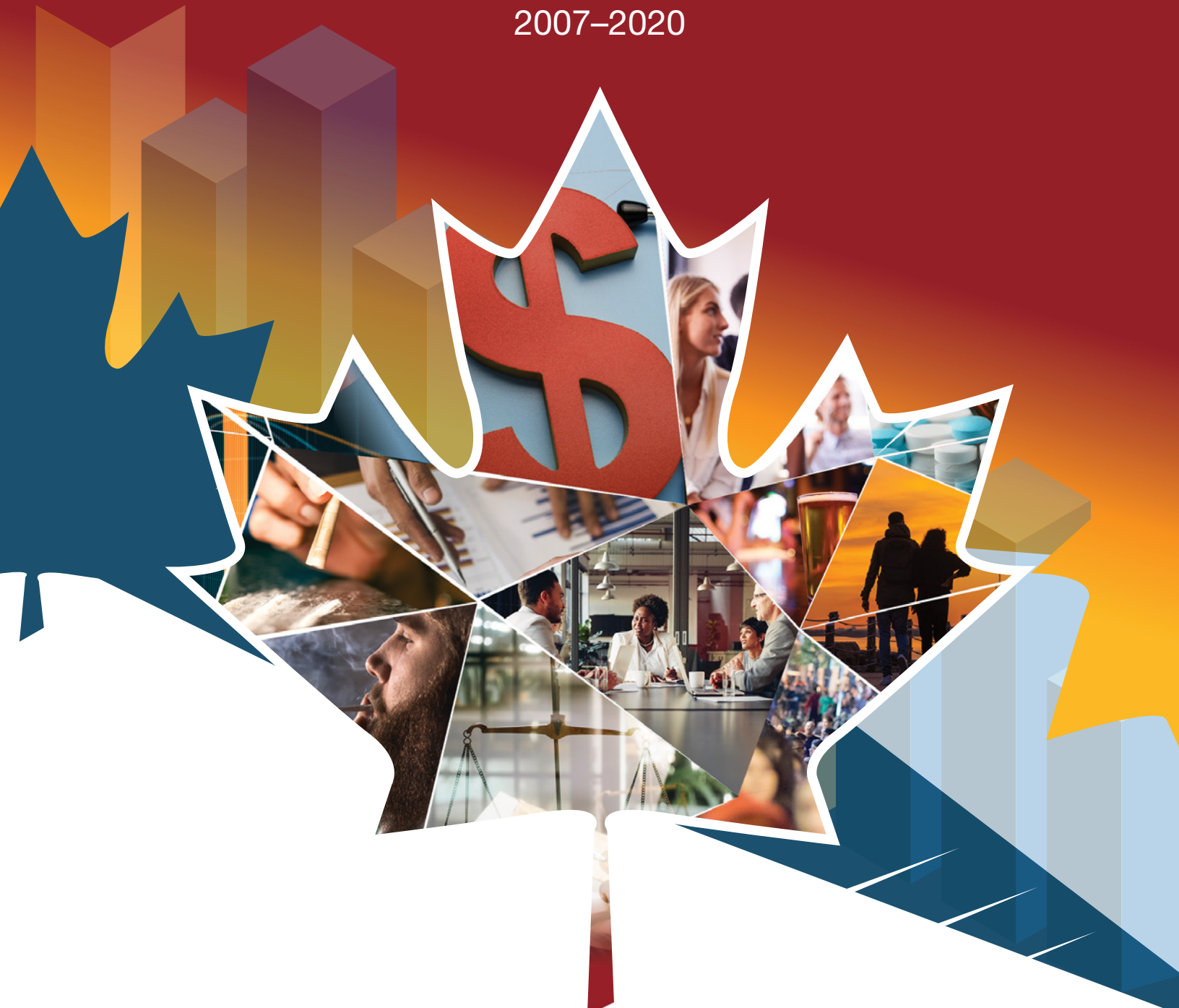


# Canadian Substance Use Costs and Harms

2007–2020



Canadian Centre  
on Substance Use  
and Addiction



University  
of Victoria

Canadian Institute  
for Substance  
Use Research

Institut canadien  
de recherche sur  
l'usage de substances



# CSUCH Canadian Substance Use Costs and Harms

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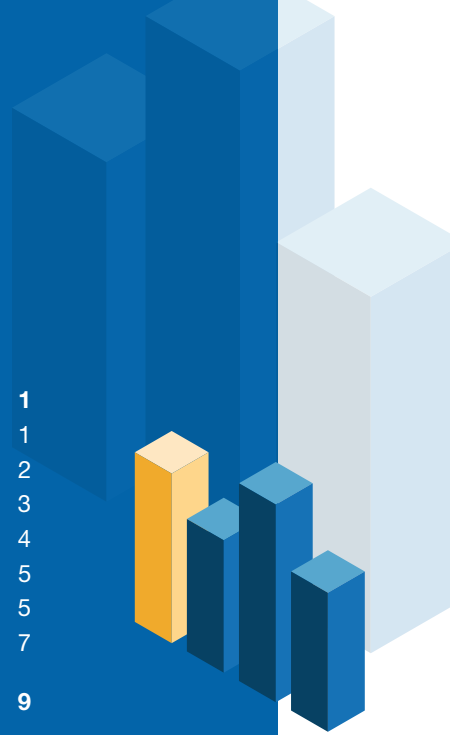
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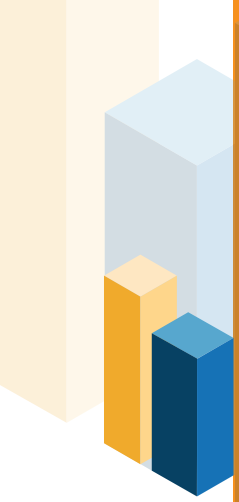
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We extend our gratitude to all past members of the Canadian Substance Use Costs and Harms Scientific Working Group, which has evolved over time. We express our sincere gratitude to Dr. Matthew Young for his critical expertise and insights throughout each iteration of the project.



## Executive Summary

In 2020, we estimate substance use (SU) costs people in Canada more than \$49 billion and led to the loss of over 200 lives every day. The estimates presented in this report demonstrate how the use of different substances affects the health and productivity of people in Canada. The estimates also define a baseline against which to assess the impact of changing levels and patterns of SU, as well as changes to SU policies and societal responses to SU. Impacts include the effects of cannabis legalization, the outcomes of the increasingly toxic unregulated drug supply and the effects of the COVID-19 pandemic on substance use costs and harms.

The ability to track costs and trends in harms uniquely caused by specific types of substances is valuable to governments, researchers, businesses and advocacy groups working to reduce these harms. A better understanding of the societal costs associated with legal and illegal substances can help decision makers prioritize relevant policies and guide resource allocation. The estimates also help to identify gaps in information that require further research. This knowledge may be applied across the continuum of prevention and care, including education, treatment, harm reduction and support services, and enforcement.

This report presents the estimated costs of substance use in Canada from 2007 to 2020. Costs are broken down into the following categories:

- Cost type (i.e., healthcare costs, lost productivity costs, criminal justice costs or other direct costs);
- Substance (i.e., alcohol, tobacco, cannabis, opioids, other central nervous system [CNS] depressants, cocaine, other CNS stimulants or other substances); and
- Jurisdiction (i.e., province or territory).

Our interactive data visualization tool (<https://csuch.ca/explore-the-data/>) presents costs and harms by sex, age group, health condition and offence category for specific cost types where these data were available.

This report is an update to *Canadian Substance Use Costs and Harms 2007–2014* and *Canadian Substance Use Costs and Harms 2015–2017* (Canadian Substance Use Costs and Harms Scientific Working Group, 2018; 2020). Estimates presented in this report incorporate the most recent evidence, up-to-date data sources and reflect numerous enhancements to method. As a result, **these estimates should be considered the most precise to date and should not be compared to those presented in previous reports.**

## Overall Costs of Substance Use



In 2020, over 62% of the total costs of SU were due to alcohol and tobacco. The four substances associated with the largest costs were (in order):

- Alcohol, accounting for \$19.7 billion or 40.1% of the total costs (net of assumed benefits)<sup>1</sup>;
- Tobacco, accounting for \$11.2 billion or 22.7% of the total costs;
- Opioids, accounting for \$7.1 billion or 14.4% of the total costs; and
- Cocaine, accounting for \$4.2 billion or 8.5% of the total costs.

<sup>1</sup> Represents the net cost of alcohol use in which the cost of the assumed benefits of low levels of alcohol consumption for some health conditions are subtracted from total (gross) costs and harms of alcohol use. All costs and harms of alcohol use presented in this report represent net, not gross, estimates.



Between 2007 and 2020, the per-person<sup>2</sup> cost of SU increased 11.8% in real terms from \$1,154 in 2007 to about \$1,291 in 2020.<sup>3</sup> However, the change in per-person costs varied significantly among the substances assessed. The three substances for which per-person costs increased the most between 2007 and 2020 were (in order):

- Central nervous system (CNS) stimulants (including amphetamines such as methamphetamine, but excluding cocaine), the costs of which increased 71.8% from \$46 to \$80;
- Opioids, the costs of which increased 66.4% from \$112 to \$186; and
- Alcohol, the costs of which increased 21.3% from \$427 to \$518.

The per-person cost of cannabis increased 5.2% during this period. Specifically, per-person costs increased 15.8% between 2007 and 2018, and decreased 9.1% between 2018 and 2020 following legalization of its recreational use.

In contrast to these increases, the per-person cost of tobacco use decreased by almost 20% (from \$365 to \$293).

Per-person costs of SU were highest in the territories for each cost category examined. This finding reflects higher rates of alcohol and tobacco use in the territories, and high costs associated with health care and other services for territorial residents.



## Healthcare Costs

Healthcare costs include in-patient hospitalizations, day surgeries, emergency department visits, paramedic services, specialized treatment<sup>4</sup> for SU disorders, physician time and prescription drugs.

In 2020:

- Healthcare costs attributable to SU were \$13.4 billion (27.3% of the total cost of SU) or \$386 per person in Canada.<sup>5</sup>
- Alcohol (\$6.3 billion) and tobacco (\$5.4 billion) contributed about 87% of costs.
- The use of opioids cost the healthcare system the third-highest amount at \$519 million (3.9%).
- Contributing to these costs were 270,695 SU-attributable hospitalizations of which 117,871 (43.5%) were attributable to alcohol use and 116,027 (42.9%) to tobacco use.

<sup>2</sup>Per-person estimates in this report do not include costs associated with in-patient hospitalizations, day surgeries, emergency department visits or paramedic services in Quebec. This likely led to an underestimation of about \$914 million or 1.9% of total costs. The 2020 per-person estimates do not include costs associated with lost productivity due to premature deaths in Yukon, as these data were not available from Statistics Canada's Vital Statistics database at the time of writing this report. This likely led to an underestimation of about \$96 million or 0.2% of total costs. All estimates are likely conservative by about \$1.0 billion or 2.0%.

<sup>3</sup>Throughout this report, costs for all years are presented in 2020 Canadian dollars.

<sup>4</sup>Specialized treatment refers to psychosocial services for substance use only, recognizing that these services are one form of treatment within a larger healthcare system. For details on what this treatment includes, see the technical report.

<sup>5</sup>Only some healthcare-related data were available for Quebec. This per-person healthcare cost does not include the costs or population of Quebec.



Between 2007 and 2020, per-person healthcare costs associated with any SU increased 10.0% from \$321 to \$353.<sup>6</sup> This trend was driven by increases in the costs associated with the following substances (in order):

- CNS stimulants (excluding cocaine), the costs of which increased almost 180% from \$3 to \$9;
- Cannabis, the costs of which increased 88.8% from \$5 to \$10;
- Alcohol, the costs of which increased 40.5% from \$117 to \$165; and
- Opioids, the costs of which costs increased 15.1% from \$12 to \$14.

SU-attributable healthcare costs rose steadily between 2007 and 2020. However, a steep (13.9%) decrease in per-person costs attributable to tobacco use between 2019 and 2020 led to an overall decline in healthcare costs in the first year of the pandemic.



## Lost Productivity Costs

Cost estimates of SU-attributable lost productivity were based on the lost value of work due to premature death, long-term disability and short-term disability (absenteeism and impaired job performance or “presenteeism”).

In 2020:

- Lost productivity costs attributable to SU amounted to \$22.4 billion or \$589 per person.<sup>7</sup>
- Costs associated with the use of alcohol and tobacco were estimated to account for about 60% of all lost productivity costs associated with SU.
- Nearly 74,000 SU-attributable deaths occurred in 2020. This included 24,346 SU-attributable deaths among people younger than 65 years old, which amounts to 345,091 potential years of productive life lost (PYPLL).
- While tobacco (46,366) and alcohol (17,098) use led to more deaths than opioid use (6,491), opioid use was the leading cause of SU-attributable PYPLL because of the relatively young average age of opioid-attributable deaths.

