



# Pan-Canadian Trends in the Prescribing of Opioids, 2012 to 2016



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# Table of contents

Acknowledgements .....	4
Key findings .....	5
Introduction .....	6
Analysis .....	7
Pan-Canadian and provincial opioid-prescribing trends .....	7
Population-based opioid prescribing trends .....	14
Conclusion .....	19
Appendix A: Data sources .....	20
QuintilesIMS CompuScript .....	20
National Prescription Drug Utilization Information System .....	20
Appendix B: Methods .....	21
Definitions and terminology .....	22
Limitations .....	23
Appendix C: ATC codes and defined daily doses used in analysis .....	24
Appendix D: Text alternative for figures .....	26
References .....	30

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Please note that the analyses and conclusions in this document do not necessarily reflect those of the individuals or organizations mentioned above.

## Key findings

**The overall quantity of opioids dispensed in Canada, as measured by the number of defined daily doses (DDDs), declined between 2012 and 2016 despite a steady increase in the number of prescriptions.**

- 226 million DDDs of prescription opioids were dispensed in 2016, compared with 238 million DDDs in 2012. The population-adjusted decline in DDDs over these 5 years was 9%, from 6,858 DDDs per 1,000 population in 2012 to 6,246 DDDs per 1,000 population in 2016. More than half of this decline occurred between 2015 and 2016.
- 21.5 million prescriptions for opioids were dispensed in 2016, compared with 20.2 million in 2012. The population-adjusted growth in opioid prescriptions over the 5-year period was just more than 2%, from 582 opioid prescriptions per 1,000 population to 595 per 1,000 population.
- British Columbia and Quebec had the lowest DDDs per 1,000 population in 2016, at 5,496 and 3,601, respectively, while Alberta and Newfoundland and Labrador had the highest DDDs per 1,000 population, at 7,955 and 7,878, respectively.

**The number of people prescribed an opioid per 1,000 population steadily declined between 2011–2012 and 2015–2016, despite an increase in the total number of prescriptions during this period.**

- Using population-based data from 3 provinces, the rate decreased from 132 people prescribed an opioid per 1,000 population to 125 people per 1,000 population.
- Seniors age 65 and older were prescribed opioids most often, with more than 200 per 1,000 population receiving a prescription for an opioid. Youth age 15 to 24 were prescribed opioids less frequently (88 persons per 1,000 population).

**The proportion of people prescribed strong opioids, opioids chronically and strong opioids chronically — all of which increase the risk of substance abuse — remained steady over the 5 years.**

- 25% of people prescribed an opioid were prescribed a strong opioid. 17% were prescribed an opioid chronically and, of these, 8% (about 1 in 12 people) were prescribed a strong opioid on a chronic basis.
- Seniors, who are at a greater risk for opioid-related harms, were prescribed strong opioids chronically most often — about 1 in 8 seniors prescribed an opioid were prescribed a strong opioid on a chronic basis.

## Introduction

Opioids are psychoactive substances that influence one's perception of pain and can induce a sense of euphoria. Opioids such as codeine, oxycodone and fentanyl are typically prescribed to treat pain, although some opioids (such as methadone) are also prescribed to treat opioid dependence.<sup>1</sup>

Canada is the second-largest per capita consumer of opioids in the world, behind only the United States.<sup>2</sup> Between 2006 and 2011, the dispensing rate for high-dose formulations of morphine, hydromorphone, oxycodone and fentanyl increased by 23% in Canada.<sup>3</sup> A 2015 Health Canada survey found that more than 1 in 8 Canadians age 15 and older had taken an opioid in the previous year,<sup>4</sup> while a Health Quality Ontario study found that 1 in 7 Ontarians had filled a prescription for an opioid in 2015–2016.<sup>5</sup>

While opioids have proven effective in the treatment of moderate to severe acute pain (such as post-surgery)<sup>6</sup> and in the treatment of cancer pain, there is much debate regarding their effectiveness in the treatment of chronic pain for non-cancer patients.<sup>7,8</sup> Opioid use can lead to dependence or addiction, particularly when the medication is used more frequently, in higher doses or for longer than prescribed.<sup>9</sup> Several studies have identified an association between the dispensing of opioids and opioid-related adverse events, particularly when opioids are combined with other substances such as alcohol or benzodiazepines.<sup>9–11</sup> For instance, Fischer and colleagues found strong correlations between opioid dispensing levels and both treatment admissions and opioid-related mortality.<sup>12</sup>

Canada is in the midst of a worsening opioid crisis. In June 2017, the Public Health Agency of Canada reported 2,458 apparent opioid-related deaths for 2016 (excluding Quebec). The ongoing monitoring of opioid harms and consumption trends is critical to supporting urgent public health surveillance needs and to measuring the impact and outcomes of policy and other interventions being used to address the crisis.

“... my doctor prescribed me 4 Percocet\* a day to try to manage the pain. The Percocet worked minimally at the beginning, and within 6 months I was up to 6 a day but the pain was still constant and interfering with my everyday life ... I needed more and more just to function, and I ended up taking 260 to 300 mg of OxyContin a day. It was like my body grew quickly immune to each new dose ... I ended up turning to street methadone just to be able to predict a capacity in days. With the methadone, I would have 48 hours of promised ability — but that too was costly and a very dodgy business.” — Susan, age 55

\* 1 Percocet contains 5 mg of oxycodone.

CIHI is helping to address the crisis by improving the quality and comparability of opioid harm and consumption data. In Health Canada's Joint Statement of Action to Address the Opioid Crisis, CIHI committed to publicly reporting 5 key metrics. The first 2, hospitalizations and emergency department visits due to opioid poisonings, were initially reported in November 2016 and updated in a September 2017 release. CIHI also collaborated with the chief coroners and medical examiners, the Public Health Agency of Canada and Health Canada to establish a common definition of an opioid-related death. This definition is being used to support the collection and public reporting of pan-Canadian data on opioid-related deaths, which began in June 2017.

The following analysis uses community-based prescription data to report on 2 more key metrics — the number of people receiving opioid prescriptions and the quantity of opioids prescribed in Canada (as measured by defined daily doses, or DDDs) — over the 5-year period 2012 to 2016. The information is intended for federal, provincial and territorial policy-makers, public health officials, health care professionals and other audiences interested in understanding recent trends in opioid prescribing.

## Analysis

This analysis used 2 types of data from 2 sources: aggregate dispensed prescriptions data (CompuScript) purchased from QuintilesIMS and record-level drug claims data from CIHI's National Prescription Drug Utilization Information System (NPDUIS). For more information about these data sources, see Appendix A; methods and terminology used in this report can be found in Appendix B.

## Pan-Canadian and provincial opioid-prescribing trends

This section uses QuintilesIMS CompuScript data to describe pan-Canadian and provincial opioid-prescribing trends between 2012 and 2016. 2 metrics are presented: the number of opioid prescriptions dispensed; and the quantity of opioids prescribed (as measured by the number of DDDs — the average daily maintenance dose for an opioid in adults). The first metric focuses on how frequently opioids are prescribed, while the second metric focuses on the amount of opioids prescribed. The following questions are addressed in this section:

- How is opioid prescribing changing?
- What are the most frequently prescribed opioids?
- How does opioid prescribing vary among provinces?

