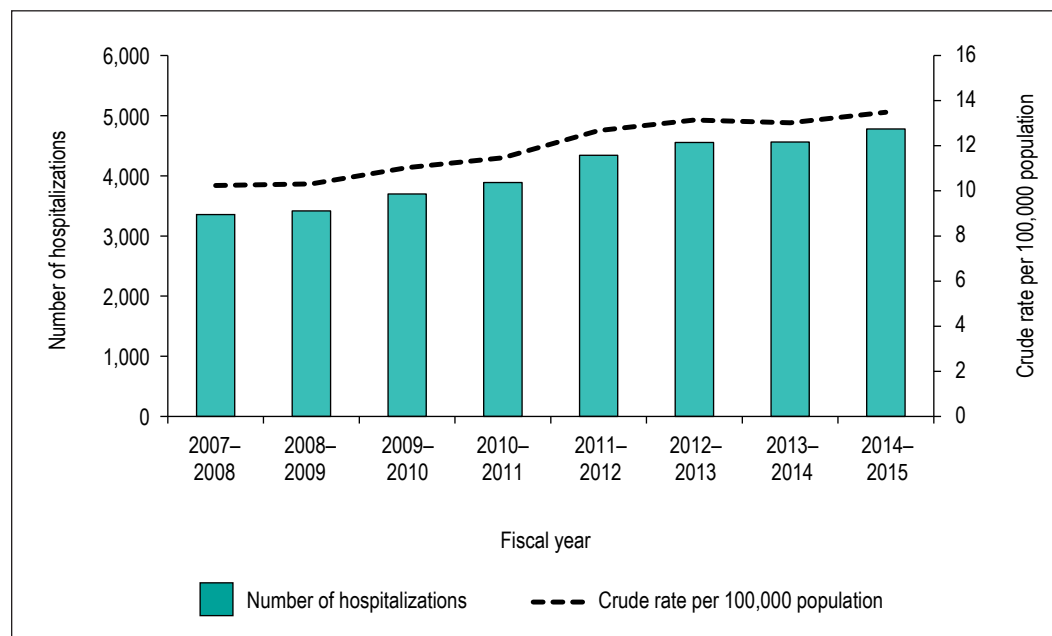
The report will also address similar questions for ED visits in Ontario and Alberta.

“I’ve had a number of calls with opioid overdoses. I’ve picked people off the floor of public washrooms . . . I’ve carried limp, barely breathing bodies and watched most wake up shortly after getting Narcan [naloxone]. I also helped a little old lady who had been given too much pain medication by her equally elderly husband who didn’t fully understand their doctor’s instructions.” — Dan, paramedic

How many opioid poisoning hospitalizations are there in Canada?

In 2014–2015, there were 4,779 hospitalizations due to opioid poisoning in Canada, an average of more than 13 hospitalizations a day, up from 3,357 in 2007–2008 (Figure 1). From 2007–2008 to 2014–2015, the crude rate increased more than 30%, from 10.2 to 13.5 per 100,000 population. This increase is consistent with the findings of a previous study examining hospitalizations among persons with a primary diagnosis of a mental or behavioural disorder due to opioid use that noted an increase of 23% between 2006 and 2011.¹⁴ These findings illustrate how the harms associated with opioids have had an increasing influence on Canada’s health care systems in recent years, despite being largely preventable.¹¹

Figure 1 Number and crude rate per 100,000 population of hospitalizations due to opioid poisoning, Canada, 2007–2008 to 2014–2015



Source

Hospital Morbidity Database, Canadian Institute for Health Information.

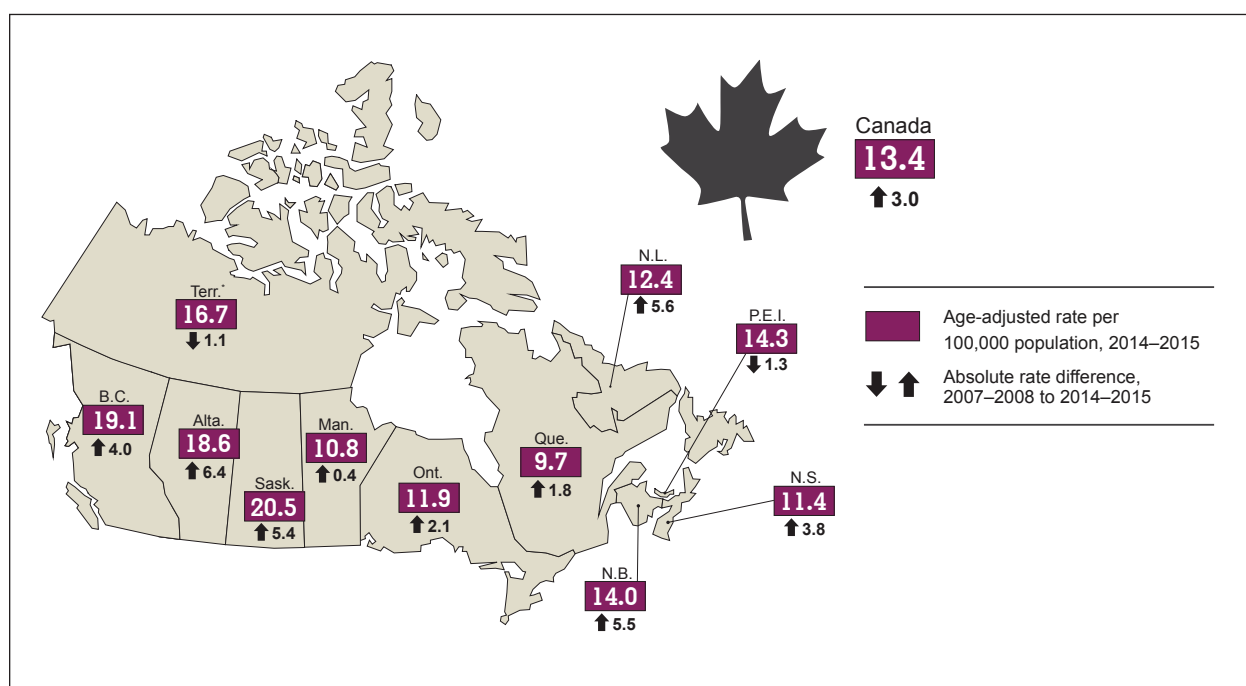
With respect to health care resources, people admitted to hospital for an opioid poisoning remained for an average of 8.0 days, longer than the average total length of stay for those admitted for a heart attack (5.1 days), pneumonia (6.9 days) or hip replacement surgery (7.3 days).¹⁵ In 2014–2015, a total of 38,405 days of care were provided in Canadian hospitals to patients admitted with a diagnosis of opioid poisoning.