Between 2007 and 2020:

- Overall, per-person lost productivity costs increased by 16.2% from \$507 in 2007 to \$589 in 2020.<sup>8</sup>
- The largest increase in per-person lost productivity costs was associated with opioid use. These costs doubled from \$69 per person in 2007 to \$139 per person in 2020. Per-person lost productivity costs associated with other CNS stimulants increased nearly as much (88.5%) from \$22 to \$41.
- The number of deaths attributable to opioid and other CNS stimulant use more than doubled in this period (opioids: 2,770 to 6,491 deaths; other CNS stimulants: 729 to 1,518 deaths). This was due to large increases in unintentional injury deaths, which consist primarily of poisoning deaths.
- Per-person lost productivity costs attributable to tobacco use declined by 23.7%, from \$181 in 2007 to \$138 in 2020.

<sup>6</sup>Only some healthcare data were available for Quebec. These national per-person trend estimates include the costs and population of Quebec and therefore differ from the \$386 indicated above.

<sup>7</sup>Data on premature mortality were not available for Yukon for the years 2017 to 2020. This per-person lost productivity cost (\$589.40) does not include the costs or population of Yukon.

<sup>8</sup>Data on premature mortality were not available for Yukon for the years 2017 to 2020. These national per-person trend estimates (\$588.70 in 2020) include the costs and population of Yukon and therefore differ slightly from the \$589.40 indicated above.



Overall lost productivity costs declined between 2018 and 2019. This decline may be driven in part by increased investment and expansion of prevention, harm reduction and treatment services. However, lost productivity costs rebounded to their highest level ever during the first year of the pandemic. Per-person lost productivity costs associated with opioids increased more than 30% between 2019 and 2020 alone.



## Criminal Justice Costs

Criminal justice costs include costs associated with policing, courts and correctional services. Our calculations include expenditures for:

- Crimes that were 100% attributable to SU. These refer to impaired driving and drug-related offences that fall under the *Controlled Drugs and Substances Act* or the *Cannabis Act*.
- Crimes that were partially attributable to SU. These refer to violent crimes such as homicide or assault and non-violent crimes such as theft or arson.

In 2020:

- About \$10.0 billion was spent on criminal justice costs associated with SU, which amounts to \$262 for every person in Canada.
- Alcohol use accounted for the greatest costs to the criminal justice system at nearly \$4.0 billion or 39.8% of all criminal justice costs.
- Cocaine use accounted for the second-highest criminal justice costs related to SU (\$2.4 billion or 24.2%).
- Opioid use accounted for the third-highest criminal justice costs related to SU (\$1.1 billion or 11.3%).

The types of offences associated with SU-attributable policing incidents, court charges or correctional admissions varied by substance. In 2020, nearly half of alcohol-attributable costs were related to violent crime. In contrast, around half of the costs attributable to opioids, cocaine and other CNS stimulants were related to non-violent crime. Just over 20% of cannabis-attributable costs were for violations of the *Cannabis Act*, the legislation concerning cannabis production, trafficking and possession violations since 2018.

Between 2007 and 2020, criminal justice costs increased 9.0% from \$241 per person in 2007 to about \$262 per person in 2020. This increase was driven by costs related to opioids (24.1% increase), cocaine (18.6% increase) and other CNS stimulants (52.7% increase). In contrast, alcohol-attributable costs remained unchanged at \$104 per person in both years (0.2% increase).

Criminal justice costs attributable to cannabis decreased 21.4% from \$36 in 2007 to \$28 per person in 2020. Specifically, costs declined 13.5% between the introduction of the *Cannabis Act* in 2018 and 2020 due to fewer incidents, charges and admissions associated with cannabis possession.





## Other Direct Costs

Other direct costs related to SU include costs across several categories, including research and prevention, fire damage, damage to motor vehicles, social assistance for SU-attributable disability and workplace costs not already covered in lost productivity (e.g., employee assistance programs, drug testing programs and administrative costs associated with workers' compensation).

In 2020:

- These other direct costs contributed over \$3.3 billion to the total cost related to SU. This equated to \$87 per person in Canada.
- Alcohol use accounted for 47.3% of other direct costs, followed by tobacco use at 14.2%.
- Over \$1.3 billion was spent on damage to motor vehicles because of collisions related to SU.
- Damage to property due to fires associated with SU amounted to \$897 million.

Between 2007 and 2020, other direct costs increased 1.2% from \$86 per person in 2007 to about \$87 per person in 2020.

## Implications

### ***Alcohol, Tobacco and Cannabis***

Alcohol and tobacco use accounted for at least 60% of the total per-person cost of SU in Canada (roughly \$25 billion to \$30 billion per year) for the past 14 years. However, costs attributable to alcohol use rose more than 21% while those attributable to tobacco use declined the most of any substance examined (nearly 20%). These divergent trends are not surprising. A range of public health policies aimed at reducing tobacco use — including warning labels, increased taxation and advertising restrictions — have been introduced over the past two decades. Similar policies for alcohol do not exist or have remained unchanged for many years. In fact, alcohol consumption and sales increased during the pandemic, and were associated with increased rates of new COVID-19 infections two weeks later (Stockwell et al, 2022). Lessons learned from this whole-of-society response to tobacco could be applied to address the economic and physical availability of alcohol and better inform people in Canada about the health risks of alcohol use.

In the calculation of healthcare and lost productivity harms attributable to alcohol, we employed conservative estimates by assuming some health benefits that appear to be associated with low volume alcohol consumption for some health conditions. Accordingly, estimates of alcohol-attributable costs and harms in this report are net, not gross, estimates. Benefits are not assumed for any other substance, and we note the scientific basis of assumed health benefits from alcohol use are increasingly questioned (Ortolá et al., 2019; World Heart Federation, 2022).

Cannabis accounted for \$2.4 billion or just under 5% of the total cost of SU in 2020. Per-person costs of cannabis use decreased about 9% between 2018 and 2020 following legalization of recreational use, owing to a 13.5% decline in cannabis-attributable criminal justice costs. This compares to a 17% increase in total per-person costs between 2007 and 2018. These findings suggest that legalization led to a slight reduction in costs associated with cannabis use.



### ***Deaths Attributable to Substance Use***

SU was responsible for 73,994 deaths in 2020 — the equivalent of more than 200 lives lost each day. Tobacco use was responsible for nearly two in three lives lost (46,366 in 2020). While alcohol and opioid use led to far fewer deaths (17,098 and 6,491 in 2020, respectively), total lost productivity costs attributable to these substances are within range of tobacco. This is because many people dying from alcohol and opioid use are younger, resulting in more lost years of productive life. In fact, opioid use led to the most lost years of productive life of any substance for the first time in 2020.

### ***Opioids and Stimulants***

Opioid use cost \$7.1 billion in 2020 — the highest of any year examined. Nearly 75% of these costs are related to lost productivity and, more specifically, people dying at a young age from opioid use. More than twice as many people in Canada died of opioid use in 2020 as did in 2007. The acceleration in our estimates of opioid-attributable costs clearly corresponds with the proliferation of fentanyl and a range of harmful substances in the unregulated drug supply (Canadian Community Epidemiology Network on Drug Use [CCENDU], 2013, 2020).

While costs and harms of opioid use were highest in 2020, there were signs of improvement between 2018 and 2019. This may be explained by increased national efforts across the spectrum of harm reduction, treatment and awareness. On the other hand, pandemic-related disruptions to these services coupled with increased toxicity of the drug supply likely contributed to the large rebound in opioid-attributable costs observed in 2020 (CCENDU, 2020b; CCSA, 2020). These findings highlight the importance of investing in and expanding access to a range of services that meet the different needs of people who use opioids. This may include addressing gaps in service for people who smoke opioids, which has become the common method of using opioids in some regions of Canada.

Another key emerging finding is the dramatic rise in harms associated with the use of stimulants. Between 2007 and 2020, per-person costs attributable to other CNS stimulants (excluding cocaine) rose the most of any substance (72%). While this category includes all amphetamine-type stimulants (which we were unable to further separate due to data source limitations), increases in methamphetamine use and harms were likely driving this trend (CCENDU, 2019; CCENDU, 2022). Costs attributable to cocaine use also rose steadily in recent years, reversing a year after year decline in costs observed between 2007 and 2012. Similar to the trend observed in opioid-attributable costs, cocaine-attributable costs fell in 2019 and rose sharply in 2020 with the onset of the COVID-19 pandemic. Increases in stimulant- and opioid-related harms were likely due to the toxic, unregulated drug supply that became even more unpredictable during the pandemic (CCENDU, 2020), and the resulting growth in intentional or unintentional polysubstance use (Payer et al, 2020; Konefal et al., 2022; CCSA, 2022a).



### ***The Pandemic and Substance Use***

Some of the wide-ranging impacts of the COVID-19 pandemic are evident in the most recent year of our estimates. In general, societal responses to the pandemic were associated with increased use of legal and illegal substances as well as increased toxicity of the unregulated drug supply. This resulted in an increase in some related harms associated with many types of SU. However, SU-attributable healthcare costs declined in 2020 for the first time since 2007. This was likely due to shifts in healthcare seeking behaviour and capacity of healthcare services during the pandemic. Looking beyond 2020, we may expect to see increased costs and harms associated with cancer, mental and behavioural disorders, and other SU-attributable health conditions for which early intervention is critical.

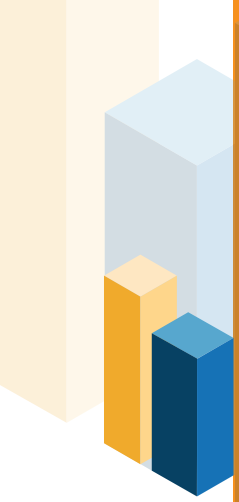
## **Conclusions**

The estimates in this report paint a picture of the current costs and harms associated with SU in Canada, and how these have evolved over the past 14 years with changing levels, patterns and policies related to SU.

Our findings suggest that prioritizing policies aimed at reducing the harms of alcohol use may lead to the most widespread reduction in the harms and economic burden of SU in Canada. Costs of alcohol use have continued to rise alongside deregulatory policies and availability, a trend that escalated during the COVID-19 pandemic (Stockwell et al, 2022). It will also be important to continue monitoring the success of policies related to tobacco — the substance that led to the most lives lost in every year examined — as the prevalence of vaping grows and the evidence on associated long-term health risks due to vaping becomes clearer.

We expect costs and harms attributable to opioid and stimulant use will continue to rise in tandem based on trends observed in recent poisoning data (Special Advisory Committee on the Epidemic of Opioid Overdoses, 2022). Policies and services may be informed by further research exploring individuals' different intentions and preferences for using these substances together. This will ensure harm reduction and treatment services are tailored to the needs of people who use drugs in communities across Canada.

The health, productivity and experiences related to SU of people in Canada can be improved through implementing and expanding evidence-based policies and programs across the spectrum of prevention and care. *Canadian Substance Use Costs and Harms* provides evidence upon which to base such efforts and against which to measure their success.





## Introduction

This report presents estimates of the overall costs of substance use (SU) in Canada. These estimates are based on the most reliable, up-to-date data sources and methods available for the years 2007 to 2020, the most recent year for which comprehensive data were available. This report is intended for policy and decision makers, researchers, businesses and advocacy groups who want to better understand the costs and harms of SU in Canada.

This report is an update to *Canadian Substance Use Costs and Harms 2007–2014* and *Canadian Substance Use Costs and Harms 2015–2017* (Canadian Substance Use Costs and Harms Scientific Working Group, 2018; 2020). As we developed estimates for this report, we further improved our methodology in several ways. For instance, we refined our methods for modelling SU prevalence, better accounted for the cost of different criminal offences, and added two new types of costs and harms.

**As a result, estimates presented in this report should be considered the most precise to date and should not be directly compared to those made in previous Canadian Substance Use Costs and Harms reports or earlier Canadian cost studies.**

The data included in this report are available in our online data visualization tool (<https://csuch.ca/explore-the-data/>). Policy makers, researchers and interested people living in Canada can use the tool to explore the results by province and territory, year, substance, type of harm or cost, sex, age group, health condition and offence category.

As in the previous reports, this report presents estimates of the costs associated with a broad range of substances, including alcohol, tobacco, cannabis, opioids, central nervous system (CNS) depressants such as benzodiazepines and barbiturates (excluding alcohol and opioids),<sup>9</sup> cocaine, CNS stimulants such as amphetamine and methamphetamine (excluding cocaine),<sup>10</sup> and other substances (e.g., hallucinogens, inhalants).