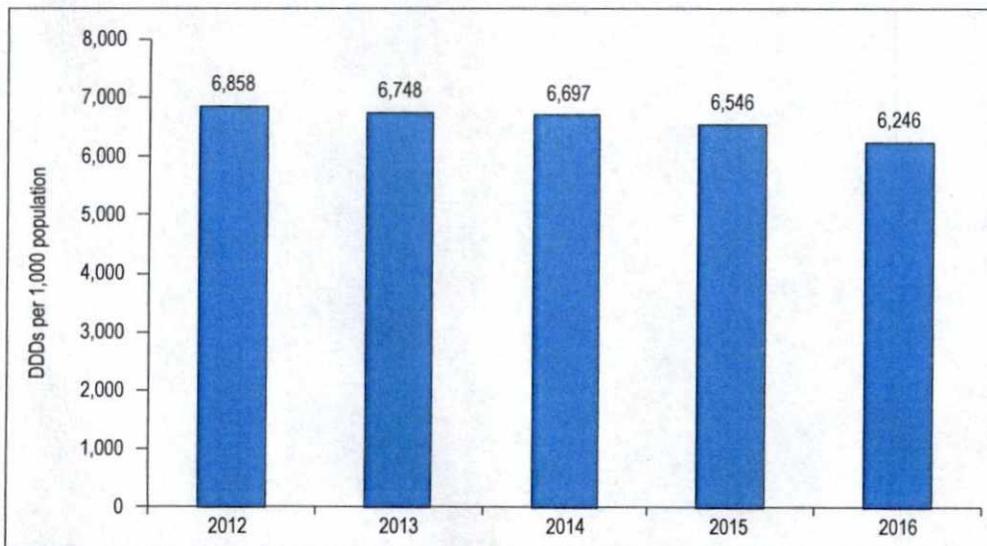
## How is opioid prescribing changing?

In 2016, 21.5 million prescriptions for opioids were dispensed from community pharmacies — an increase of 6.8% from the 20.2 million prescriptions dispensed in 2012. When adjusted for population growth, the increase is just more than 2%, from 582 opioid prescriptions per 1,000 population to 595 per 1,000 population.

During the same time period, the total number of DDDs of opioids dispensed declined by 4.9%, from 238 million in 2012 to 226 million in 2016. In 2012, an opioid prescription included an average of 11.8 DDDs; by 2016, that figure had decreased to 10.5 DDDs per prescription. The net effect of smaller quantities per prescription was fewer opioids dispensed overall, despite a steady increase in the number of prescriptions.

When adjusted for population growth, the rate of DDDs per 1,000 population decreased by 8.9% during the 5-year study period: from 6,858 DDDs per 1,000 population in 2012 to 6,246 DDDs per 1,000 population in 2016 (Figure 1). More than half of this decline occurred between 2015 and 2016, when the rate decreased by 4.6%.

**Figure 1** Defined daily doses per 1,000 population for prescription opioids, Canada,\* 2012 to 2016



**Notes**

\* Excludes the territories.

DDDs: Defined daily doses.

Excludes injectable and rectal dosage forms, as use in community pharmacy settings is relatively infrequent and the quantity is not always reported accurately.

Crude data by province and year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

**Source**

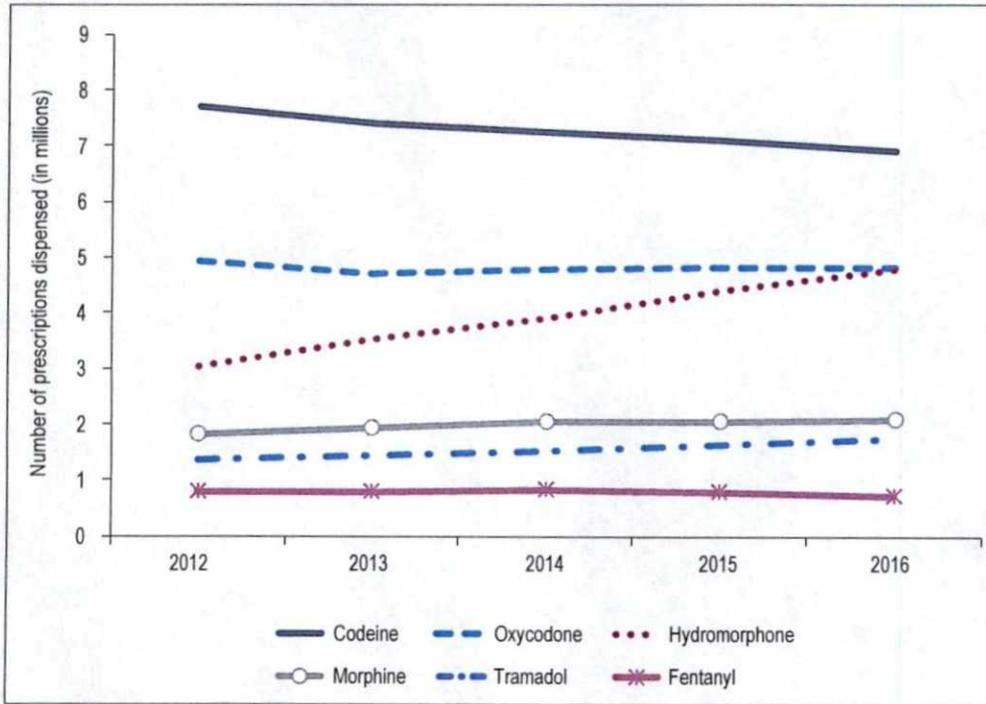
CompuScript, QuintilesIMS Canada Inc.

## What are the most frequently prescribed opioids?

6 opioids accounted for more than 96% of all opioid prescriptions between 2012 and 2016: codeine, oxycodone, hydromorphone, morphine, tramadol and fentanyl (Figure 2). 4 of these 6 are considered strong opioids (oxycodone, hydromorphone, morphine and fentanyl), and are usually prescribed for moderate to severe pain.

The proportion of all opioid prescriptions that were for strong opioids rose during the study period, from 52.2% in 2012 to 57.3% in 2016. Although this shift is modest, it is of potential concern given the increased risk of substance abuse associated with the use of strong opioids.<sup>13</sup>

**Figure 2** Number of prescriptions for the 6 most frequently prescribed opioids, Canada,\* 2012 to 2016



**Notes**

\* Excludes the territories.