Over the study period, the proportion of patients who were admitted to hospital for an opioid poisoning and died during the stay increased from 3.8% (150) in 2007–2008 to 4.9% (199) in 2014–2015. It is important to note that this proportion includes only persons who were alive at the time of admission and does not include deaths that occurred outside the hospital. Currently, there are no reliable pan-Canadian estimates of opioid-related deaths in Canada; however, data from Ontario indicates that rates of opioid-related deaths have increased 242%, from 1.2 deaths per 100,000 population in 1991 to 4.2 deaths per 100,000 in 2010.⁷

How does the rate of opioid poisoning hospitalizations differ by province?

Age-adjusted rates of hospitalizations due to opioid poisoning varied across the provinces in 2014–2015, from a high of 20.5 per 100,000 population in Saskatchewan to a low of 9.7 per 100,000 population in Quebec (Figure 2). The greatest change in rates from 2007–2008 to 2014–2015 occurred in Alberta (increase of 6.4 per 100,000 population) and Newfoundland and Labrador (increase of 5.6 per 100,000 population). Quebec had consistently lower rates of opioid poisoning hospitalizations compared with all other provinces across all data years (ranging from 7.9 per 100,000 in 2007–2008 to 9.7 in 2014–2015).

Figure 2 Age-adjusted rates of hospitalization due to opioid poisoning per 100,000 population by province/territories, Canada, 2014–2015



Notes

* Yukon, the Northwest Territories and Nunavut are grouped together and reported as “Territories” due to low volumes. The direct standardization process was used with the 2011 Canadian population as the reference year.

Source

Hospital Morbidity Database, Canadian Institute for Health Information.

The number of cases, as well as the crude, age-standardized and age–sex-standardized rates, by province and territories for each study year are available in the companion Excel file *Hospitalizations and Emergency Department Visits Due to Opioid Poisoning in Canada: Data Tables*.

What types of opioids are responsible for poisoning hospitalizations?

The ICD-10-CA codes used in this analysis group opioid poisonings into 6 broad categories: synthetic opioids, opium, methadone, heroin, other opioids and unspecified/other opioids (see Appendix A). The “other opioids” category (which includes oxycodone, morphine and hydromorphone, among others) accounted for more than half of all opioid poisoning hospitalizations in each year of the study (ranging from 55% to 59%). The rate of hospitalizations for opioid poisoning related to this group increased by more than 42% between 2007–2008 and 2014–2015 (from 5.8 to 8.2 per 100,000 population). Interestingly, high dispensing rates of oxycodone and hydromorphone during the same time period are consistent with these findings.^{3, 16}

Synthetic opioids (such as fentanyl and tramadol) accounted for 6% of hospitalizations due to opioid poisoning in 2014–2015. However, the rate of hospitalizations due to synthetic opioid poisoning increased from 0.5 to 0.8 per 100,000 population across the study period (from 166 in 2007–2008 to 300 in 2014–2015).