Estimates are also presented by province or territory and cost type (i.e., healthcare, lost productivity, criminal justice and other direct costs). Results are presented in the following order:

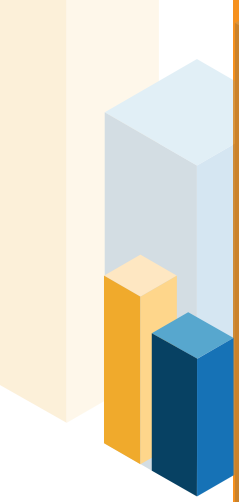
- Overall costs
- Estimates of substance use prevalence
- Healthcare costs
- Lost productivity costs
- Criminal justice costs
- Other direct costs

Detailed methods are provided in the *Canadian Substance Use Costs and Harms: Technical Report*, available upon request (email [csuch@ccsa.ca](mailto:csuch@ccsa.ca)).

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<sup>9</sup> Referred to in this report as other CNS depressants.

<sup>10</sup> Referred to in this report as other CNS stimulants.



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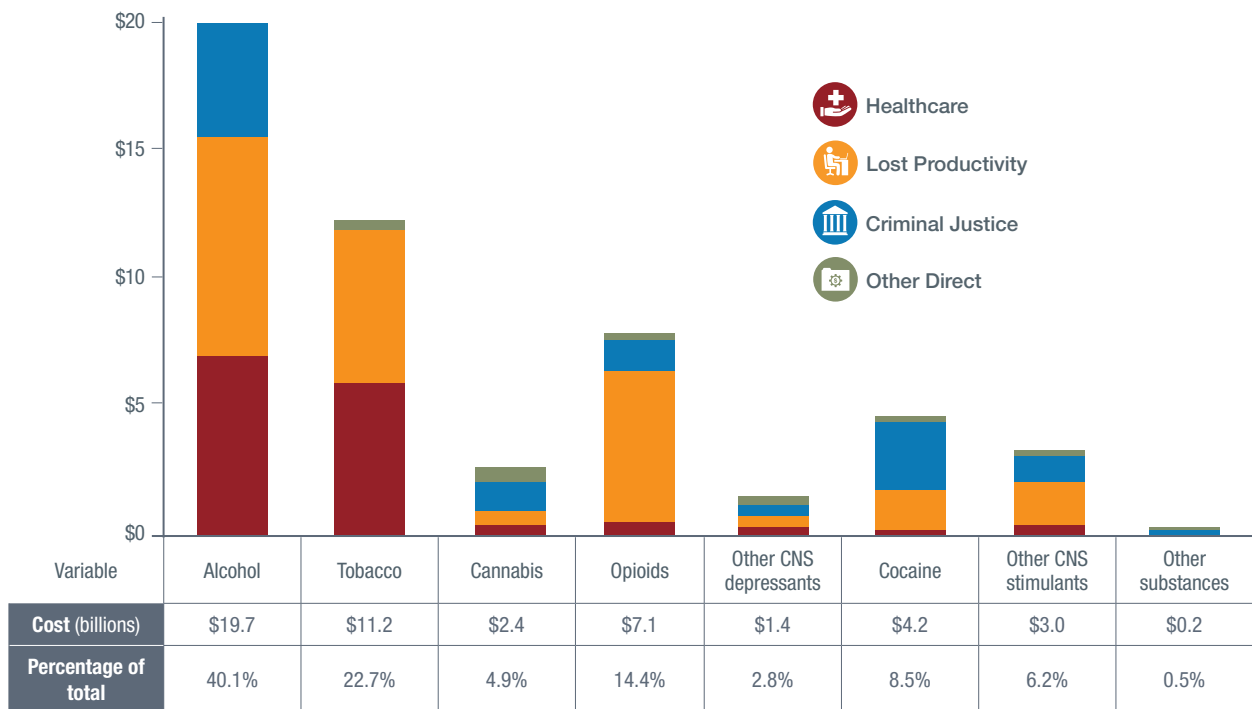
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## Overall Costs of Substance Use in Canada

In 2020, the overall cost of SU in Canada was estimated to be \$49.1 billion.<sup>11</sup> This estimate represents a cost of about \$1,291 per person in Canada. In 2020, two of the legally available<sup>12</sup> and most widely used psychoactive substances — alcohol and tobacco — accounted for about 62.8% of these costs. Alcohol accounted for about \$19.7 billion (40.1%) (net of assumed benefits),<sup>13</sup> tobacco accounted for about \$11.2 billion (22.7%) and all other substances accounted for \$18.2 billion (37.2%) (see Figure 1 and Table 1). Among the other substances studied, opioids accounted for the highest costs (\$7.1 billion), followed by cocaine (\$4.2 billion).

**Figure 1.** Costs (in billions) and percentage of total costs attributable to substance use in Canada by substance and cost type, 2020



**Note:** These estimates do not include costs associated with in-patient hospitalizations, day surgeries, emergency department visits or paramedic services in Quebec, nor costs associated with lost productivity due to premature deaths in Yukon.

<sup>11</sup> This number does not include costs associated with in-patient hospitalizations, day surgeries, emergency department visits or paramedic services in Quebec. A rough calculation based on per-person costs in Ontario across these four cost types indicates that these costs account for about \$914 million or 1.9%. The 2020 estimates do not include costs associated with lost productivity due to premature deaths in Yukon. This led to an underestimation of about \$96 million or 0.2% of total cost based on a similar calculation using Northwest Territories per-person premature death costs. All estimates as well as per-person estimates should be considered conservative by this margin (\$1.0 billion or 2.1% in total).

<sup>12</sup> For the purposes of this report, legal substances refer to substances that were legally available for recreational use during the reporting period (i.e., alcohol, tobacco and cannabis as of 2018). Costs and harms associated with other substances could be linked to legal use (e.g., an individual taking opioid medication as prescribed may still experience harm).

<sup>13</sup> Represents the net cost of alcohol use in which the assumed cost of benefits of low levels of alcohol consumption for some health conditions are subtracted from total (gross) costs and harms of alcohol use. All costs and harms of alcohol use presented in this report represent net, not gross, estimates.



Cost estimates included in this report are broken down into four major cost types:



**Healthcare costs** associated with in-patient hospitalizations, day surgeries, emergency department visits, paramedic services, specialized treatment for SU disorders, physician time and prescription drugs;



**Lost productivity costs** associated with SU-attributable premature deaths, long-term disability and short-term disability (absenteeism and impaired performance on the job, or “presenteeism”);



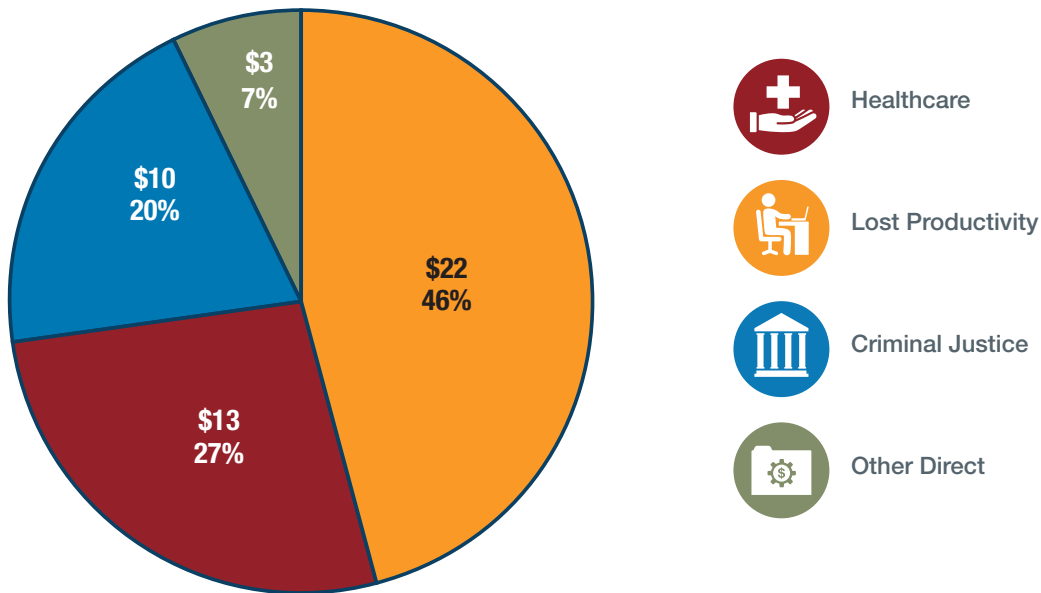
**Criminal justice costs** associated with policing, courts and correctional services attributable to SU, including costs associated with the enforcement of current drug and impaired driving laws, and the proportion of violent and non-violent crimes that would not have occurred without some SU; and



**Other direct costs** are a mixed category that includes costs associated with the federal funding of research and prevention programs, fire damage and motor vehicle damage attributable to SU, drug testing in the workplace, social assistance, employee assistance programs and workers’ compensation.

The costs of SU in Canada in 2020 by cost type are presented in Figure 2 and Table 1. Productivity losses were \$22.4 billion or 45.6% of the total costs, while healthcare costs were \$13.4 billion or 27.3%. The third-highest contributor to the total costs related to SU were criminal justice costs, which were \$10.0 billion or 20.3% of the total. Other direct costs accounted for \$3.3 billion or 6.7%.

**Figure 2.** Overall costs (in billions) and percentage of total overall costs attributable to substance use in Canada by cost type, 2020





**Table 1.** Costs attributable to substance use in Canada (in millions of dollars), 2020

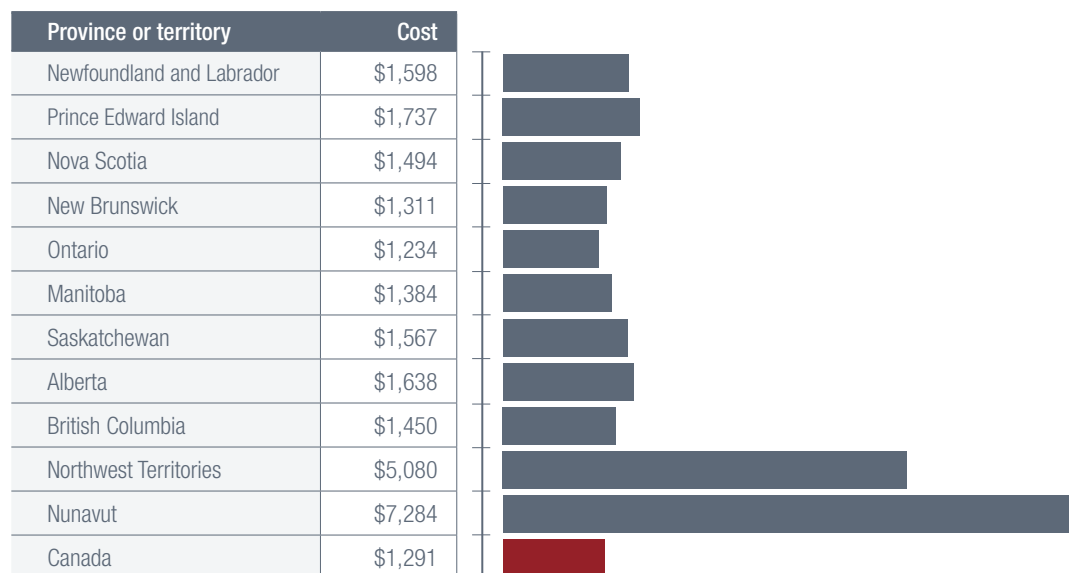
	Alcohol	Tobacco	Cannabis	Opioids	Other CNS Depressants	Cocaine	Other CNS Stimulants	Other Substances	Total
<b>Healthcare costs</b>	<b>6,267.8</b>	<b>5,429.0</b>	<b>380.6</b>	<b>519.0</b>	<b>240.6</b>	<b>184.3</b>	<b>359.1</b>	<b>25.0</b>	<b>13,405.3</b>
Inpatient hospitalizations	1,628.4	1,369.1	58.6	95.1	39.4	36.1	59.9	4.2	3,290.9
Day surgeries	68.1	62.4	0.7	0.3	0.3	0.5	0.4	0.1	132.7
Emergency department visits	235.5	92.9	15.9	28.4	8.9	11.0	19.3	1.7	413.5
Paramedic services	128.8	49.5	7.6	15.6	5.6	5.5	10.2	1.0	223.8
Specialized treatment for SU	454.5	—	46.7	43.8	9.2	18.9	54.0	2.1	629.2
Physician time	1,935.3	1,972.1	123.6	176.0	89.2	59.7	115.0	8.1	4,479.1
Prescription drugs	1,817.2	1,883.0	127.4	159.8	88.0	52.6	100.3	7.8	4,236.1
<b>Lost productivity costs</b>	<b>7,868.9</b>	<b>5,248.7</b>	<b>490.9</b>	<b>5,264.1</b>	<b>489.6</b>	<b>1,413.4</b>	<b>1,542.2</b>	<b>57.2</b>	<b>22,375.0</b>
Premature death	4,641.1	2,612.1	242.6	4,882.0	312.2	1,280.2	1,282.1	40.1	15,292.5
Long-term disability	1,490.6	1,047.2	88.9	157.5	68.2	55.3	107.5	6.4	3,021.7
Short-term disability (absenteeism and presenteeism)	1,737.2	1,589.3	159.4	224.6	109.2	77.8	152.6	10.7	4,060.9
<b>Criminal justice costs</b>	<b>3,969.0</b>	<b>5.5</b>	<b>1,066.8</b>	<b>1,127.3</b>	<b>344.8</b>	<b>2,414.8</b>	<b>928.9</b>	<b>117.3</b>	<b>9,974.4</b>
Policing	2,180.4	—	535.6	611.7	145.2	1,238.6	495.6	57.8	5,264.9
Courts	763.6	—	198.3	206.5	71.7	424.6	182.1	21.6	1,868.5
Correctional services	1,025.0	—	332.9	309.0	127.9	751.6	251.2	37.9	2,835.6
<b>Other direct costs</b>	<b>1,565.4</b>	<b>471.1</b>	<b>443.0</b>	<b>163.2</b>	<b>294.2</b>	<b>149.0</b>	<b>200.5</b>	<b>20.7</b>	<b>3,307.0</b>
Research and prevention	16.5	60.7	7.7	14.6	0.5	0.1	0.4	3.0	103.6
Fire damage	681.7	186.1	29.0	—	—	—	—	—	896.7
Motor vehicle damage	424.1	—	309.8	87.6	223.1	111.8	140.2	12.5	1,309.1
Workplace drug testing	10.4	—	9.9	7.1	6.9	1.1	1.6	0.9	37.8
Employee assistance programs	46.1	—	2.7	2.7	0.5	1.0	4.5	0.1	57.7
Workers' compensation administrative costs	66.1	—	64.8	17.7	48.7	23.0	30.6	2.8	253.8
Social assistance	320.4	224.3	19.0	33.5	14.5	11.9	23.2	1.4	648.3
<b>Total</b>	<b>19,671.1</b>	<b>11,154.3</b>	<b>2,381.3</b>	<b>7,073.7</b>	<b>1,369.3</b>	<b>4,161.4</b>	<b>3,030.6</b>	<b>220.2</b>	<b>49,061.8</b>
<b>Total cost per person (in dollars)</b>	<b>517.6</b>	<b>293.5</b>	<b>62.7</b>	<b>186.1</b>	<b>36.0</b>	<b>109.5</b>	<b>79.7</b>	<b>5.8</b>	<b>1,290.9</b>
<b>Percentage of all costs</b>	<b>40.1%</b>	<b>22.7%</b>	<b>4.9%</b>	<b>14.4%</b>	<b>2.8%</b>	<b>8.5%</b>	<b>6.2%</b>	<b>0.4%</b>	<b>100.0%</b>