Crude data by province and year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

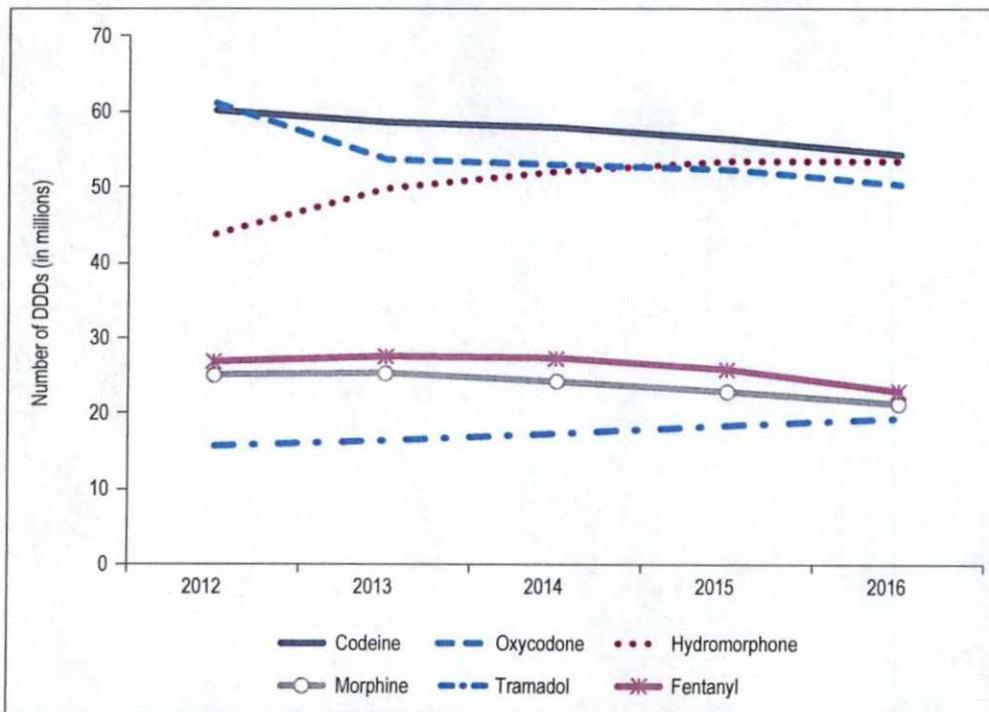
**Source**

CompuScript, QuintilesIMS Canada Inc.

Although much attention has focused on fentanyl and the harms attributed to its use and misuse, it is much less frequently prescribed than other strong opioids. In 2016, there was 1 fentanyl prescription for every 16 prescriptions of the other strong opioids. Since 2012, the number of prescriptions for strong opioids (other than fentanyl) has increased more than 19%, while the number of fentanyl prescriptions has decreased by almost 7%.

The previous section described the decline in overall quantities of opioids dispensed, due to smaller quantities in an average prescription. This trend holds true for strong opioids as well; there was a reduction in the overall quantities dispensed between 2012 and 2016, from 156 million DDDs to 148 million — a decrease of approximately 5% (Figure 3).

**Figure 3** Top 6 opioids by defined daily doses dispensed per year, Canada,\* 2012 to 2016



**Notes**

\* Excludes the territories.

DDD: Defined daily doses.

Excludes injectable and rectal dosage forms, as use in community pharmacy settings is relatively infrequent and the quantity is not always reported accurately.

Crude data by province and year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

**Source**

CompuScript, QuintilesIMS Canada Inc.

The most notable trend among the strong opioids was the shift between hydromorphone and oxycodone DDDs between 2012 and 2016: hydromorphone DDDs increased by 21.8% while oxycodone DDDs decreased by 17.5%. It is likely that regulatory and formulary changes contributed to these trends.

The decline in dispensing of oxycodone began in February 2012 when OxyContin was discontinued and coverage of the replacement product, OxyNEO, was restricted in provincial public drug benefit plans.<sup>14</sup> The rise in hydromorphone dispensing during the study period may indicate that it was one of the opioids being used as a substitute for oxycodone.<sup>15, 16</sup> This trend was observed by Fischer et al. where "prescribing of strong opioids overall decreased [between 2010 and 2013], mainly related to substantive dispensing reductions of oxycodone formulations but partly offset by increases in hydromorphone."<sup>17</sup>

Among all opioid prescriptions, the proportion that were for weak opioids decreased from 47.8% in 2012 to 42.7% in 2016. The most notable trend among the weak opioids was the significant increase in tramadol prescriptions and DDDs (30% and 23%, respectively). This may be due in part to a shift away from using codeine, evidenced by a decline in prescriptions and DDDs (10% and 9.7%, respectively).

Although codeine and tramadol are less potent than strong opioids, the misuse of codeine has been identified as an area of concern.<sup>18, 19</sup> In addition, the United States Substance Abuse and Mental Health Services Administration released a report stating that "the number of emergency department visits involving tramadol abuse or misuse increased approximately 250 percent from 2005 to 2011."<sup>20</sup>

Tramadol was first marketed in Canada in 2005 as a non-narcotic medication in low-dose combination with acetaminophen. Tramadol continues to be marketed as a non-narcotic despite Health Canada recognizing, in 2007, that "it is reasonable to foresee that higher dose formulations of tramadol may be abused or misused in the future."<sup>21</sup>

## How does opioid prescribing vary among provinces?

Figure 4 compares the dispensing of the top 6 opioids among the provinces in 2016 using DDDs per 1,000 population, as well as the changes among the provinces between 2015 and 2016.

British Columbia and Quebec had the lowest DDDs per 1,000 population, at 5,496 and 3,601, respectively, while Alberta and Newfoundland and Labrador had the highest DDDs per 1,000 population, at 7,955 and 7,878, respectively.

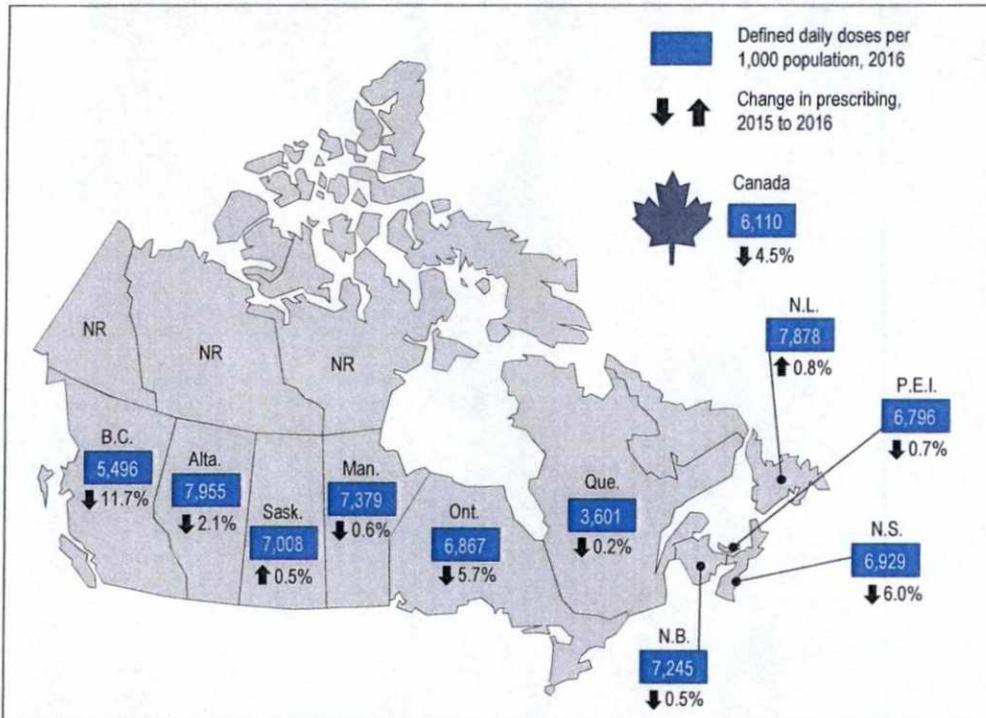
An examination of Quebec data revealed 2 interesting trends:

Quebec had, on average, about half as many DDDs dispensed per prescription than other provinces. However, when looking at numbers of prescriptions (claims dispensed), there were no significant differences compared with other provinces. The prescribing of smaller quantities per prescription does not appear to be related to a policy or guideline, and while the relationship with hospitalization was not studied, Fischer and colleagues, as noted earlier, have found strong correlations between opioid dispensing and opioid-related mortality.<sup>12</sup>

Recently released data from CIHI shows that Quebec also had the lowest rate for opioid-related hospitalizations.<sup>22</sup> Understanding the relationship between opioid prescribing and harms such as hospitalizations in Quebec could have valuable implications for best practices in the future.

Looking at the changes in DDDs per 1,000 population between 2015 and 2016 within provinces also showed variability. As Figure 4 shows, the largest decreases were seen in British Columbia and Nova Scotia (at -11.78% and -6%, respectively), while small increases were observed in Newfoundland and Labrador and Saskatchewan (at 0.8% and 0.5%, respectively). The U.S. Centers for Disease Control and Prevention issued new opioid prescribing guidelines in March 2016.<sup>23</sup> Shortly thereafter, those guidelines were endorsed by the College of Physicians and Surgeons of both British Columbia and Nova Scotia.<sup>24, 25</sup>

**Figure 4** Defined daily doses per 1,000 population for top 6 opioids, 2016, and percentage change from 2015 to 2016, Canada



**Notes**

NR: Not reported.

Excludes injectable and rectal dosage forms, as use in community pharmacy settings is relatively infrequent and the quantity is not always reported accurately.

Crude data by province and year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

**Source**

CompuScript, QuintilesIMS Canada Inc.

Other factors that may contribute to provincial variations include differences in the following: prescribing practices; reported rates of chronic pain; provincial regulations; public drug program policies; and the use of prescription drug monitoring programs.

In 2015, the Canadian Centre on Substance Use and Addiction (CCSA) undertook a review of prescription drug monitoring programs (PMPs) to outline the diversity of current practices, in order to assess the evidence for effectiveness and to identify best practices in the literature.<sup>26</sup> PMPs vary not only in design and oversight but also in the range of features and practices employed, including which drugs are monitored, the criteria employed, the interventions used as well as the technology for data collection. As the implementation of technologies progresses across provinces — technologies such as drug information systems, electronic health records and electronic prescribing — PMPs may play an increasingly important role in influencing opioid prescribing.

## Population-based opioid prescribing trends

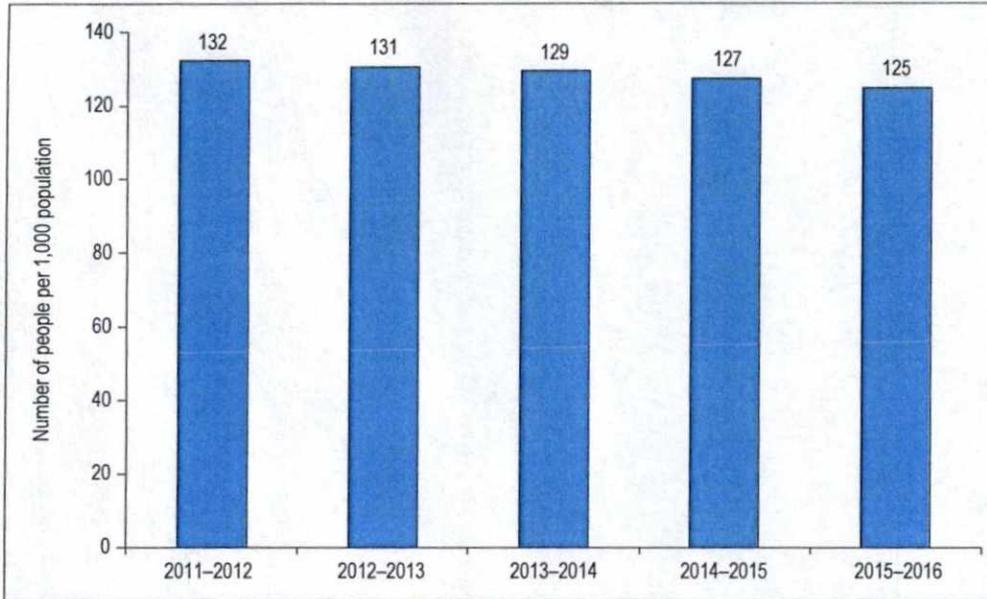
This section uses data from CIHI's National Prescription Drug Utilization Information System (NPDUIS) to analyze opioid prescribing in Manitoba, Saskatchewan and British Columbia, the 3 provinces for which CIHI has population-based claims data. The following questions are addressed:

- How many people are prescribed opioids?
- How does opioid prescribing vary across age groups?
- How many people are prescribed chronic opioids and strong opioids?

### How many people are prescribed opioids?

The number of people prescribed an opioid per 1,000 population steadily declined from 2011–2012 to 2015–2016, despite an increase in the total number of prescriptions during this period. For the provinces included in this analysis, the rate decreased from 132 people prescribed an opioid per 1,000 population to 125 people per 1,000 population (Figure 5). A recent Health Quality Ontario study found that 141 Ontarians per 1,000 population were prescribed an opioid in 2015–2016.<sup>5</sup>

**Figure 5** Number of people prescribed an opioid per 1,000 population, Manitoba, Saskatchewan and British Columbia, 2011–2012 to 2015–2016



**Source**

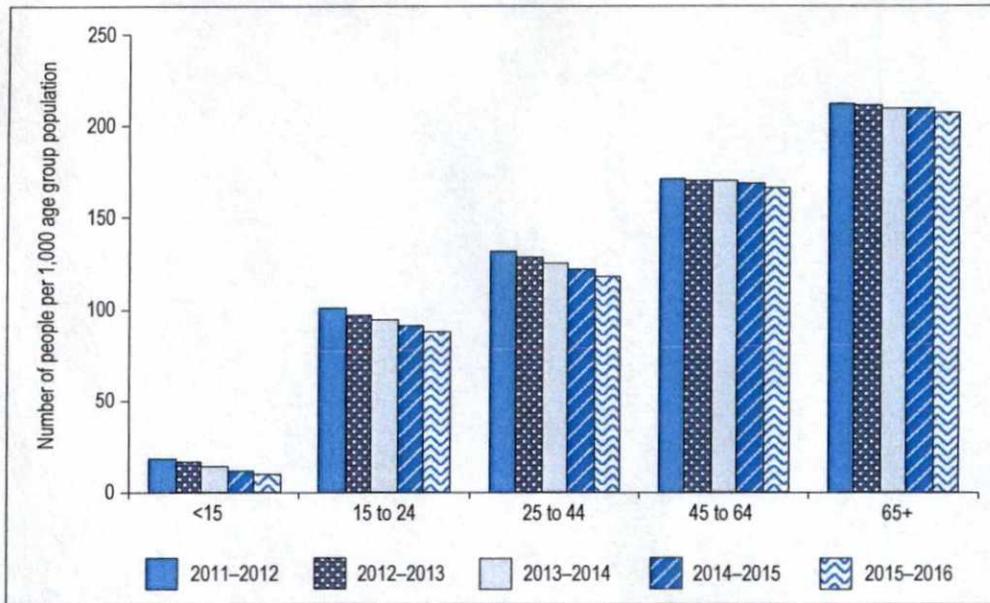
National Prescription Drug Utilization Information System, Canadian Institute for Health Information.