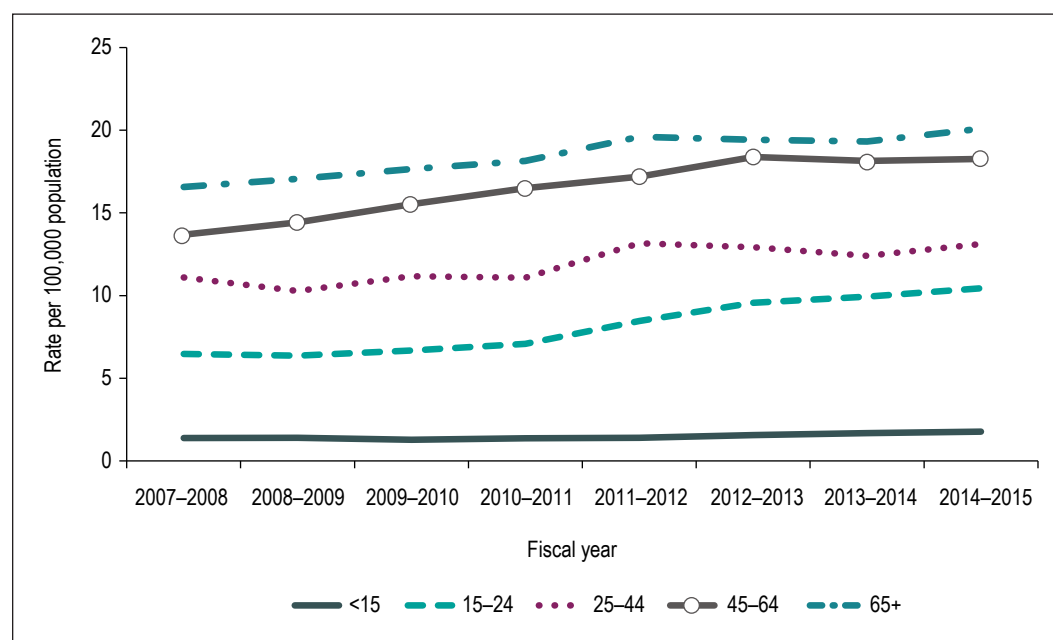
A similar trend was observed for hospitalizations due to heroin poisoning: although it accounted for 6% of all opioid poisoning hospitalizations in 2014–2015, the rate increased from 0.3 to 0.8 per 100,000 population (from 83 in 2007–2008 to 278 in 2014–2015).

In the United States, a 145% increase in heroin use has been observed since 2007, accompanied by significant increases in heroin-related mortality.¹⁷ Recently, in 2013, illicitly produced powdered fentanyl appeared in the Canadian illicit drug market as an ingredient in counterfeit oxycodone tablets, white powder heroin and other drugs.¹⁸ Fentanyl is considerably more potent than other opioids, and even small quantities can result in poisoning.¹⁹ In B.C., the increasing number of drug poisoning deaths, including those in which fentanyl was detected, prompted that province to declare a public health emergency in April 2016.²⁰ While this analysis was unable to specifically explore rates of fentanyl-related hospitalizations, it found that the highest rate of hospitalizations due to synthetic opioid poisoning was observed in B.C. (1.3 per 100,000 population, or 59 cases, in 2014–2015). However, it is unclear how many of the poisonings included in this report may be partially or wholly attributable to inadvertently consumed fentanyl.

Who is being hospitalized for opioid poisonings?

By age: Between 2007–2008 and 2014–2015, rates of hospitalizations due to opioid poisoning increased across all age groups (Figure 3). Notably, the greatest change in rates over the study period was observed among youth (age 15 to 24), increasing by 62% from 6.5 to 10.4 hospitalizations per 100,000 population. However, seniors 65 and older consistently had the highest rates of all age groups, reaching 20.1 hospitalizations per 100,000 population in 2014–2015.

Figure 3 Rate of hospitalizations due to opioid poisoning per 100,000 population by age group, Canada, 2007–2008 to 2014–2015



Source

Hospital Morbidity Database, Canadian Institute for Health Information.

Seniors accounted for nearly a quarter of hospitalizations for opioid poisoning in 2014–2015, even though this age group represents only 16% of the Canadian population. Previous reports examining the impact of substance use disorders on hospital use have yielded similar findings. For example, in a 2014 report from CCSA, Young and Jesseman noted a 142% increase in days spent in hospital due to opioid use disorders among seniors from 2006 to 2011.¹⁴

Higher rates of opioid poisoning hospitalizations among seniors could be due to a number of factors. In Canada, the rate of opioid use is highest among seniors,² and they are more likely to receive prescriptions due to increased rates of pain and age-related illnesses.²¹ Seniors might also be at a greater risk for experiencing opioid-related harms due to high rates of polypharmacy²² and age-related changes to the body.²³ The issue of opioid-related harms in seniors warrants further attention. In 2015, nearly 16% of Canadians were age 65 and older and, according to projections, this will increase to more than 20% in 2024.²⁴

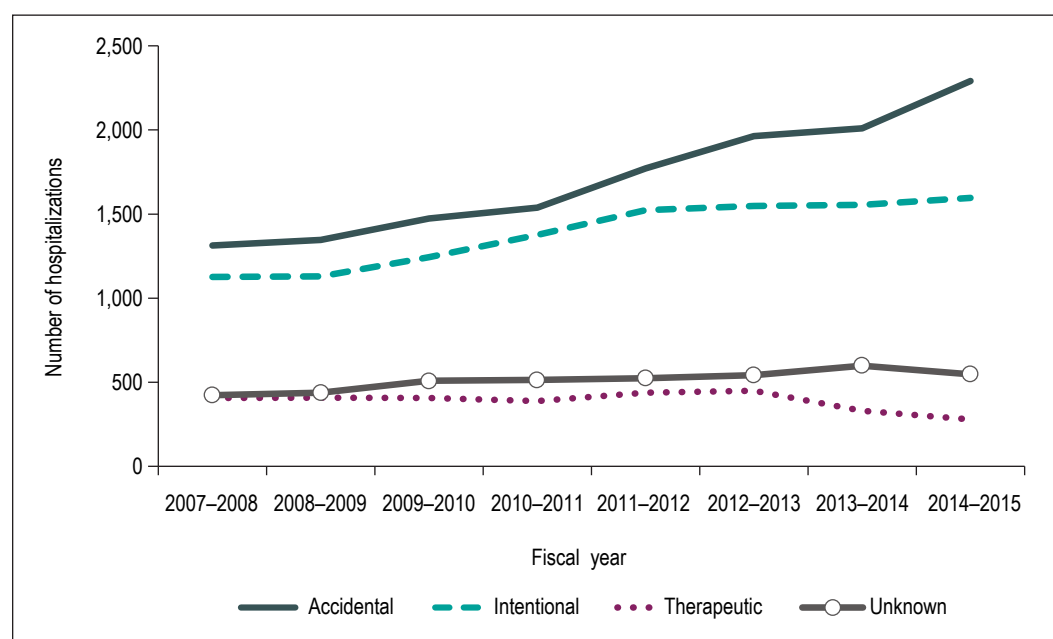
By gender: Throughout the study period, the proportion of opioid poisoning hospitalizations was slightly higher among females than males, accounting for 53% of poisonings in 2014–2015. Rates of opioid poisoning hospitalizations increased steadily for both females (from 11.3 to 14.2 per 100,000 population) and males (from 9.1 to 12.8) between 2007–2008 and 2014–2015. There was a greater change in rates for males (40% increase) than for females (26% increase).