**Note:** These estimates do not include costs associated with in-patient hospitalizations, day surgeries, emergency department visits or paramedic services in Quebec. At the time of writing this report, the data on premature deaths in Yukon (2017 to 2020 only) required to calculate costs of potential years of productive life lost were not available from Statistics Canada's Vital Statistics database. Emergency department (ED) visits and physician costs attributable to alcohol are underestimated by roughly 3%, resulting in an underestimation of total healthcare costs attributable to alcohol by about 1%. This is due to an underestimation of the number of cardiovascular and digestive health conditions attributable to alcohol and the resulting costs for ED visits and physician time only. — = Not applicable. CNS = central nervous system.



In 2020, the per-person costs of SU were highest in the territories. This finding reflects higher rates of alcohol and tobacco use in the territories, as well as the higher costs of health care for territorial residents (see Figure 3).

**Figure 3.** Per-person costs attributable to substance use by province and territory, 2020



**Note:** Meaningful per-person costs for Quebec and Yukon could not be calculated. The estimated per-person costs in Canada should be considered an underestimate, as they do not include costs associated with in-patient hospitalizations, day surgeries or emergency department visits in Quebec, nor costs associated with lost productivity due to premature deaths in Yukon.

## Cost Trends from 2007 to 2020

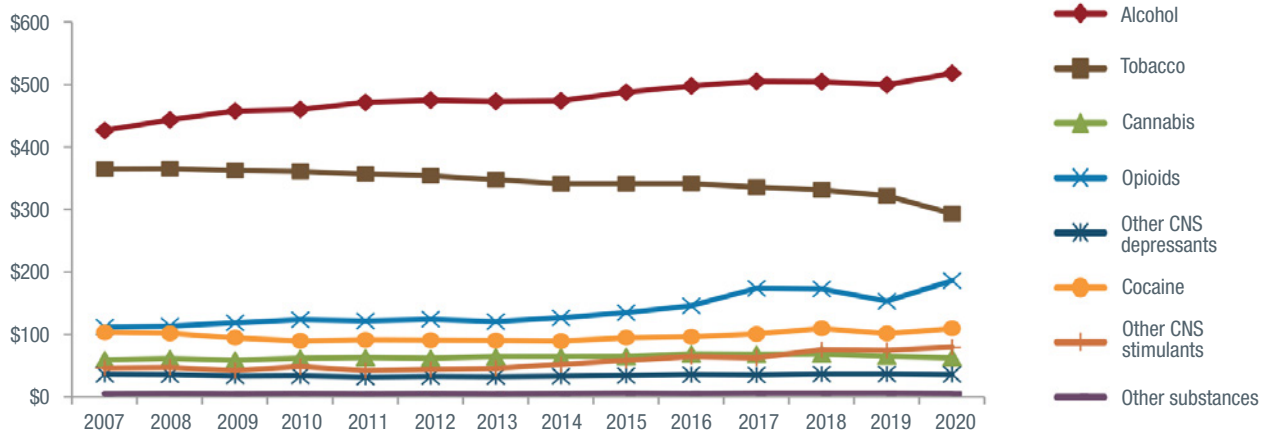
The cost of SU in Canada increased nearly 30% from \$38.0 billion in 2007 to \$49.1 billion in 2020. However, the Canadian population also increased over that time. The per-person costs of SU in Canada increased by 11.8% from \$1,154 per person in 2007 to \$1,291 in 2020 (in 2020 inflation-adjusted Canadian dollars).

From 2007 to 2020, the largest per-person increases in cost were associated with the use of other CNS stimulants, followed by opioids. Costs associated with other CNS stimulants use grew by 71.8% from \$46 to \$80, while costs associated with opioids increased by 66.6% from \$112 to \$186 (see Figure 4).

Of the three substances that were legally available in 2020, the per-person costs associated with alcohol use increased the most (21.3%), from \$427 in 2007 to \$518 in 2020. Per-person costs associated with cannabis use increased 5.2% from \$60 to \$63. In contrast, per-person costs attributable to tobacco use decreased substantially — the only substance category that did so. These costs decreased 19.6% from \$365 per person in 2007 to \$294 per person in 2020. The decline in SU-attributable costs is largely a result of fewer hospitalizations and deaths related to tobacco use.



**Figure 4.** Per-person costs attributable to substance use in Canada by substance, 2007–2020



Healthcare costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Alcohol	427	443	458	460	472	475	473	474	488	497	505	504	500	518
Tobacco	365	365	362	361	357	354	347	341	341	341	336	331	322	293
Cannabis	60	61	59	62	63	62	64	64	65	69	68	69	65	63
Opioids	112	114	119	124	122	124	121	126	135	146	174	173	153	186
Other CNS depressants	36	36	34	34	32	33	33	33	34	36	35	37	37	36
Cocaine	103	102	95	90	92	91	90	90	95	97	101	110	102	109
Other CNS stimulants	46	47	42	49	42	44	46	52	58	64	62	76	75	80
Other substances	5	6	5	6	5	6	5	6	6	6	6	6	6	6

**Note:** These estimates do not include costs associated with inpatient hospitalizations, day surgeries, visits to emergency departments or paramedic services in Quebec, nor costs associated with lost productivity due to premature deaths in Yukon (for 2017 to 2020 only). Therefore, costs are likely 2.1% higher than what is reported here.

## Overview of Methods

The methods we used in this project were based on the approaches applied in other Canadian and international cost studies on SU (e.g., Rehm et al., 2006; Collins & Lapsley, 2008). However, the availability of additional datasets and analytic resources enabled us to significantly improve and refine our methods across numerous key areas. As a result, **the estimates presented in this report should not be directly compared to those made in previous Canadian Substance Use Costs and Harms reports or earlier Canadian cost studies.**

All dollar estimates are presented in 2020 Canadian dollars. The national Consumer Price Index was used to adjust costs from earlier years to 2020 dollars (Statistics Canada, 2022j). Results presented in this report are also presented by calendar year. When data were only available by fiscal year (FY), we converted them into calendar year by allocating 25.0% of the costs and counts to the following year. For example, when converting FY 2019–2020 to calendar years 2019 and 2020, we added 25.0% of FY 2018–2019 to 2019, 25.0% of FY 2019–2020 to 2020, and so on.



Wherever possible, we used current data and data specific to the provinces and territories first to estimate relevant harms from SU that might generate costs. For example, many hospitalizations caused by SU are clearly identified in official diagnostic records (e.g., opioid overdose, SU disorder, alcoholic psychosis). We were able to access individual-level data on the costs of different types of hospitalizations and then combine these data to calculate accurate costs for hospitalizations that were 100% attributable to SU. However, many health conditions and crimes are only partially attributable to SU. Healthcare and crime records cannot always reliably record the contributions of SU and so an indirect **attributable fraction approach** was used to estimate the proportions of health and crime outcomes that could be considered caused by alcohol or other SU.

### The Attributable Fraction Approach

There are some health conditions and crimes that, by definition, can be fully attributed to SU. For example, all hospital stays associated with an International Statistical Classification of Diseases and Related Health Problems (ICD) code of “mental and behavioural disorders attributed to the use of alcohol”<sup>14</sup> are caused by alcohol use. Similarly, all charges associated with a violation of the *Controlled Drugs and Substances Act* for cocaine possession can be fully attributed to cocaine use. However, healthcare and crime records do not always record the contributions of SU.

For example, an association between specific levels of alcohol consumption and colorectal cancer has been established (World Health Organization, 2018). However, not all cases of colorectal cancer are caused by alcohol use. The attributable fraction approach allows us to estimate the number of cases of colorectal cancer in the population that can be attributed to alcohol use. To do so, we assessed the risk of developing a condition (in this case, colorectal cancer) that is associated with various quantities of alcohol consumption and the proportion of people in a population consuming alcohol at those quantities. Using this information, we estimated the proportion of all cases of colorectal cancer attributable to alcohol use. Multiplying this proportion by the total number of colorectal cancer cases allowed us to calculate the number of alcohol-attributable cases of colorectal cancer and the costs associated with treating them. This procedure can then be conducted for all the conditions for which alcohol is causally associated.

The causal associations for all included conditions were based on analyses by the U.S.-based Centers for Disease Control and Prevention (2008) and the World Health Organization (2018). First, we found that there were 39 alcohol-attributable conditions (see Table 2). We then conducted a similar exercise for other substances. A list of substances, as well as the health conditions considered fully and partially attributable, are included in Table 2.

In the calculation of healthcare and lost productivity harms attributable to alcohol, we employed conservative estimates by assuming some health benefits that appear to be associated with low volume alcohol use for some health conditions (e.g., ischaemic heart disease and diabetes mellitus). Accordingly, estimates of alcohol-attributable costs and harms in this report are net, not gross, estimates. Benefits are not assumed for any other substance.

The healthcare and lost productivity estimates were mostly completed using a condition-based, epidemiological attributable fraction approach. In this approach, the proportion of each condition related to SU that would be eliminated in the absence of SU was calculated. These proportions were used to estimate the healthcare and lost productivity costs incurred within a given year.

For more details about the attributable fraction approach and how it was applied in estimating the different costs, see the technical report.

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<sup>14</sup> When patients are discharged from hospitals in Canada, they are assigned a code indicating the main reason for their hospital stay. The coding systems used differ depending on the database. The Discharge Abstract Database and Hospital Morbidity Database use the Canadian enhancement of the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10-CA; Canadian Institute for Health Information [CIHI], n.d.) to code the diagnosis of the hospital stay.