This downward trend is consistent with the aggregate data presented in the previous section showing that fewer DDDs per 1,000 population are being dispensed overall.

## How does opioid prescribing vary across age groups?

Rates of opioid prescribing generally increase with age. Across the study period, seniors age 65 and older consistently had the highest rates of opioid prescriptions. Among this population, more than 200 in 1,000 (or 1 in 5) seniors received a prescription for opioids in 2015–2016 (Figure 6). This pattern is comparable to the finding in a recent Health Quality Ontario report that seniors had the highest rate of receiving opioid prescriptions.<sup>5</sup>

**Figure 6** Rate of people prescribed an opioid per 1,000 age group population, by age group, Manitoba, Saskatchewan and British Columbia, 2011–2012 to 2015–2016



**Note**

Crude data for each year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

**Source**

National Prescription Drug Utilization Information System, Canadian Institute for Health Information.

Recently updated prescribing guidelines in both Canada and the United States underscore the risks of prescribing opioids, particularly for vulnerable populations such as seniors. Seniors are at a greater risk for opioid-related harms due to several factors, including age-related changes in drug absorption and metabolism, and cognitive changes that may increase the risk of accidental drug poisoning.<sup>27–30</sup>

A recent CIHI analysis reported that seniors age 65 and older had the highest rate of hospitalizations resulting from opioid poisoning in 2015–2016.<sup>22</sup> That analysis included poisonings resulting from prescribed opioids, opioids diverted to the streets and illegally produced opioids.

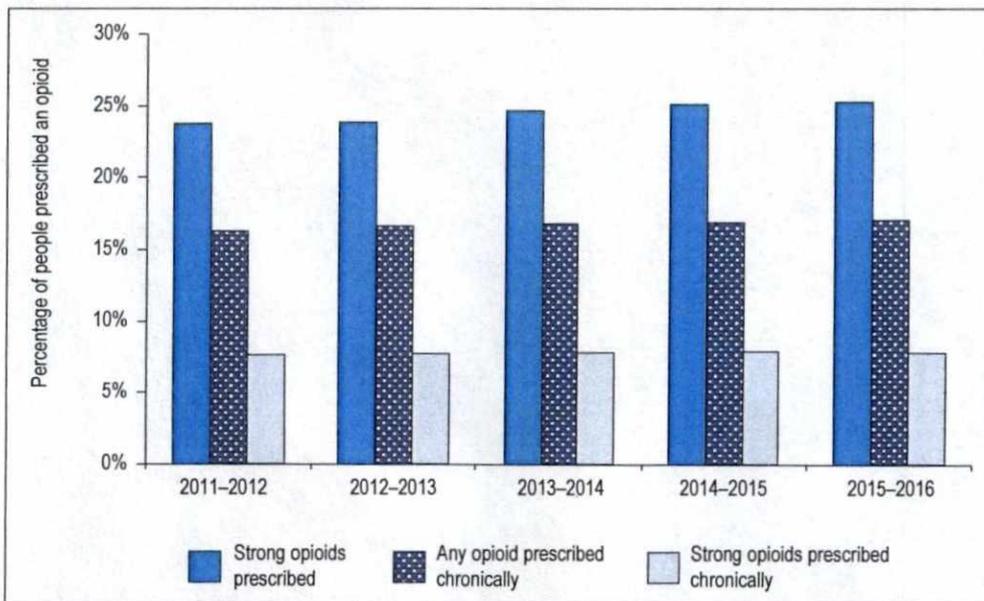
Comparatively fewer youth age 15 to 24 are prescribed opioids (at 87.8 persons per 1,000 population in 2015–2016), yet this age group has the fastest-growing hospitalization rate. Some opioid poisonings experienced by youth are not caused by opioids prescribed to them, but rather are the result of opioids accessed via the illicit marketplace or diverted from the prescriptions of friends or family.<sup>31</sup>

## How many people are prescribed chronic opioids and strong opioids?

Studies have shown that the risk of substance abuse increases with both chronic opioid use<sup>32</sup> and strong opioid use.<sup>13</sup> Treatment protocols and prescribing guidelines stress the importance of balancing effective treatment against these risk factors.

Figure 7 looks at the prescribing of strong opioids in Manitoba, Saskatchewan and British Columbia over the 5-year study period. It shows that the proportion of the population prescribed strong opioids on a chronic basis has remained consistent. In 2015–2016, 25% of the people prescribed an opioid were prescribed a strong prescription opioid while 17% were prescribed an opioid on a chronic basis. Furthermore, almost 8% (about 1 in 12 people) prescribed an opioid were chronically prescribed a strong opioid.

**Figure 7** Proportion of all people prescribed opioids who were prescribed strong\* or chronic opioids, or prescribed strong opioids chronically, Manitoba, Saskatchewan and British Columbia, 2011–2012 to 2015–2016



### Notes

\* Strong opioids refers to oxycodone, hydromorphone, morphine and fentanyl.

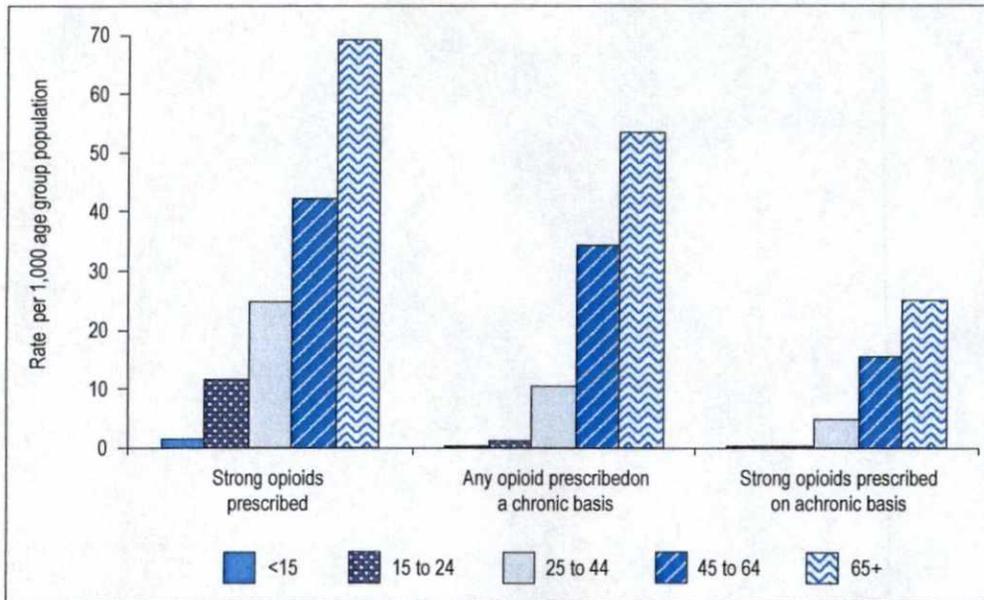
Crude data for each year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

### Source

National Prescription Drug Utilization Information System, Canadian Institute for Health Information.