What was the reason behind these opioid poisonings?

Opioid poisonings were categorized into 1 of 4 ICD-10-CA categories: accidental, intentional, therapeutic or unknown (see the Methods section for further information).

Accidental opioid poisonings accounted for the highest proportion of hospitalizations, increasing from 40% (1,314) in 2007–2008 to 49% (2,291) in 2014–2015 (Figure 4). Intentional poisonings accounted for the second-highest proportion of hospitalizations, remaining stable at around 34% throughout the study period. In contrast, the proportion of therapeutic poisonings (i.e., those that occurred when the drug was used as prescribed) decreased from 12% (407) in 2007–2008 to 6% (280) in 2014–2015. Meanwhile, the proportion of opioid poisonings with unknown reason remained relatively stable, comprising 12% (548) of hospitalizations in 2014–2015.

Figure 4 Number of hospitalizations due to opioid poisoning by documented reason, Canada, 2007–2008 to 2014–2015



Source

Hospital Morbidity Database, Canadian Institute for Health Information.

The finding that accidental opioid poisonings accounted for the highest proportion of hospitalizations is not surprising. Accidental poisonings can occur in patients who are prescribed opioids when the medication is not taken as directed. For instance, vision and memory problems may develop with age, increasing the risk of overconsumption, especially for patients with complex medical regimens.²⁵ For those who intentionally misuse drugs, accidental poisonings can occur when the drug taken contains different substances or higher concentrations than the user expects. For example, the unknown presence of fentanyl and other novel synthetic opioids in products purchased in the illicit market increases the risk of accidental poisoning, as doses vary and individuals may be opioid naïve.^{26, 27} Also, lower tolerance due to a recent period of abstinence, such as following release from a detoxification facility, has been shown to significantly increase the risk of accidental poisoning.²⁸

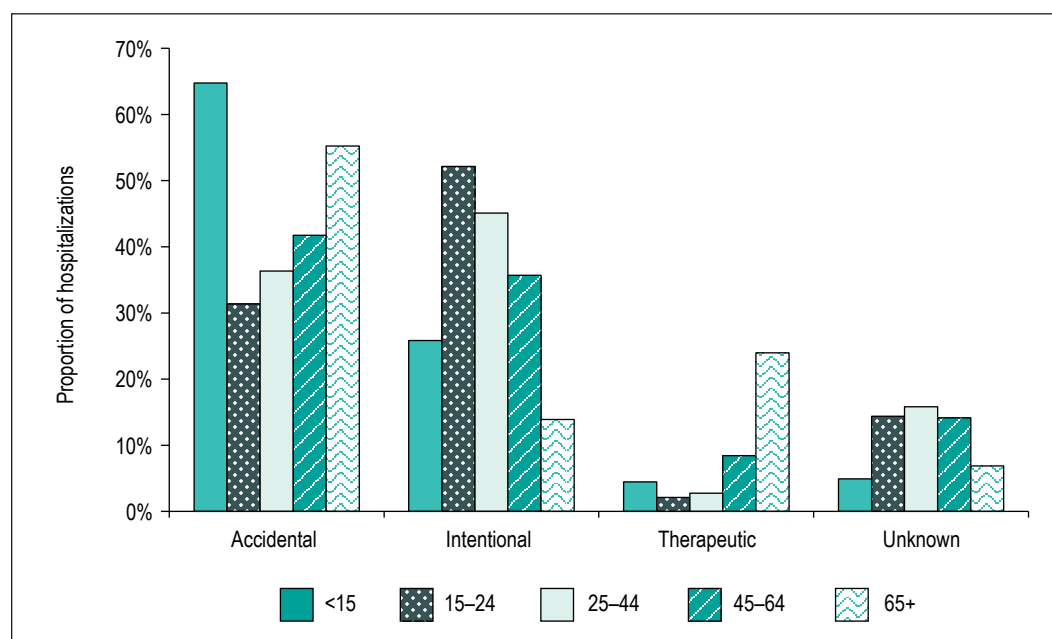
The finding that approximately one-third of opioid poisonings were intentional is consistent with trends in the recorded use of opioids in self-harm behaviours in Canada. For example, between 1998 and 2007, opioid analgesics were the most common category of substances implicated in nearly 400 suicides in Toronto, Ontario, accounting for 28% of all cases.²⁹ It is important to note that the measure of intentional poisonings relies on self-reported data by the patient or witness accounts. An investigation of the validity of intentional poisoning codes from Canadian hospitals has shown that the data can be subject to under-reporting.¹³

In addition, the current data does not indicate whether individuals had the intent to die; rather, it suggests the intent to self-harm by opioid poisoning. As such, any links between suicidal behaviour and intentional opioid poisoning–related hospitalizations should be made with caution. Nonetheless, these findings highlight the importance of adherence to best practice clinical guidelines that advise physicians to evaluate depression and suicidal risk among those prescribed opioids.³⁰ They also highlight the importance of safe disposal of leftover or unused opioid prescriptions through initiatives such as prescription drop-off days, in order to mitigate access to supplies that could potentially be used for intentional self-harm.