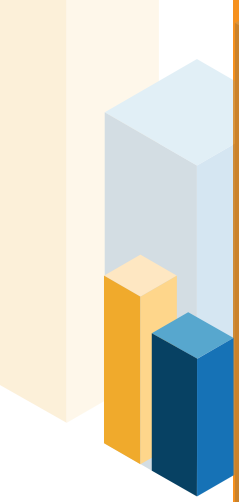


**Table 2.** Health conditions that are wholly (indicated with [W]) and partially attributable to substance use

Health condition category	Alcohol	Tobacco	Cannabis	Cocaine	Other CNS Stimulants	Opioids	Other CNS Depressants	Other Substances
Cancer	Oral cavity and pharynx, esophageal, colorectal, liver, laryngeal, breast	Oral cavity and pharynx, esophageal, colorectal, stomach, colorectal, pancreatic, laryngeal, tracheal, lung, cervical, kidney and renal pelvic, bladder, acute myeloid leukemia	—	—	—	—	—	—
Cardiovascular conditions	Alcoholic cardiomyopathy (W), hypertension, ischemic heart disease, hemorrhagic stroke, ischemic stroke, esophageal varices	Other heart disease, ischemic heart disease, cerebro-vascular disease, other vascular diseases	—	—	—	—	—	—
Communicable diseases	HIV	—	—	Viral hepatitis B, viral hepatitis C, HIV	Viral hepatitis B, viral hepatitis C, HIV	Viral hepatitis B, viral hepatitis C, HIV	—	—
Conditions arising during pregnancy	Complication of pregnancy by maternal use of alcohol (W), fetal alcohol syndrome (W), low birth weight	Prenatal conditions, sudden infant death syndrome	Complications of pregnancy and birth due to maternal use of drugs*	Complications of pregnancy and birth due to maternal use of drugs*	Complications of pregnancy and birth due to maternal use of drugs*	Complications of pregnancy and birth due to maternal use of drugs*	Complications of pregnancy and birth due to maternal use of drugs*	Complications of pregnancy and birth due to maternal use of drugs*
Digestive conditions	Alcoholic gastritis (W), alcohol-induced pancreatitis (W), liver cirrhosis, pancreatitis	—	—	—	—	—	—	—
Endocrine conditions	Alcohol-induced pseudo-Cushing's syndrome (W), Diabetes (Type 2)	Diabetes (Type 2)	—	—	—	—	—	—
Motor vehicle collisions	Motor vehicle collisions	—	Motor vehicle collisions	Motor vehicle collisions	Motor vehicle collisions	Motor vehicle collisions	Motor vehicle collisions	Motor vehicle collisions
Neuropsychiatric conditions	Alcohol use disorders (W), alcoholic polyneuropathy, myopathy and degeneration of nervous system (W), epilepsy	Mental and behavioural disorders due to use of tobacco (W), mental and behavioural disorders due to multiple drug use*	Mental and behavioural disorders due to the use of cannabinoids (W), mental and behavioural disorders due to multiple drug use*	Mental and behavioural disorders due to use of cocaine (W), mental and behavioural disorders due to multiple drug use*	Mental and behavioural disorders due to stimulants and amphetamines (W), mental and behavioural disorders due to multiple drug use*	Mental and behavioural disorders due to use of opioids (W), mental and behavioural disorders due to multiple drug use*	Mental and behavioural disorders due to use of other CNS depressants (W), mental and behavioural disorders due to multiple drug use*	Mental and behavioural disorders due to use of all other psychoactive drugs (W), mental and behavioural disorders due to multiple drug use*
Unintentional injuries	Accidental poisoning by alcohol (W), falls, drowning, fires, other unintentional injuries, accidental poisoning by substances other than alcohol	Accidental poisoning by tobacco or nicotine (W), fires	Accidental poisoning by cannabis (W), fires	Accidental poisoning by cocaine (W)	Accidental poisoning by other stimulants and amphetamines (W)	Accidental poisoning by opioids (W)	Accidental poisoning by all other CNS depressants (W)	Accidental poisoning by all other psychoactive drugs (W)
Intentional injuries	Intentional self-poisoning by alcohol (W), assault/homicide, other intentional self-harm, intentional injuries, intentional self-poisoning by substances other than alcohol	—	Intentional self-poisoning by cannabis (W), assault/homicide	Intentional self-poisoning by cocaine (W), assault/homicide, other intentional self-harm	Intentional self-poisoning by other stimulants and amphetamines (W), other intentional self-harm	Intentional self-poisoning by opioids (W), assault/homicide, other intentional self-harm	Intentional self-poisoning by other CNS depressants (W), assault/homicide	Intentional self-poisoning by all other psychoactive drugs (W), assault/homicide
Respiratory conditions	Tuberculosis, lower respiratory tract infections	Pneumonia, influenza and tuberculosis, chronic obstructive pulmonary disease	—	—	—	—	—	—

**Note:** Most conditions listed here have a corresponding ICD-10-CA code. These codes are used to calculate costs associated with hospitalizations, deaths and other healthcare costs and harms related to SU. — = No health conditions attributable to substance.

\*Conditions that are 100% attributable to all drugs (excluding alcohol and tobacco).





## Substance Use Prevalence Estimates

Most of the methods we used to calculate the estimates in this report required estimates of the prevalence of SU in Canada by province or territory, age, sex, year and type of substance. We drew upon multiple national, provincial and territorial surveys that included questions on SU (see Table 3). Some of the required data elements had either insufficient or missing data. Fortunately, we were able to find predictable trends by province or territory, age, sex, year and type of substance within the very large survey datasets available. These consistent trends helped us model and accurately estimate the prevalence of SU where direct survey estimates were unavailable.

More detailed descriptions of the methods used to model these prevalence estimates are included in the technical report. For estimates related to alcohol and tobacco use, survey data were complemented with retail sales data by province, territory and year. Survey data were also complemented with counts of hospitalizations by province, territory and year that were wholly attributable to each substance category (for all substances), and with information on contents of substances submitted by law enforcement agencies to Health Canada's Drug Analysis Service (for cannabis, cocaine, other CNS stimulants and opioids).<sup>15</sup>

**Table 3.** Data sources used to model prevalence estimates

Substance	Data Sources
Alcohol	Canadian Alcohol and Drug Use Monitoring Survey (CADUMS) 2008–2012 (Statistics Canada, 2022f); Canadian Tobacco, Alcohol and Drugs Survey (CTADS) 2013, 2015 and 2017 (Statistics Canada, 2022i); Canadian Alcohol and Drug Survey (CADS) 2019 (Statistics Canada, 2022g); Canadian Community Health Survey (CCHS) 2005 and 2007–2017 (Statistics Canada, 2022h); official sales from Statistics Canada 2006–2020 (Statistics Canada, 2022s)
Tobacco	CADUMS 2008–2012 (Statistics Canada, 2022f); CTADS 2013, 2015 and 2017 (Statistics Canada, 2022i); CADS 2019 (Statistics Canada 2022g); CCHS 2005 and 2007–2017 (2022h); official sales from Statistics Canada 2006–2020 (Statistics Canada, 2022u)
Cannabis, opioids, other CNS depressants, cocaine, other CNS stimulants and other substances	CADUMS 2008–2012 (Statistics Canada, 2022f); CTADS 2013, 2015 and 2017 (Statistics Canada, 2022i); CADS 2019 (Statistics Canada, 2022g); CCHS 2007, 2015, 2017 (Statistics Canada, 2022h); Northwest Territories Substance Use and Addictions Survey 2012 (Northwest Territories Health and Social Services, 2017)
All substances	Discharge Abstract Database 2006–2007 to 2020–2021 (CIHI, 2022b); Drug Analysis Service: Samples of illegal drugs (Health Canada, 2022)

<sup>15</sup> Hospitalizations with ICD-10-CA codes F10–F15 and T40 codes. Drug Analysis Service data on cannabis were excluded from substance use prevalence modelling after 2017 due to changes in law enforcement cannabis seizure activity following cannabis legalization.



## Results

The prevalence of past-year opioid use decreased by 11.0% (from 21.6% to 10.6%) between 2007 and 2020, the most of any substance examined (see Figure 5). We also observed a 7.1% decline in the use of tobacco during the project period. In contrast, cannabis use increased from 11.1% in 2007 to 18.1% in 2020. The use of cocaine and other CNS stimulants grew marginally overall, with greater increases among people of different ages, sexes and regions. For instance, in 2007, 2.0% of males aged 15 to 34 years used CNS stimulants (excluding cocaine) in the past year, increasing to 6.3% in 2020.

**Figure 5.** Estimates of substance use prevalence in Canada by substance, 2007–2020 (percentage of population using substance in past year)

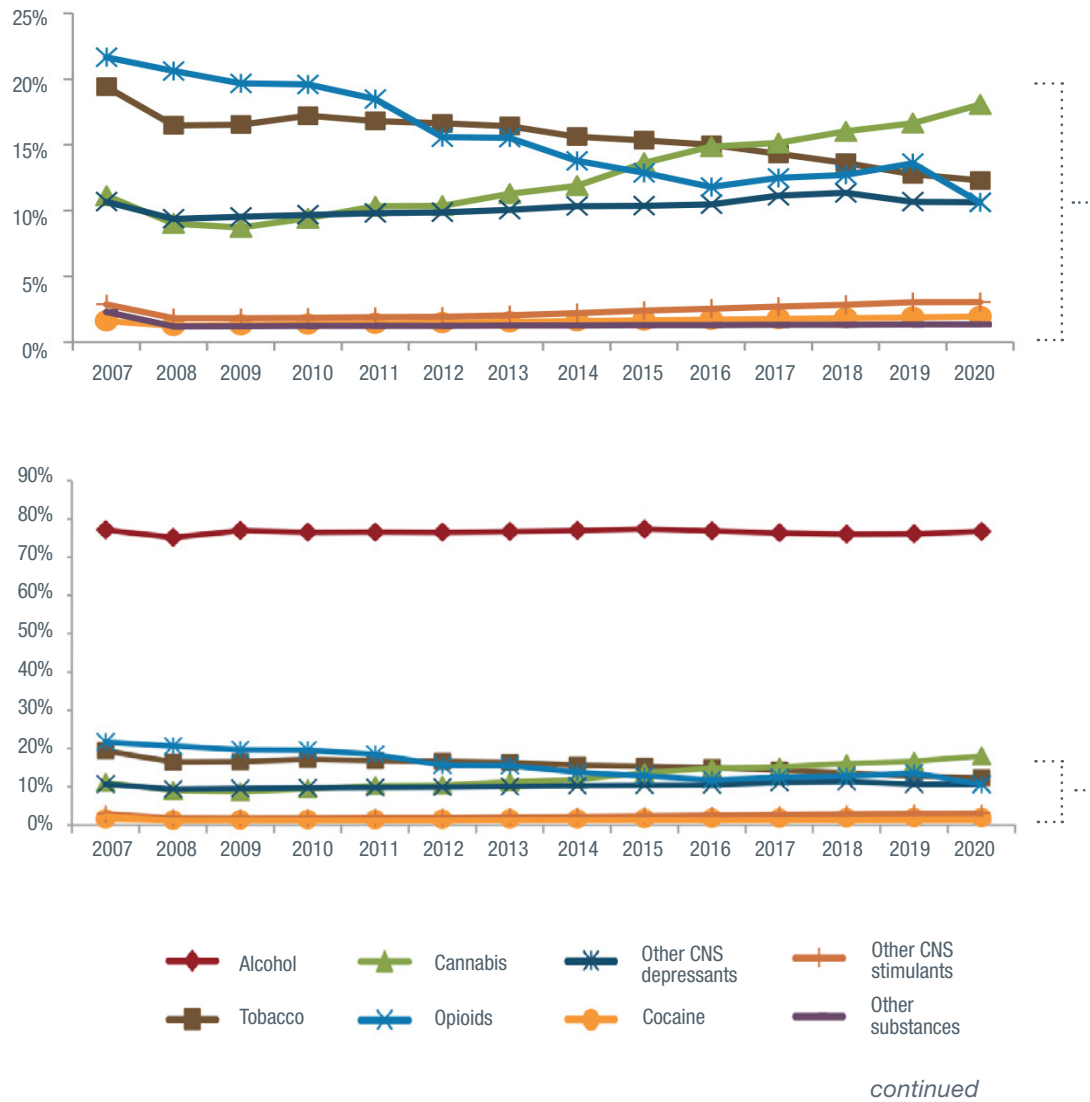






Figure 5. continued

Substance	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Alcohol	77.2	75.2	77.0	76.6	76.6	76.6	76.7	77.0	77.4	76.9	76.4	76.1	76.1	76.8
Tobacco	19.4	16.5	16.5	17.2	16.8	16.6	16.4	15.6	15.4	15.0	14.3	13.6	12.8	12.3
Cannabis	11.1	9.0	8.7	9.4	10.3	10.4	11.3	11.9	13.6	14.9	15.1	16.0	16.7	18.1
Opioids	21.7	20.6	19.7	19.6	18.5	15.6	15.5	13.8	12.9	11.8	12.5	12.7	13.6	10.6
Other CNS depressants	10.7	9.4	9.5	9.7	9.8	9.9	10.1	10.3	10.4	10.5	11.1	11.4	10.7	10.6
Cocaine	1.6	1.3	1.3	1.4	1.4	1.5	1.5	1.6	1.7	1.7	1.8	1.8	1.9	2.0
Other CNS stimulants	2.9	1.8	1.8	1.9	1.9	1.9	2.1	2.2	2.4	2.6	2.7	2.9	3.0	3.1
Other substances	2.3	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.4

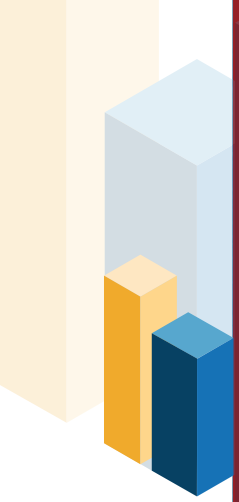
**Note:** Estimates for alcohol and tobacco refer to the prevalence of people who currently drink (individuals who have consumed at least one standard drink of alcohol in the past year) and people who currently smoke (individuals who have smoked at least 100 cigarettes in their lifetime and at least one in the last year). Estimates for all drugs refer to the prevalence of people who have used the drug (e.g., for opioids: an opioid pain reliever or heroin) at least once in the past year. The estimates presented above are aggregated across age and sex groups and regions. The more detailed data show greater variation in prevalence between age and sex groups. For prevalence estimates by region, age and sex groups, see the technical report.