A further analysis of prescriptions by age group for strong opioids or any opioids on a chronic (or long-term) basis found substantial differences. Looking again at seniors age 65 and older, more than 200 per 1,000 population were prescribed an opioid in 2015–2016. Of these, 69 per 1,000 were prescribed a strong opioid, while 54 per 1,000 were prescribed an opioid on a chronic basis. Most interestingly, 25 seniors per 1,000 population — and 1 in 8 who were prescribed an opioid — were prescribed a strong opioid on a chronic basis. This rate is the equivalent of 1 in 40 seniors age 65+ being at the highest risk for opioid-related misuse and harms<sup>27–30, 33</sup> (Figure 8).

**Figure 8** Rates of persons per 1,000 population prescribed strong\* opioids, and any opioid and strong opioids on a chronic basis, Manitoba, Saskatchewan and British Columbia, 2015–2016



**Note**

\* Strong opioids refers to oxycodone, hydromorphone, morphine and fentanyl.

**Source**

National Prescription Drug Utilization Information System, Canadian Institute for Health Information.

The prescribing of strong opioids is expected (and would likely be considered appropriate) in palliative care settings. In Manitoba and British Columbia, where palliative care drug claims can be identified, only a small proportion of those prescribed a strong opioid could be attributed to palliative care. However, it is noted that some people may be prescribed strong opioids for palliative care independent of the palliative care drug programs.

## Conclusion

Smaller quantities in each prescription — not the number of prescriptions — is resulting in fewer opioids being dispensed in Canada. This trend is observed in almost all provinces, and the rate of decline has quickened with heightened awareness of the risks of chronic opioid use. Prescriptions of shorter duration and fewer doses can create more frequent interactions between prescribers and patients, helping the prescriber to monitor the effectiveness of the treatment regimen and the need to continue therapy.

Fewer Canadians in the 3 provinces studied are being prescribed opioids, although strong opioids represent an increasing proportion of all opioid prescriptions. The decrease in prescribing was present across all age groups, although seniors age 65 and older were still the most likely to be prescribed strong opioids on a chronic basis — the age–prescription type combination most likely to result in opioid-related harms and dependence.

When prescribed appropriately and taken as directed, opioids remain an effective treatment for acute pain relief.<sup>6</sup> The findings of this report highlight the importance of developing pan-Canadian strategies to reduce the harms associated with the use of prescription opioids. The following examples are either being used or considered in many parts of the country:

- Evidence-based prescribing guidelines, such as *The 2017 Canadian Guideline for Opioids for Chronic Non-Cancer Pain*, that emphasize the use of non-pharmacologic treatments, non-opioid treatments, more frequent monitoring of patient response, and patient education;
- The introduction of tamper-resistant<sup>i</sup> prescription opioids;
- Changes to prescription labelling requirements;
- Restricted access to high-strength opioids in public drug programs;
- Changes to access to low-dose, over-the-counter codeine products;
- Improved access to opioid-substitution therapies;
- The use of technology, such as electronic prescribing and drug information systems, to provide real-time information to prescribers at the point of care; and,
- Prescription monitoring programs to help manage the risks associated with opioid prescribing.

i. According to [Health Canada Guidance Document: Tamper-Resistance Formulations of Opioid Drug Products](#), "a tamper-resistant product is formulated or manufactured with measures intended to reduce the likelihood of abuse by different routes of administration . . ."

This report also highlights the importance of, and need for, population-based data to understand the impact of various strategies on the prescribing and chronic use of prescription opioids.

The ongoing monitoring of opioid harms and consumption trends support urgent public health surveillance needs in addressing Canada's opioid crisis. This information is also important for measuring the impact and outcomes of policy and other interventions and strategies being used to address the crisis.

## Appendix A: Data sources

### QuintilesIMS CompuScript

Data pertaining to the dispensing of prescription opioids was obtained from the QuintilesIMS CompuScript database,<sup>ii</sup> which includes Canadian drug-dispensing data projected from a sample of more than 6,000 pharmacies, representing more than 60% of all retail pharmacies in Canada.<sup>34</sup> The data included the following measures:

- Estimated number of prescriptions dispensed by Canadian retail pharmacies;
- Estimated number of units (quantity of drug) dispensed by Canadian retail pharmacies; and
- Estimated dollar value of total prescriptions dispensed from Canadian retail pharmacies (includes dispensing fees and markups).

### National Prescription Drug Utilization Information System

The National Prescription Drug Utilization Information System (NPDUIS) contains prescription claims data submitted by 10 provincial and territorial public drug programs (Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia and Yukon), as well as the First Nations and Inuit Health Branch (FNIHB) federal public drug program. The NPDUIS houses pan-Canadian information related to public program formularies, drug claims, policies and population statistics. It was designed to provide information that supports accurate, timely and comparative analytical and reporting requirements for the establishment of sound pharmaceutical policies and the effective management of Canada's public drug benefit programs.

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ii. Data on pharmaceutical sales was prepared using CompuScript Audit data from IMSight 360, QuintilesIMS Canada Inc. All rights reserved. The statements, findings, conclusions, views and opinions contained and expressed in this publication are those of the Canadian Institute for Health Information and not those of QuintilesIMS Canada Inc. or any of its affiliated or subsidiary entities.

The NPDUIS<sup>35</sup> includes prescription drug claims accepted by public drug programs, either for reimbursement or to be applied toward a deductible. The database also contains claims data from Manitoba and British Columbia that were paid for by non-public drug programs such as private insurance or cash, although the exact source of claim payment was not known.

The NPDUIS does not include information about

- Prescriptions that were written but never dispensed;
- Prescriptions dispensed in hospital for inpatient use;
- Whether the medication was actually taken;
- Prescriptions that were dispensed but for which the associated drug costs were not submitted to or not accepted by the public drug programs (except Manitoba and British Columbia; see above); or
- Diagnoses or conditions for which prescriptions were written.

## Appendix B: Methods

The analysis of opioid prescribing trends for calendar years 2012 to 2016 was conducted using CompuScript data from QuintilesIMS Canada Inc. The analysis of prescription opioid drug claims for fiscal years 2011–2012 to 2015–2016 was conducted using data from CIHI's NPDUIS. In both databases, a drug was included if one of the chemical ingredients was considered an opioid or if the World Health Organization (WHO) Anatomical Therapeutic Chemical (ATC) code was N02A (opioids)<sup>36</sup> (see Appendix C, Table C1).