Are there differences in opioid poisoning reasons by age or gender?

By age: Trends for reason varied dramatically by age (Figure 5), although across all years examined, opioid poisoning distributions by reason remained relatively consistent within age groups. Overall, the majority of opioid poisoning hospitalizations among children younger than 15 were accidental (65%), while intentional poisonings were the most prevalent for youth age 15 to 24 (52%) and younger adults age 25 to 44 (45%). Higher rates of accidental opioid poisonings observed among children and intentional poisonings among youth underline the importance of prevention efforts aimed at reducing harm, such as safe storage of opioid-related drugs.

Figure 5 Proportion of opioid poisoning hospitalizations by age group and reason, 2007–2008 to 2014–2015



Source

Hospital Morbidity Database, Canadian Institute for Health Information.

Accidental poisonings were more common in older age, accounting for the largest proportion of hospitalizations among older adults age 45 to 64 (42%) and seniors age 65 and older (55%). Opioid poisonings that occurred during therapeutic use were also more prevalent with older age, accounting for almost one-quarter (24%) of poisonings among seniors. As mentioned previously, seniors are at greater risk for hospitalization from adverse drug reactions due to the number of drugs they take, a higher prevalence of certain chronic conditions and age-related changes in the body.^{31, 32} One study found that 1 in 200 Canadian seniors was identified as having an adverse drug reaction–related hospitalization, compared with 1 in 1,000 non-seniors. Opioids and related analgesics were the third most common drug class associated with adverse drug reaction–related hospitalizations among seniors.³³ These findings also highlight the importance of safer opioid prescribing guidelines and effective implementation of such guidelines among seniors, which should include the education of older adults and their care providers on the dangers of combining opioids and other substances (e.g., benzodiazepines, alcohol).³⁴

By gender: In 2014–2015, accidental opioid poisonings accounted for the highest proportion of hospitalizations among both genders — 51% among males and 46% among females — whereas intentional opioid poisonings accounted for the second-largest proportion — 30% and 37%, respectively. The distribution of reason for opioid poisoning by gender remained relatively consistent across all years examined.

The finding that females had slightly higher rates of intentional opioid poisoning relative to males is supported by other data suggesting that females are at a greater risk of co-occurring substance use and self-harm behaviours. In 2013–2014, intentional self-harm by Canadian females age 10 to 17 accounted for 45% of all hospitalizations among this group. As well, within this group, there was a 102% increase in self-injury between 2009 and 2014, which was largely attributed to intentional poisoning (88% of the cases) where substances such as prescription medications, illicit drugs and alcohol, among others, were cited as used.³⁵

What are common co-occurring poisonings?

Some persons hospitalized for opioid poisoning also had a documented primary or secondary diagnosis for another poisoning due to a non-opioid drug during the same hospital stay, referred to here as a “co-occurring poisoning.” The most common co-occurring poisonings are discussed below.

Benzodiazepines: The most common co-occurring poisoning involved benzodiazepines, present in 1 out of 5 opioid poisoning hospitalizations (19%). Benzodiazepines are a class of sedative–hypnotic mainly used to relieve anxiety and assist with sleep problems. They work as central nervous system depressants, meaning that they depress or slow down the body’s functions.³⁶ The combination of opioids and benzodiazepines increases the risk of harms such

as respiratory depression and death, especially in older age.²⁸ Those with intentional opioid poisonings had a higher proportion of co-occurring poisonings due to benzodiazepines (29%), compared with accidental and therapeutic poisonings, where benzodiazepines were present in just 13% and 3% of hospitalizations, respectively.

Acetaminophen: The second most common co-occurring poisoning involved 4-aminophenol derivatives (e.g., acetaminophen), which were present in 14% of opioid poisoning hospitalizations. These co-occurring poisonings can be due to several factors, including taking an opioid product along with an acetaminophen product, or taking a combination product that includes acetaminophen and an opioid (e.g., Percocet, Tylenol 3). Those with intentional opioid poisonings were more likely to have a co-occurring poisoning due to 4-aminophenol derivatives (27%), compared with accidental and therapeutic poisonings, where these derivatives were present in 8% and 1% of hospitalizations, respectively.