## Limitations

There are limited data available to supplement the survey data. This is particularly true for illegal and “other substances” categories, which might have affected the reliability of the prevalence estimates. The inclusion of data on hospitalizations for 100% SU-attributable conditions and contents of seized substances further improved the accuracy of the 2007–2020 estimates compared to earlier estimates (Canadian Substance Use Costs and Harms Scientific Working Group, 2018; 2020).

We continued to model prevalence estimates for substances other than alcohol, tobacco and cannabis for the territories with limited survey data specific to the territories. We used population data from the territories and highly consistent patterns in the survey data from the provinces to estimate the extent of SU in the territories. Counts of conditions that were 100% attributable to SU were used to improve the accuracy of territorial and provincial estimates.

To estimate the instances of HIV, viral hepatitis B and viral hepatitis C attributable to substance use required a unique methodology, as the causal pathway for these conditions is through injection drug use (IDU) only, and not the use of specific substances. The survey sources used in this report do not separate IDU into substance categories. Because of this lack of information, the relative weighting between substances that can be injected (opioids, cocaine and other CNS stimulants) were used to divide the overall attributable fraction derived from IDU prevalence in each region, year, sex and age group.





## Healthcare Costs

Cost estimates are provided for inpatient hospitalizations, day surgeries, emergency department visits, paramedic services, specialized treatment for SU disorders, physician time and prescription drugs. Fundamental to these estimates is the use of the attributable fraction approach for estimating the proportions of different types of illness or injury that can be attributed to the use of a particular substance. Attributable fractions were calculated using the latest World Health Organization methodologies to assess burden of disease (Degenhardt et al., 2016) and a new international open-access resource, the International Model of Alcohol Harms and Policies, for alcohol-attributable fractions (Sherk et al., 2017, Sherk et al., 2020).

The diagnostic information available for hospitalizations is the most reliable and detailed. We were able to access individual-level data on the costs of different types of hospital admissions for conditions that are 100% attributable to SU and conditions that are partially attributable to SU. We then combined these data to come up with accurate cost estimates for all health conditions related to SU. This information was used as a basis for estimating SU-attributable healthcare costs in other domains as well. A list of health conditions considered either 100% or partially attributable to SU are displayed in Table 2. The data sources used to develop the healthcare cost estimates are listed in Table 4.

**Table 4.** Data sources used to calculate costs of healthcare related to substance use

Costs or Harm	Data Source
SU attributable fractions	Alcohol: Calculated using the International Model of Alcohol Harms and Policies (Sherk et al., 2017; Sherk et al., 2020) Tobacco: Relative risks taken from the U.S. Surgeon General's report (National Center for Chronic Disease Prevention and Health Promotion, 2014) Other substances: Various relative risks taken from the literature on specific conditions (see technical report)
In-patient hospitalizations	Discharge Abstract Database (DAD) 2006–2007 to 2020–2021 (counts) (CIHI, 2022b); Cost of a Standard Hospital Stay (indicator) (CIHI, 2022a)
Day surgeries	DAD 2006–2007 to 2020–2021 (CIHI, 2022b) and National Ambulatory Care Reporting System (NACRS) 2006–2007 to 2020–2021 (CIHI, 2022c) (counts); Cost of a Standard Hospital Stay (indicator) (CIHI, 2022a)
Emergency department visits	NACRS 2006–2007 to 2020–2021 (counts) (CIHI, 2022c); Cost of a Standard Hospital Stay (indicator) (CIHI, 2022a)
Paramedic services	DAD 2006–2007 to 2020–2021 (CIHI, 2022b) and NACRS 2006–2007 to 2020–2021 (counts) (CIHI, 2022c); Provincial or territorial reports on fee per ambulance transport for non-insured individuals (costs) (see technical report)
Physician time	National Physician Database 2006–2007 to 2019–2020 (CIHI, 2022e) and DAD 2006–2007 to 2020–2021 (counts) (CIHI, 2022b); Quick Stats Inpatient Hospitalizations 2007–2020 (CIHI, 2022f)

*continued*



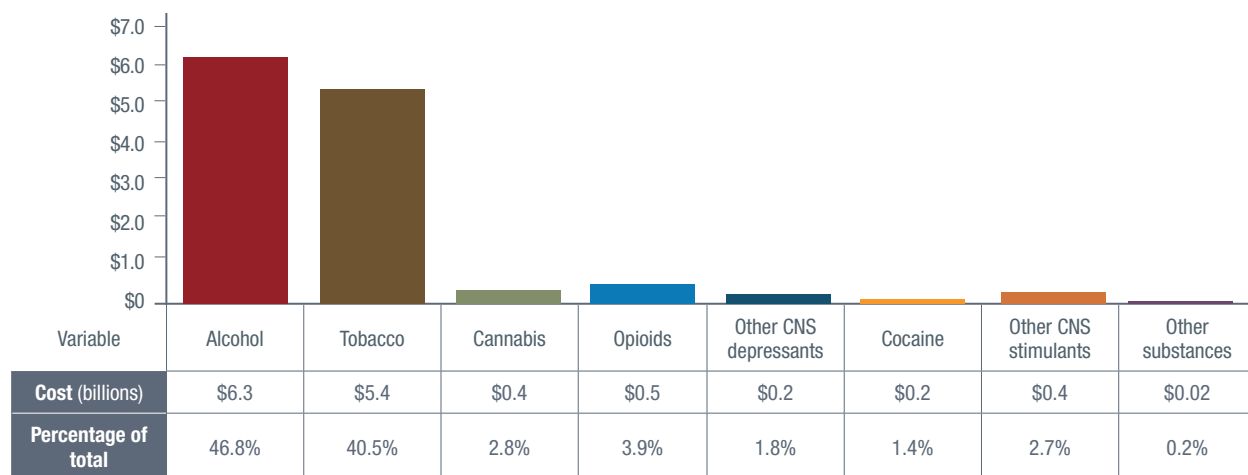
Table 4. continued

Prescription drugs	National Health Expenditure Trends 2007–2020 (CIHI, 2022d)
Specialized treatment for SU disorders	National Treatment Indicators (NTI) Working Group data 2009–2010 to 2020–2021 (counts) (Beasley, Jesseman, Patton, & NTI Working Group, 2012; CCSA, 2022b; McQuaid, Di Gioacchino, & NTI Working Group, 2017; Meister, Maloney-Hall, Urbanoski, & NTI Working Group, 2018; Pirie, Jesseman, Di Gioacchino, NTI Working Group, 2014; Pirie, Jesseman, & NTI Working Group, 2013; Pirie & NTI Working Group, 2015; Pirie, Wallingford, Di Gioacchino, McQuaid, & NTI Working Group, 2016) DAD 2006–2007 to 2020–2021 (CIHI, 2022b); Cost of a Standard Hospital Stay (costs) (CIHI, 2022a) Literature: <i>Comorbid mental disorders among clients in addiction treatment: the costs of care</i> (costs) (Urbanoski et al., 2014)

## Results

In 2020, SU-attributable healthcare costs were \$13.4 billion. Costs associated with the use of alcohol and tobacco (two of the three substances legally available at the time) were estimated to account for over 87% of all SU-attributable healthcare costs (see Figure 6).<sup>16</sup> These costs were broken down by cost type and by substance (see Table 1).

**Figure 6.** Costs (in billions) of healthcare related to substance use in Canada by substance, 2017



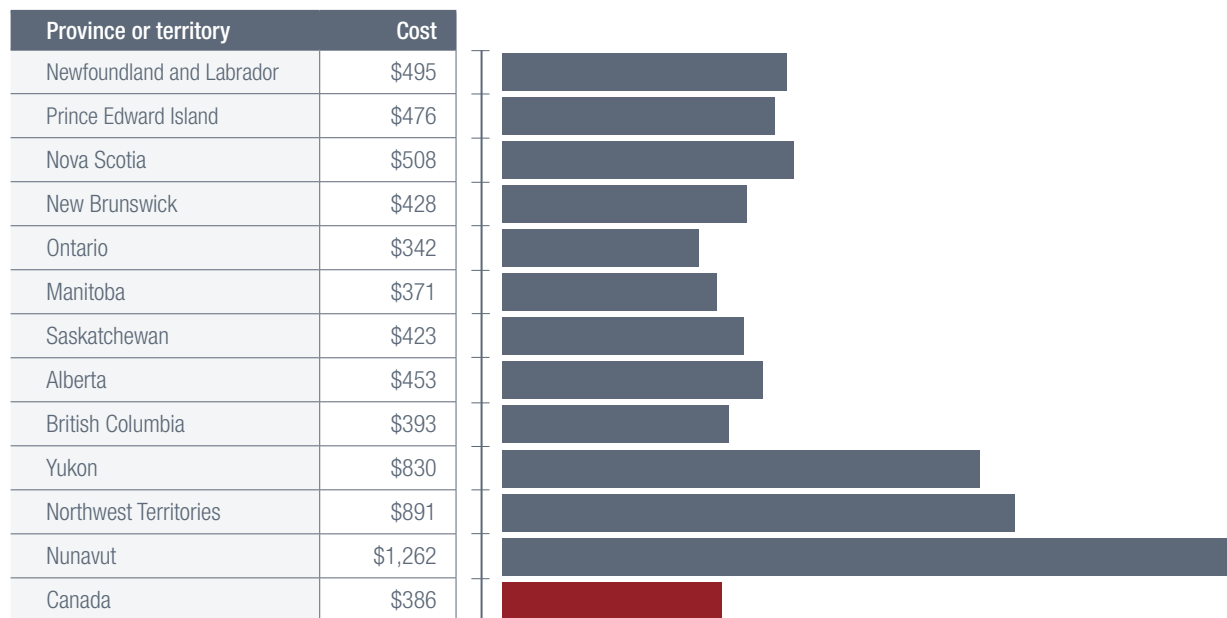
**Note:** These estimates do not include costs associated with in-patient hospitalizations, day surgeries, emergency department visits and paramedic services in Quebec. A rough calculation based on Ontario per-person costs and data available from Quebec suggests that these per-person costs are likely conservative by about 8%.

<sup>16</sup> Emergency department (ED) visits and physician costs attributable to alcohol are underestimated by roughly 3% for all years. We estimate total healthcare costs attributable to alcohol in 2020 are conservative by about 1% or \$61 million. This is due to an underestimation of the number of cardiovascular and digestive health conditions attributable to alcohol and the resulting costs for ED visits and physician time only.



Estimated costs by province or territory were largely driven by population size: the smaller the population, the higher the costs. Direct comparisons can be made from the data in Figure 7, which presents estimated healthcare costs attributable to SU per person. These estimates show that for all of Canada (excluding Quebec), healthcare costs attributable to SU were \$386 per person in 2020. Per-person costs were highest in the territories and relatively high in Atlantic Canada.