However, not all drugs and/or dosage forms were included in the analyses:

- Methadone and buprenorphine/naloxone combinations (Suboxone) were excluded from all analyses, as these products are most often used in the treatment of addiction and the focus of this report is opioids for pain.
- Analyses that use drug quantity, such as DDDs, include only those forms intended to be used orally or as transdermal patches. Injectable and rectal dosage forms were excluded, as they are not predominantly administered in community pharmacy settings.

The NPDUIS contains population-based data for Manitoba, Saskatchewan and British Columbia. Data from these provinces was used to analyze opioid prescriptions 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).

## Definitions and terminology

Please note that some of the terms in this analysis may have alternate definitions. The stated definitions are meant only to reflect how these terms were used in the context of this report and are not necessarily the sole definitions of these terms.

**Opioid quantity:** Defined daily dose (DDD) and morphine milligram equivalent (MME) are 2 measures commonly used to express the quantity of opioids dispensed. DDDs reflect both the indication and the potency of an opioid, whereas MMEs reflect only the potency:

- **Defined daily dose** is defined by WHO as “the assumed average maintenance dose per day for a drug used for its main indication in adults.”<sup>36</sup>
- **Morphine milligram equivalent** uses equi-analgesic ratios to convert opioid doses to an equivalent dose of oral morphine.<sup>37</sup> It is typically used for the purpose of switching between different opioids; however, it can also be used to measure the amount of opioids dispensed by converting doses of all opioids to equivalent morphine doses.

For this report, the DDD is used to measure the quantity of opioids prescribed. The total DDDs dispensed for each prescription was calculated by multiplying the total quantity of drug (e.g., tablets) by the strength (e.g., milligram per unit) to obtain the total number of milligrams dispensed. This total was then divided by the opioid-specific DDD from the ATC/WHO index (see Appendix C, Table C2) to calculate the number of DDDs dispensed.

For fentanyl patches, the result was further multiplied by 72 to account for the fact that the strength of the patch reflects the hourly rate of fentanyl release and that each patch lasts for 72 hours.

### Example

The number of DDDs in 30 tablets of oxycodone 20 mg:

$30 \text{ tablets} \times 20 \text{ mg oxycodone per tablet} = 600 \text{ mg of oxycodone}$

$600 \text{ mg of oxycodone} \div 75 \text{ mg oxycodone per DDD (Appendix C, Table C2)} = 8 \text{ DDDs}$

WHO does not provide a DDD for codeine when used for pain; therefore, the International Narcotic Control Board (INCB) standard DDD for codeine of 240 mg per day was used.<sup>2</sup>

When interpreting opioid utilization data, it is important to consider both potency and quantity. Opioids are available in a wide range of potencies, and it's possible to achieve the same therapeutic effect by prescribing either a lower quantity of strong opioids or a higher quantity of weak opioids. Similarly, prescriptions of shorter duration that provide fewer pills may result in more frequent prescriptions but may not change the total amount of opioids dispensed to an individual over time.

**Opioid potency:** The effectiveness or intensity required to treat a type of pain. In other words, mild to moderate pain can usually be treated with “weak opioids” such as codeine or tramadol, whereas more severe to disabling pain may be treated with “strong opioids” such as oxycodone, hydromorphone, morphine or fentanyl.<sup>38–40</sup>

**Prescription opioid use:** One or more claim transactions for a prescribed opioid, in the year of analysis.

**Chronic opioid use:** For this study, “chronic opioid use” is defined as opioids prescribed with a supply of 90 days or longer and 2 or more claims in the year of analysis. This definition aligns with *The 2017 Canadian Guideline for Opioids for Chronic Non-Cancer Pain*, where chronic pain is defined as “a condition that persists for  $\geq 3$  months,”<sup>41</sup> and with published studies that define chronicity as opioid use for greater than 90 days.<sup>32, 42, 43</sup>

## Limitations

There are several limitations to this study that must be noted:

- The QuintilesIMS CompuScript data used for utilization trends is projections based on a sample size of approximately 60% of Canadian community pharmacies across the provinces. Data is not available for the 3 territories. Sampling can result in under- or overestimates of the amount of opioid prescriptions dispensed. However, given the large sample size, the stratified nature and the stringent data quality checks completed on the data, the QuintilesIMS CompuScript data was considered to provide good representation of opioid dispensing in Canada.
- Projections based on sampling will also result in differences from actual figures. For example, the NPDUIS contains comprehensive publicly and privately paid drug claims data for British Columbia, and comparisons with QuintilesIMS CompuScript data found similar trends but different totals. However, to maintain comparability across all provinces, CIHI used the QuintilesIMS data in analyses of utilization trends.

- Not all opioids prescribed are dispensed and not all opioids dispensed are consumed. At present, it is not possible to determine the proportion of opioid prescriptions that are not filled nor the quantity of prescribed medication that is not consumed. It is assumed that fentanyl patches are used for 3 days; however, it is not possible to determine whether a patch is removed earlier than required, thereby decreasing the amount consumed from the patch.
- This study includes only prescription opioids that were acquired through prescription by authorized health care providers and acquired from a community pharmacy, even if some of the opioids become diverted.
- Non-prescription sources of opioids, such as over-the-counter medications or illicit drugs, are not included.

## Appendix C: ATC codes and defined daily doses used in analysis

The following tables contain the information used to identify the drugs for analysis and the defined daily dose calculations.

**Table C1** List of prescription opioids by chemical name and ATC code

Chemical name or class	ATC code
Acetylsalicylic acid, combinations excluding psycholeptics	N02BA51
Acetylsalicylic acid, combinations with psycholeptics	N02BA71
Belladonna	—
Butorphanol	N02AF01
Chlorzoxazone, combinations excluding psycholeptics	M03BB53
Codeine	R05DA04
Codeine and acetylsalicylic acid	N02AJ07
Codeine and ibuprofen	N02AJ08
Codeine and other non-opioid analgesics	N02AJ09
Codeine and paracetamol	N02AJ06
Codeine, combinations excluding psycholeptics	N02AA59
Codeine, combinations with psycholeptics	N02AA79
Dextropropoxyphene	N02AC04
Dihydrocodeine and acetylsalicylic acid	N02AJ02
Dihydrocodeine and paracetamol	N02AJ01

Chemical name or class	ATC code
Fentanyl	N02AB03
Hydrocodone	R05DA03
Hydromorphone	N02AA03
Pethidine or meperidine	N02AB02
Methocarbamol, combinations excluding psycholeptics	M03BA53
Morphine	N02AA01
Nalbuphine (Nalbufine)	N02AF02
Opioids	N02A
Opium derivatives and expectorants	R05FA02
Oxycodone	N02AA05
Oxycodone and acetylsalicylic acid	N02AJ18
Oxycodone and ibuprofen	N02AJ19
Oxycodone and paracetamol	N02AJ17
Oxycodone, combinations	N02AA55
Paracetamol, combinations excluding psycholeptics	N02BE51
Pentazocine	N02AD01
Propoxyphene	N02AC04
Tapentadol	N02AX06
Tramadol	N02AX02
Tramadol and dexketoprofen	N02AJ14
Tramadol and other non-opioid analgesics	N02AJ15
Tramadol and paracetamol	N02AJ13
Tramadol, combinations	N02AX52