Cocaine: Co-occurring poisoning due to cocaine was present in 6% of opioid poisoning hospitalizations. Those with accidental opioid poisonings had a slightly higher proportion of co-occurring poisonings due to cocaine (7%), compared with intentional and therapeutic poisonings, where cocaine was present in 6% and 0.3% of hospitalizations, respectively. Some people who use opioids will use them in combination with cocaine to alleviate symptoms of withdrawal or to achieve a desired effect.³⁷

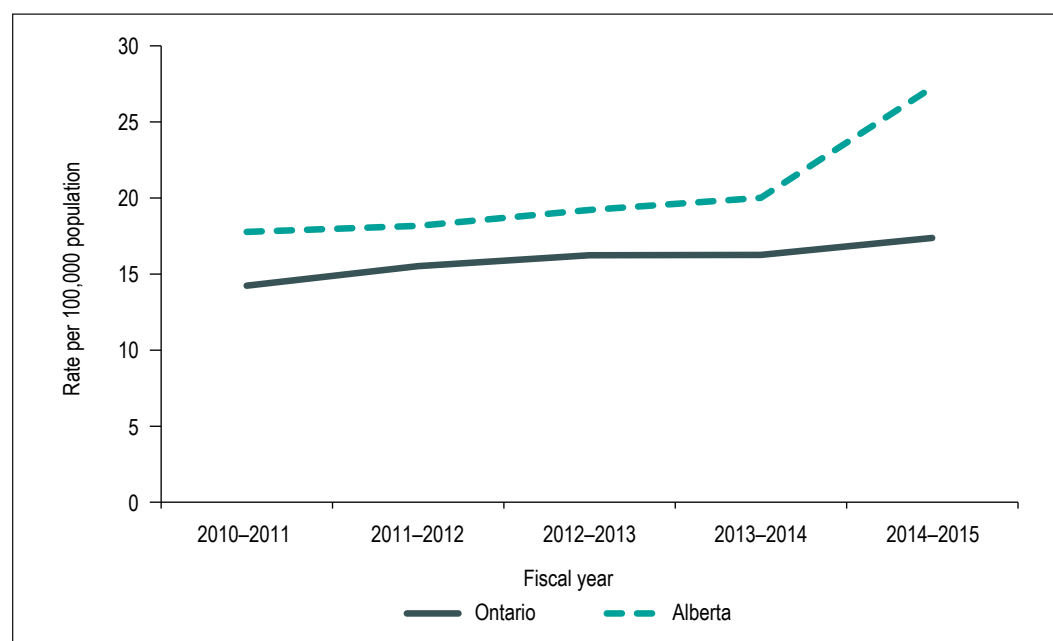
Alcohol: A co-occurring poisoning due to alcohol was found in more than 6% of opioid poisoning hospitalizations. As with sedatives–hypnotics, mixing opioids with alcohol increases the risk of respiratory depression and death, and combinations of these substances are often present in fatal drug poisonings.³⁸ Those with intentional opioid poisonings were more likely to have a co-occurring poisoning due to alcohol (10%), compared with accidental and therapeutic poisonings, where alcohol poisoning was present in 5% and 0.3% of hospitalizations, respectively.

How many emergency department visits are there for opioid poisonings?

The number of ED visits due to opioid poisonings was examined from 2010–2011 to 2014–2015 in Ontario and Alberta, the 2 provinces for which comprehensive data was available. In 2014–2015, there were 2,377 ED visits in Ontario and 1,143 ED visits in Alberta, an average of almost 7 ED visits a day in Ontario and more than 3 ED visits a day in Alberta. This translates to 1.6 ED visits for every hospitalization in Alberta and 1.4 ED visits for every hospitalization in Ontario in 2014–2015.

The age-adjusted rate of ED visits due to opioid poisoning increased by 53% in Alberta (from 17.8 to 27.3 visits per 100,000 population) and by 22% in Ontario (from 14.2 to 17.4 visits per 100,000) between 2010–2011 and 2014–2015. In Alberta, the majority of growth occurred between 2013–2014 and 2014–2015, when the rate of ED visits increased by more than one-third (36%) from 20.0 to 27.3 per 100,000 population (Figure 6).

Figure 6 Age-adjusted rate of ED visits due to opioid poisoning, Ontario and Alberta, 2010–2011 to 2014–2015



Source

National Ambulatory Care Reporting System, Canadian Institute for Health Information.

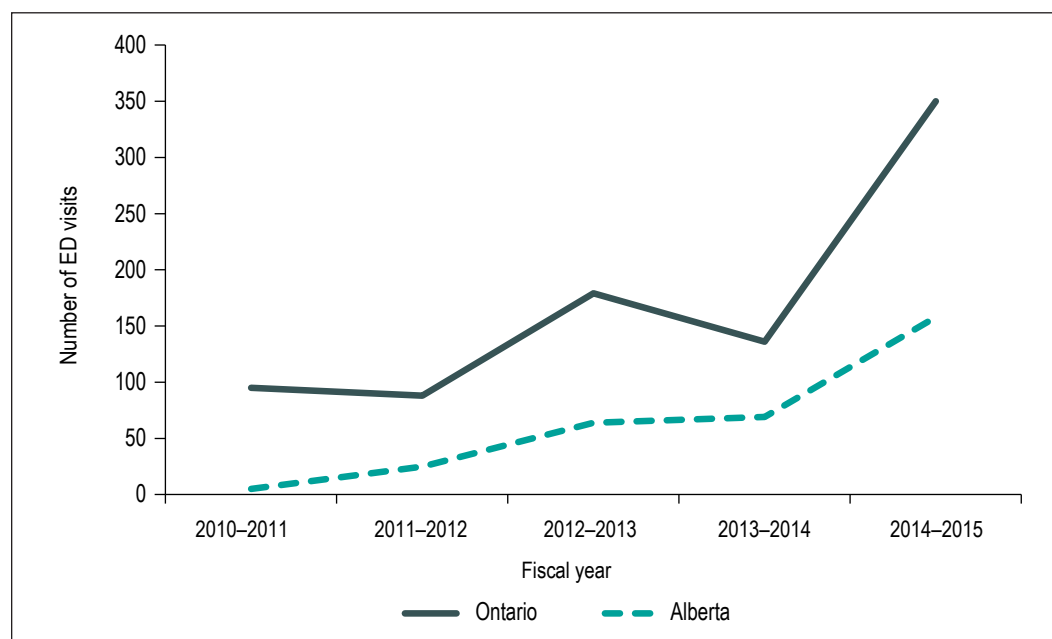
The number of cases, as well as the crude, age-standardized and age–sex-standardized rates, by province for each study year are available in the companion Excel file *Hospitalizations and Emergency Department Visits Due to Opioid Poisoning in Canada: Data Tables*.