**Figure 7.** Per-person costs of health care related to substance use in Canada (except Quebec) by province and territory, 2020

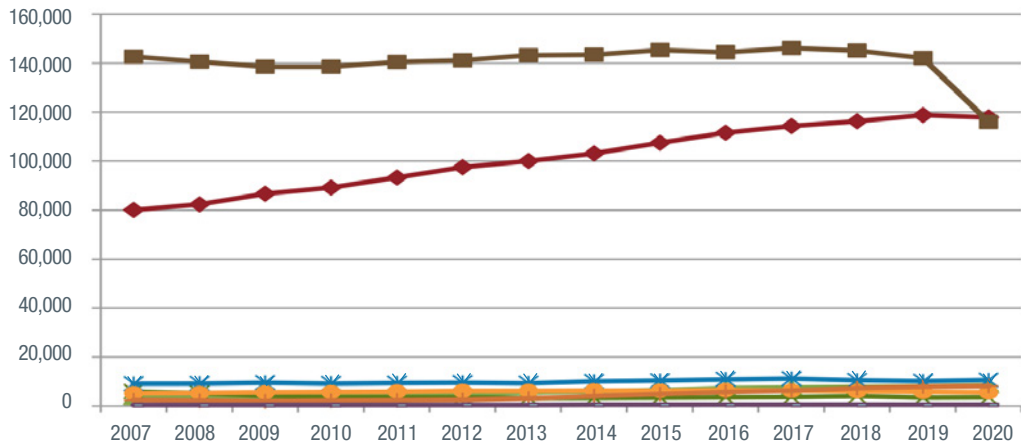
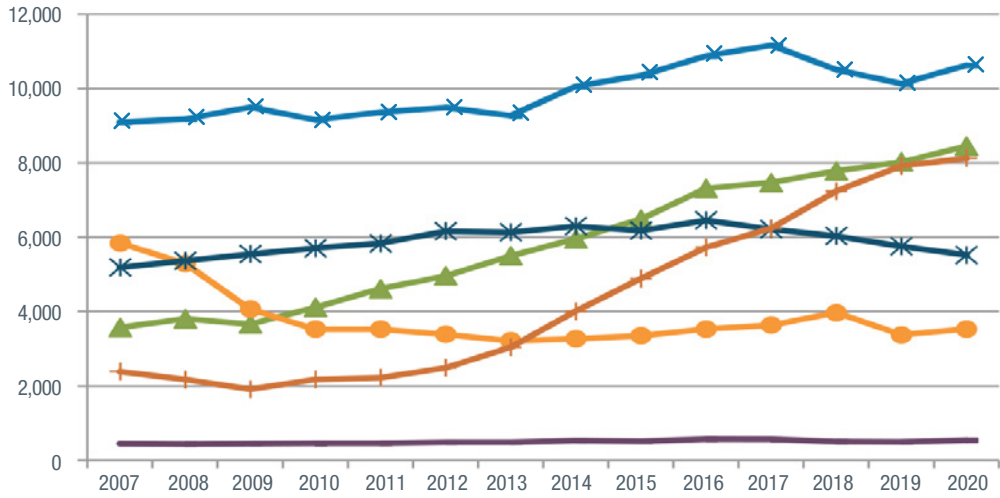


**Note:** Meaningful per-person costs for Quebec could not be calculated. In-patient hospitalizations and associated costs for Ontario and Manitoba are underestimated because we were not able to include hospitalizations recorded in the Ontario Mental Health Recording System.

As shown in Figure 8, contributing to these costs were an estimated 270,695 hospitalizations attributable to SU, of which 117,871 (43.5% of the total) were from alcohol use and 116,027(42.9%) from tobacco use. By comparison, opioid-attributable hospitalizations were estimated to be the next-highest category with 10,628 hospital stays (3.9% of the total).



**Figure 8.** Hospitalizations in Canada (not including Quebec) attributable to substance use, 2007–2020 by type of substance



- ◆ Alcohol
- ▲ Cannabis
- ✱ Other CNS depressants
- + Other CNS stimulants
- Tobacco
- ✱ Opioids
- Cocaine
- Other substances

*continued*



Figure 8. continued

Substance	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Alcohol	80,048	82,337	86,689	89,175	93,366	97,569	100,041	103,192	107,505	111,572	114,342	116,302	118,817	117,871
Tobacco	142,660	140,589	138,582	138,551	140,500	141,162	143,215	143,499	145,463	144,501	146,188	145,172	142,142	116,027
Cannabis	3,572	3,803	3,663	4,112	4,612	4,960	5,499	5,953	6,485	7,311	7,471	7,780	8,024	8,449
Cocaine	5,841	5,292	4,066	3,523	3,527	3,388	3,210	3,266	3,352	3,529	3,634	3,969	3,373	3,530
Opioids	9,094	9,176	9,497	9,158	9,358	9,493	9,269	10,058	10,350	10,873	11,169	10,510	10,132	10,628
Other CNS depressants	5,187	5,365	5,544	5,707	5,837	6,159	6,134	6,299	6,180	6,455	6,216	6,030	5,755	5,524
Other CNS stimulants	2,384	2,170	1,912	2,175	2,223	2,489	3,039	4,008	4,891	5,731	6,241	7,239	7,918	8,124
Other substances	446	436	447	454	455	483	485	533	513	569	563	506	496	542

**Note:** Inpatient hospitalizations for Ontario and Manitoba are underestimated because we were not able to include hospitalizations recorded in the Ontario Mental Health Recording System.

Canada's overall per-person healthcare costs attributable to substance use increased 10% from \$321 in 2007 to \$353 in 2020.<sup>17</sup> More specifically, the largest increases in per-person costs were associated with the use of (in order):

- Other CNS stimulants, for which per-person costs increased almost 180% from \$3 to \$9 (see Figure 9);
- Cannabis, for which costs increased almost 90% from \$5 to \$10;
- Alcohol, for which costs increased 40.5% from \$117 to \$165; and
- Opioids, for which costs increased 15.1% from \$12 to \$14.

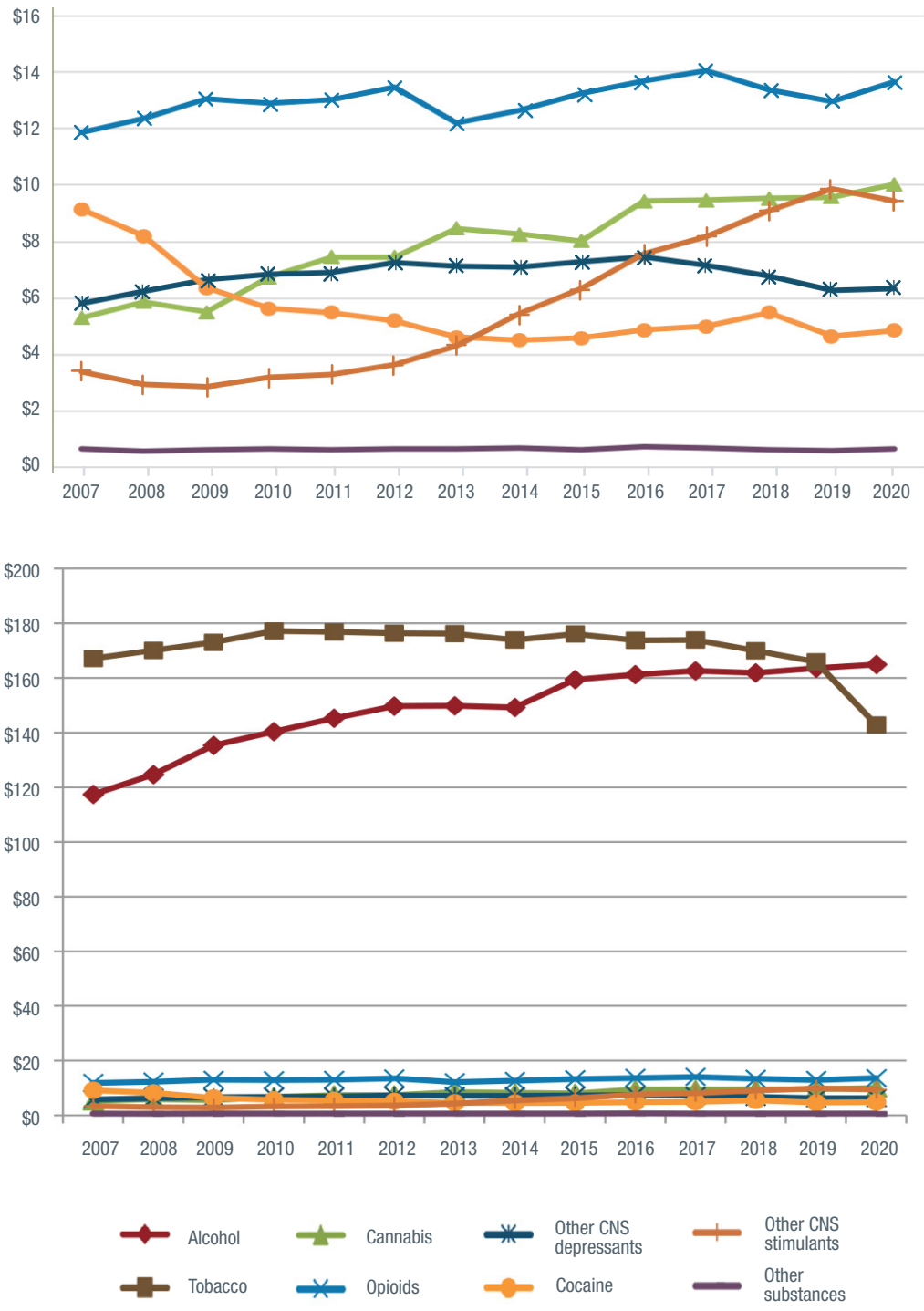
In contrast, per-person healthcare costs associated with some substance categories decreased between 2007 and 2020. Costs due to cocaine decreased 47.0% from \$9 to \$5, and costs due to tobacco use decreased 14.5% from \$167 to \$143 (see Figure 9).

Per-person healthcare costs due to tobacco use declined most steeply (13.9%) between 2019 and 2020, likely due to changes in how people with non-COVID illnesses accessed health care during the pandemic. This led to a 5.5% decrease in overall healthcare costs between 2019 and 2020.

<sup>17</sup> Only some healthcare-related data were available for Quebec. These national per-person trend estimates include Quebec and therefore differ from the \$386 indicated above.



Figure 9. Per-person healthcare costs related to substance use in Canada by substance, 2007–2020



continued





Figure 9. continued

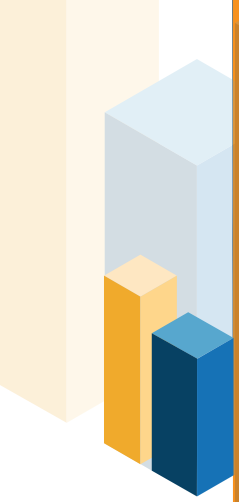
Substance	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Alcohol	117	125	135	140	145	150	150	149	159	161	163	162	164	165
Tobacco	167	170	173	177	177	176	176	174	176	174	174	170	166	143
Cannabis	5	6	6	7	7	7	8	8	8	9	9	10	10	10
Opioids	12	12	13	13	13	13	12	13	13	14	14	13	13	14
Other CNS depressants	6	6	7	7	7	7	7	7	7	7	7	7	6	6
Cocaine	9	8	6	6	5	5	5	5	5	5	5	5	5	5
Other CNS stimulants	3	3	3	3	3	4	4	5	6	8	8	9	10	9
Other substances	1	1	1	1	1	1	1	1	1	1	1	1	1	1

**Note:** These estimates do not include costs associated with in-patient hospitalizations, day surgeries and paramedic services in Quebec. A rough calculation based on Ontario per-person costs and data available from Quebec suggests that these per-person costs are likely conservative by about 8%.

## Limitations

The methodology we used to assess the burden of disease assumes that high-quality studies from around the world on the association between use of substances in a population and disease and injury were universally applicable. While we used national, provincial and territorial data to assess the prevalence of broad categories of disease and injury and population prevalence of SU, we must use international assumptions about the relationship between SU and the risk of some diseases and injuries, as these data rarely exist for a single country. As is standard practice in SU epidemiology, we have relied on the latest systematic reviews and meta-analyses of the international literature to estimate these risk relationships. The evidence base of published studies, however, is stronger in some areas than in others. In general, the published literature is stronger in relation to tobacco and alcohol use, and weaker for most of the other substances. To estimate in-patient hospitalizations, day surgeries, paramedic services and emergency department visits, we applied attributable fractions to individual-level data. However, to estimate the costs of physician time and prescription drugs, we used an attributable percentage methodology.<sup>18</sup> Using this method, we assumed that the proportional contributions of different types of substances to healthcare costs are consistent. We will investigate this assumption and continue to refine our methodologies to improve the accuracy of our estimates.

<sup>18</sup> Attributable percentages are equivalent to the percentage of total inpatient hospitalizations that could be attributed to substance use for each province, territory and year.





## Lost Productivity Costs

Estimates are provided for the indirect costs associated with lost productivity related to SU in terms of foregone earnings. These costs were due to premature death, long-term disability and short-term disability (absenteeism and presenteeism).

To estimate lost productivity costs due to premature death, we primarily used the human capital approach (Single et al., 2003). This approach assumes the deceased individual cannot be replaced in the workforce and that their lost income up to the age of retirement (assumed to be 65 years) is not recoverable. To determine the number of deaths attributable to SU, we used the same condition-based, epidemiological attributable fraction approach we used to assess healthcare costs related to SU. To estimate the cost of long-term disability, we limited our estimates to the year in question as recommended by Schroeder (2012). The methods used to calculate lost production costs are described in detail in Sorge and colleagues (2019) and in the technical report.