**Table C2** WHO defined daily doses (DDDs) for the top 6 opioids<sup>44</sup>

Drug name	DDD
Oxycodone	75 mg
Hydromorphone	20 mg
Fentanyl (sublingual/buccal tablets)	0.6 mg
Fentanyl (transdermal patches)	1.2 mg
Morphine	100 mg
Codeine	240 mg*
Tramadol	300 mg

**Note**

\* The DDD for codeine was based on the INCB standard for analgesia, 240 mg per day.<sup>2</sup>

## Appendix D: Text alternative for figures

### Text alternative for Figure 1: Defined daily doses per 1,000 population for prescription opioids, Canada,\* 2012 to 2016

The number of defined daily doses (DDDs) per 1,000 population for prescription opioids in Canada decreased each year between 2012 and 2016. In 2012, the rate was 6,858 DDDs per 1,000 population; in 2013, it was 6,748; in 2014, it was 6,697; in 2015, it was 6,546; and in 2016, the rate was 6,246 DDDs per 1,000 population.

**Notes**

\* Excludes the territories.

DDDs: Defined daily doses.

Excludes injectable and rectal dosage forms, as use in community pharmacy settings is relatively infrequent and the quantity is not always reported accurately.

Crude data by province and year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

**Source**

CompuScript, QuintilesIMS Canada Inc.

### Text alternative for Figure 2: Number of prescriptions (in millions) for the 6 most frequently prescribed opioids, Canada,\* 2012 to 2016

Prescribed opioid	2012	2013	2014	2015	2016
Codeine	7.7	7.4	7.3	7.1	6.9
Oxycodone	4.9	4.7	4.8	4.8	4.8
Hydromorphone	3.0	3.5	3.9	4.4	4.8
Morphine	1.8	1.9	2.0	2.0	2.1
Tramadol	1.3	1.4	1.5	1.6	1.7
Fentanyl	0.8	0.8	0.8	0.8	0.7

**Notes**

\* Excludes the territories.

Crude data by province and year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

**Source**

CompuScript, QuintilesIMS Canada Inc.

**Text alternative for Figure 3: Top 6 opioids by defined daily doses dispensed (in millions) per year, Canada,\* 2012 to 2016**

Prescribed opioid	2012	2013	2014	2015	2016
Codeine	60.1	58.7	58.0	56.4	54.2
Hydromorphone	43.8	49.7	52.0	53.3	53.3
Oxycodone	61.0	53.7	53.1	52.3	50.4
Fentanyl	26.9	27.6	27.3	25.7	22.8
Morphine	25.1	25.2	24.2	22.7	21.1
Tramadol	15.5	16.3	17.2	18.2	19.1

**Notes**

\* Excludes the territories.

Excludes injectable and rectal dosage forms, as use in community pharmacy settings is relatively infrequent and the quantity is not always reported accurately.

Crude data by province and year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

**Source**

CompuScript, QuintilesIMS Canada Inc.

**Text alternative for Figure 4: Defined daily doses per 1,000 population for top 6 opioids, 2016, and percentage change from 2015 to 2016, Canada\***

Province	Defined daily doses per 1,000 population, 2016	Percentage change from 2015 to 2016
N.L.	7,878	0.8%
P.E.I.	6,796	-0.7%
N.S.	6,929	-6.0%
N.B.	7,245	-0.5%
Que.	3,601	-0.2%
Ont.	6,867	-5.7%
Man.	7,379	-0.6%
Sask.	7,008	0.5%
Alta.	7,955	-2.1%
B.C.	5,496	-11.7%
Canada*	6,110	-4.5%

**Notes**

\* The territories were not reported.

Excludes injectable and rectal dosage forms, as use in community pharmacy settings is relatively infrequent and the quantity is not always reported accurately.

Crude data by province and year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

**Source**

CompuScript, QuintilesIMS Canada Inc.

**Text alternative for Figure 5: Number of people prescribed an opioid per 1,000 population, Manitoba, Saskatchewan and British Columbia, 2011–2012 to 2015–2016**

The number of people prescribed an opioid per 1,000 population in Manitoba, Saskatchewan and British Columbia decreased each year between 2011–2012 and 2015–2016. In 2011–2012, the rate was 132 people per 1,000 population; in 2012–2013, it was 131; in 2013–2014, it was 129; in 2014–2015, it was 127; and in 2015–2016, the rate was 125 people per 1,000 population.

**Source**

National Prescription Drug Utilization Information System, Canadian Institute for Health Information.

**Text alternative for Figure 6: Rate of people prescribed an opioid per 1,000 age group population, by age group, Manitoba, Saskatchewan and British Columbia, 2011–2012 to 2015–2016**

Age group	2011–2012	2012–2013	2013–2014	2014–2015	2015–2016
Younger than 15	18.1	16.9	13.9	11.7	10.2
15 to 24	100.6	96.9	94.2	90.9	87.8
25 to 44	132.0	128.4	125.2	121.8	117.9
45 to 64	171.4	170.8	170.7	168.9	166.3
65+	211.8	211.2	209.4	209.7	206.8

**Note**

Crude data for each year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

**Source**

National Prescription Drug Utilization Information System, Canadian Institute for Health Information.

**Text alternative for Figure 7:** Proportion of all people prescribed opioids who were prescribed strong\* or chronic opioids, or prescribed strong opioids chronically, Manitoba, Saskatchewan and British Columbia, 2011–2012 to 2015–2016

Year	Strong opioids prescribed	Any opioid prescribed chronically	Strong opioids prescribed chronically
2011–2012	23.8%	16.3%	7.6%
2012–2013	23.9%	16.7%	7.7%
2013–2014	24.7%	16.9%	7.8%
2014–2015	25.2%	16.9%	7.9%
2015–2016	25.3%	17.1%	7.8%

**Notes**

\* Strong opioids refers to oxycodone, hydromorphone, morphine and fentanyl.

Crude data for each year is available in the companion Excel file *Pan-Canadian Trends in Prescription Opioid Dispensing: Data Tables*.

**Source**

National Prescription Drug Utilization Information System, Canadian Institute for Health Information.

**Text alternative for Figure 8:** Rates of persons per 1,000 population prescribed strong\* opioids, and prescribed any opioid and strong opioids on a chronic basis, Manitoba, Saskatchewan and British Columbia, 2015–2016

Age group	Strong opioids prescribed	Any opioid prescribed on a chronic basis	Strong opioids prescribed on a chronic basis
Younger than 15	1.6	0.04	0.01
15 to 24	11.7	1.1	0.4
25 to 44	24.9	10.6	4.9
45 to 64	42.2	34.5	15.5
65+	69.3	53.5	25.0

**Note**

\* Strong opioids refers to oxycodone, hydromorphone, morphine and fentanyl.

**Source**

National Prescription Drug Utilization Information System, Canadian Institute for Health Information.

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