What are the characteristics of opioid poisoning emergency department visits?

By opioid type: Similar to hospitalizations, the “other opioids” category (oxycodone, morphine and hydromorphone, among others) accounted for the largest proportion of ED visits in Alberta (56% to 64%) and Ontario (50% to 57%) over the study period.

Of note, the annual proportion of ED visits due to heroin poisonings increased most rapidly of any opioid type. In 2010–2011, heroin accounted for 1% of opioid poisoning ED visits in Alberta and 5% in Ontario. The proportion climbed to 14% and 15%, respectively, in 2014–2015. The majority of growth occurred between 2013–2014 and 2014–2015, when the number of ED visits due to heroin poisoning more than doubled in each province (Alberta: from 69 to 158 cases; Ontario: from 136 to 350 cases) (Figure 7).

Figure 7 Number of ED visits due to heroin poisoning, Ontario and Alberta, 2010–2011 to 2014–2015



Source

National Ambulatory Care Reporting System, Canadian Institute for Health Information.

The category for synthetic opioid poisoning, which includes poisoning due to fentanyl, also increased significantly between 2010–2011 and 2014–2015, rising from 36 to 105 ED visits in Alberta and from 168 to 243 ED visits in Ontario.

By age: Between 2010–2011 and 2014–2015, rates of ED visits due to opioid poisonings increased across all age groups in Ontario and Alberta, except for children younger than 15. Unlike hospitalizations, for which seniors had the highest rates of opioid poisoning, the highest rates for ED visits in Ontario and Alberta were among persons age 15 to 24 and 25 to 44. In Alberta, the ED visit rates more than doubled across the study period for youth 15 to 24 (from 15.4 to 40.0 visits per 100,000 population) and younger adults age 25 to 44 (from 18.8 to 39.4 visits per 100,000 population).

By gender: In Ontario and Alberta, rates of opioid poisoning ED visits were higher among males across all years examined (except for 2011–2012 in Alberta). In each province, rates of opioid poisoning ED visits increased for both genders, although most notably for males. From 2010–2011 to 2014–2015, ED visits for males increased by 86% in Alberta (from 17.4 to 32.4 per 100,000 population) and by 38% in Ontario (from 14.7 to 20.2). Rates of opioid poisoning ED visits for females increased at a higher rate in Alberta (36%, from 17.2 to 23.3 per 100,000 population) than in Ontario (7%, from 13.8 to 14.7) across the study period.

By reason: In 2014–2015, accidental opioid poisonings accounted for the highest proportion of ED visits (Alberta: 70%; Ontario: 47%). Approximately a quarter of ED visits due to opioid poisoning in Ontario were intentional, compared with 17% of ED visits in Alberta. Notably, the greatest annual increase in the number of opioid poisoning ED visits by reason was observed in Alberta between 2013–2014 and 2014–2015, when accidental opioid poisonings increased by more than 59%, from 506 to 804 (compared with an 11% increase in Ontario). This increase in Alberta was largely driven by a rise in accidental poisonings among males.

Conclusion

Opioid poisonings are a significant public health concern in Canada. This report indicates that hospitalizations and ED visits due to opioid poisoning have increased in recent years. However, the data presented does not include cases of opioid poisonings that did not receive treatment in a hospital or ED setting. Therefore, these figures underestimate the number of Canadians experiencing opioid-related harms.

The implications of this work have been discussed throughout and have relevance to a range of sectors, including public health, primary care, emergency response, pharmacy and gerontology, among others. The report highlights the importance of evidence-based strategies to reduce the risk of and harms associated with opioid poisonings. These include, but are not limited to,

- Enhanced access to evidence-based prevention, screening and treatment (including opioid-substitution therapy) for opioid use disorder;

- Improved prescribing practices that adhere to accepted guidelines and emphasize patient education;
- Use of prescription monitoring programs to monitor and address problematic prescribing practices; and
- Increased access to naloxone by first responders, organizations serving people who use opioids, and people who use opioids and their family members and friends.

It also highlights the importance of pan-Canadian strategies to combat opioid and other prescription drug harms, such as First Do No Harm and Health Canada's Action on Opioid Misuse. Current work to develop key measures for the analysis of opioid use and associated harms will allow for more immediate identification of and responses to trends, in addition to informed resource allocation at the local level and decision-making at the provincial/territorial and pan-Canadian levels.

In summary, this report improves the Canadian evidence base on the impact of opioid poisonings on hospital utilization and provides foundational information to support effective implementation of the priorities identified in Health Canada's 5-point Action Plan on Opioid Misuse. Moving forward, this pan-Canadian data should be used to provide better information to Canadians on the risks associated with opioids, support evidence-based initiatives aimed at reducing opioid-related harms and fuel future collaborations between organizations at local, provincial/territorial and pan-Canadian levels in an effort to mitigate harms due to opioids.

Appendix A: ICD-10-CA codes used in analysis

The ICD-10-CA codes used to restrict abstracts to only those involving relevant opioid poisonings were the following:

- T40.0 (poisoning by opium)
- T40.1 (poisoning by heroin)
- T40.2 (poisoning by other opioids)
- T40.3 (poisoning by methadone)
- T40.4 (poisoning by synthetic opioids)
- T40.6 (poisoning by unspecified/other opioids)

The ICD-10-CA codes used in the analysis group opioids into broad categories, so it was not possible to attribute hospitalizations to a specific opioid, such as fentanyl or oxycodone. Specific drug names included in these categories are presented in the table.

Table List of opioid poisoning ICD-10-CA codes

Drug name	ICD-10-CA code
Laudanum	T40.0
Opium alkaloids (total)	T40.0
Opium alkaloids (total) — Standardized powdered	T40.0
Opium alkaloids (total) — Tincture (camphorated)	T40.0
Papaveretum	T40.0
Paregoric	T40.0
Diacetylmorphine	T40.1
Diamorphine	T40.1
Heroin	T40.1
Acemorphan	T40.2
Antitussive NEC — Codeine mixture	T40.2
Antitussive NEC — Opiate	T40.2
Codeine	T40.2
Dihydrocodeine	T40.2
Dihydrocodeinone	T40.2
Dihydrohydroxycodeinone	T40.2
Dihydromorphinone	T40.2

Drug name	ICD-10-CA code
Drocode	T40.2
Ethylmorphine	T40.2
Hydrocodone	T40.2
Hydromorphone	T40.2
Methylmorphine	T40.2
Morfin	T40.2
Morphine	T40.2
Nicomorphine	T40.2
Opioid NEC	T40.2
Oxycodone	T40.2
Oxymorphone	T40.2
Amidone	T40.3
Methadone	T40.3
Alfentanil	T40.4
Alphaprodine	T40.4
Anileridine	T40.4
Bezitramide	T40.4
Buprenorphine	T40.4
Butorphanol	T40.4
Dextromoramide	T40.4
Dextropropoxyphene	T40.4
Dipipanone	T40.4
Eptazocine	T40.4
Ethoheptazine	T40.4
Fentanyl	T40.4
Isonipecaïne	T40.4
Ketobemidone	T40.4
Levopropoxyphene	T40.4
Levorphanol	T40.4
Meperidine	T40.4
Nalbuphine	T40.4
Narcotic NEC — Synthetic NEC	T40.4
Pentazocine	T40.4
Pethidine	T40.4
Phenazocine	T40.4
Phenoperidine	T40.4
Piritramide	T40.4

Drug name	ICD-10-CA code
Profadol	T40.4
Propoxyphene	T40.4
Sufentanil	T40.4
Tilidine	T40.4
Tramadol	T40.4
Analgesic NEC — Narcotic NEC	T40.6
Analgesic NEC — Narcotic NEC — Combination	T40.6
Analgesic NEC — Narcotic NEC — Obstetric	T40.6
Narcotic NEC	T40.6
Opiate NEC	T40.6

Note

NEC: Not elsewhere classified.

Codes with a prefix of Q indicating a suspected diagnosis were excluded to limit our analysis to confirmed cases. For analyses regarding reason of opioid poisoning, cases were categorized using the ICD-10-CA external cause codes X42 (accidental), X62 (intentional self-poisoning), Y12 (unknown) and Y45.0 (therapeutic).

To determine significant opioid poisoning hospitalizations (i.e., cases in which opioid poisoning was considered influential to the time spent and treatment received by the patient while in hospital), the following diagnosis types were selected:

- (M) = Most responsible diagnosis (MRDx)
- (1) = Pre-admit comorbidity
- (2) = Post-admit comorbidity
- (W), (X), (Y) = Service transfer diagnosis
- (6) = Proxy MRDx
- (C) = CIHI-assigned value for Quebec

Co-occurring opioid poisoning hospitalizations due to non-opioid drugs were determined by the presence of ICD-10-CA codes in the range T36 to T51 (excluding T40.0, T40.1, T40.2, T40.3, T40.4 and T40.6) during the same hospital stay.

Appendix B: Text alternative for image

Data table for Figure 2: Age-adjusted rates of hospitalization due to opioid poisoning per 100,000 population by province/territories, Canada, 2014–2015

Measure	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Territories*	Canada
Age-adjusted rate per 100,000 population, 2014–2015	12.4	14.3	11.4	14.0	9.7	11.9	10.8	20.5	18.6	19.1	16.7	13.4
Absolute rate difference, 2007–2008 to 2014–2015	5.6	-1.3	3.8	5.5	1.8	2.1	0.4	5.4	6.4	4.0	-1.1	3.0

Notes

* Yukon, the Northwest Territories and Nunavut are grouped together and reported as “Territories” due to low volumes. The direct standardization process was used with the 2011 Canadian population as the reference year.

Source

Hospital Morbidity Database, Canadian Institute for Health Information.

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