### Methods Used to Estimate Deaths Attributable to Substance Use Poisoning

For our estimates of deaths attributable to substance poisoning, we relied on the Canadian vital statistics database and the assistance of and collaboration with Statistics Canada (Centre for Population Health Data unit).

In the vital statistics database, each SU-attributable poisoning death is identified as either accidental (with codes beginning with X4\* or Y1\*) or intentional (with codes beginning with X6\*). Also included on the record is a list of codes identifying the substances considered to be contributing to the death. For records in which one substance was identified as contributing to the death, we assigned the record to that substance category. For records in which multiple substances were indicated, we created drug poisoning weights. We used these weights to distribute deaths attributable to polysubstance use<sup>19</sup> based on the relative proportions of SU-attributable deaths in which only one substance was considered a contributor.

For example, if we found 100 deaths to which alcohol and opioids were considered to have contributed, we looked at the ratio of deaths attributable to alcohol use only to deaths attributable to opioid use only and distributed the 100 deaths accordingly. If this ratio were 6:4, we allocated 0.6 of each of the 100 deaths to alcohol use and 0.4 to opioid use. We repeated this procedure for all the polysubstance combinations in the data. The final poisoning weights were adjusted for age and regional variations using the corresponding in-patient hospitalization proportions for substance poisonings.

### Methods Used to Assess Long- and Short-Term Disability

We assessed long-term disability based on counts of Canada Pension Plan and Quebec Pension Plan disability beneficiaries, which represent individuals permanently unable to work. Short-term disability includes those who are absent from work (absenteeism) or experience reduced productivity while working (“presenteeism”) due to substance use. We calculated these costs using questions from the Labour Force Survey and the Canadian Community Health Survey, respectively. The data sources used to develop these estimates are listed in Table 5. For full details on the methods used, see the technical report.

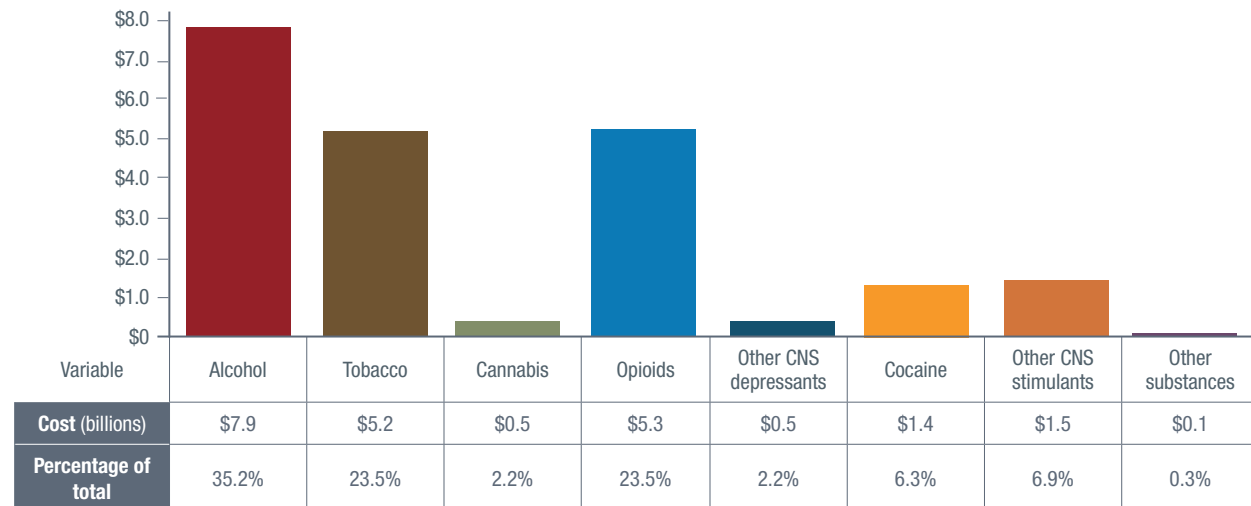
<sup>19</sup>For the following substance categories: alcohol, opioids, other CNS depressants, cocaine and other CNS stimulants. Cannabis and other psychoactive substances were excluded from this analysis following a special analysis of deaths in Vital Statistics deaths that showed these substances were rarely the only substance present in substance poisoning deaths. This is consistent with earlier evidence suggesting these substances categories cannot directly cause overdose death, or do so very rarely (Hall & Solowij, 1998).

**Table 5.** Data sources used to calculate lost productivity costs related to substance use

Costs or Harm	Data Source
Premature death	Vital Statistics – Death Database (Statistics Canada, 2022u) (counts); Labour Force Survey (Statistics Canada, 2022o) and Survey of Employment, Payrolls and Hours (Statistics Canada, 2022m) (costs)
Long-term disability	Canadian Pension Plan (CPP) Disability Benefits by Class of Diagnosis (Employment and Social Development Canada, 2022) and Quebec Pension Plan (QPP) Disability Benefits (Government and Municipalities of Quebec, 2022) (counts); and Survey of Employment, Payrolls and Hours (Statistics Canada, 2022m)
Short-term disability (absenteeism and presenteeism)	Canadian Community Health Survey 2005, 2007–2017 (Statistics Canada, 2022h) and Labour Force Survey (Statistics Canada, 2022p) (counts); Survey of Employment, Payrolls and Hours (Statistics Canada, 2022m) (costs)

## Results

In 2020, lost productivity costs attributable to SU were about \$22.4 billion. Costs associated with the use of two of the three substances legally available at the time (alcohol and tobacco) were estimated to account for 58.7% (\$13.1 billion) of all lost productivity costs (see Figure 10). Opioid use accounted for 23.5% (\$5.3 billion) of the costs.

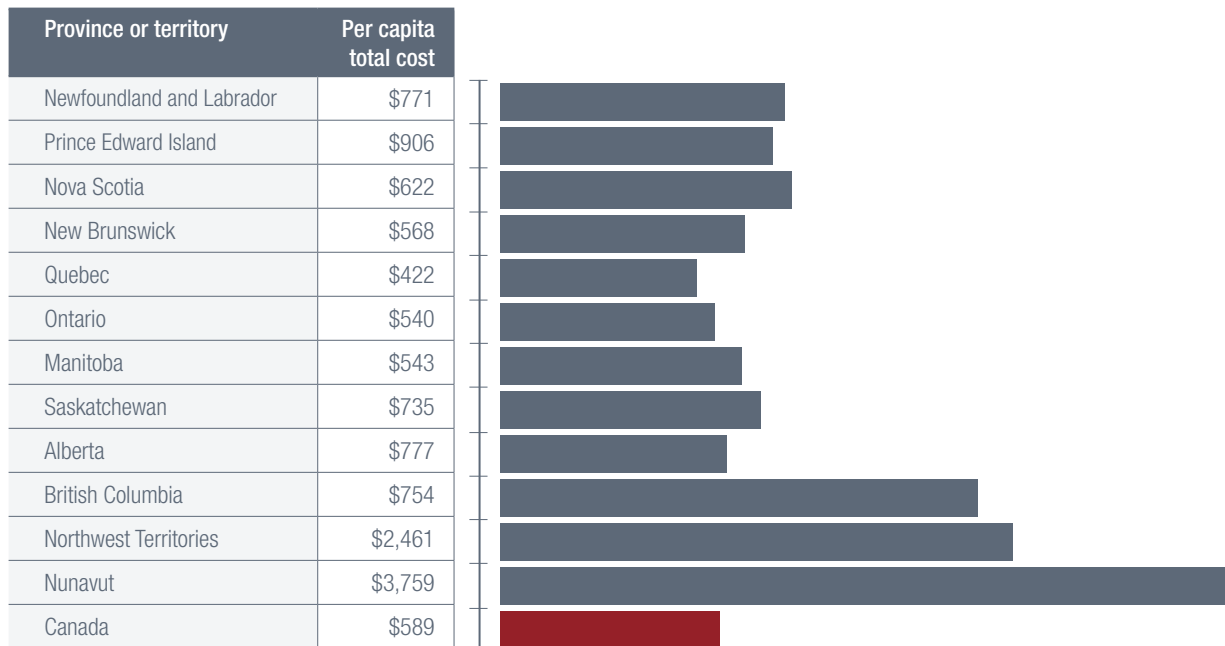
**Figure 10.** Costs (in billions) of lost productivity attributable to substance use in Canada by substance, 2020

**Note:** At the time of writing this report, the data on premature deaths in Yukon (2017 to 2020 only) required to calculate costs of potential years of productive life lost were not available from Statistics Canada's Vital Statistics database. A rough calculation based on per-person costs and data in the Northwest Territories suggests that these costs are likely conservative by about 0.5%.



The estimated per-person lost productivity costs attributable to SU for the provinces, territories and all of Canada are presented in Figure 11. For all of Canada, lost productivity attributable to SU costs an average of \$589 per person. Per-person costs were highest in the territories.

**Figure 11.** Per-person lost productivity costs attributable to substance use in Canada by province and territory, 2020



**Note:** At the time of writing this report, the data on premature deaths in Yukon (2017 to 2020 only) required to calculate costs of potential years of productive life lost were not available from Statistics Canada's Vital Statistics database. Therefore, meaningful per-person costs for lost productivity could not be calculated for Yukon in 2020.

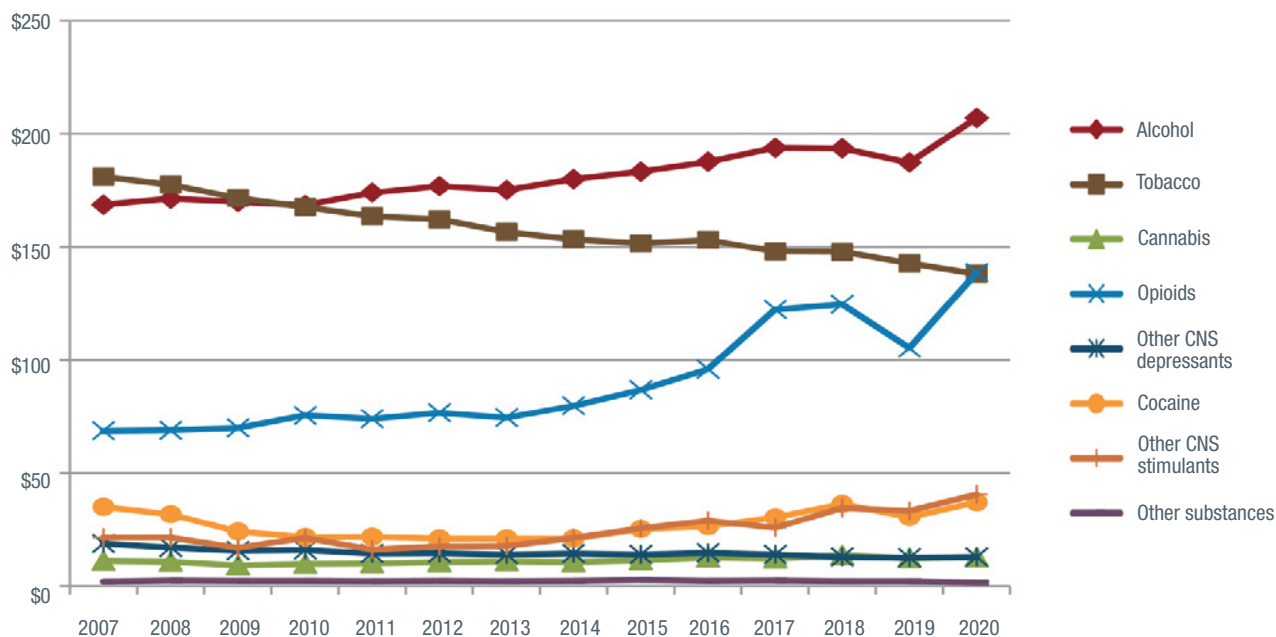
Overall, per-person lost productivity costs increased by 16.2% from \$507 in 2007 to \$589 in 2020. The per-person costs of lost productivity due to alcohol use increased 22.8% from \$169 per person in 2007 to \$207 per person in 2020, while per-person costs related to tobacco use decreased by 23.7% from \$181 in 2007 to \$138 in 2020 (see Figure 12).

The largest increase was related to opioid use. The per-person cost of opioid use increased by more than 100% over the course of the project from \$69 per person in 2007 to \$139 per person in 2020 (see Figure 12). A similar trend was observed for other CNS stimulants: per-person lost productivity costs increased by 88.5% from \$22 to \$41. These increases are largely due to the growing number of poisoning deaths related to opioids and stimulants (see Figure 13).

Per-person lost productivity costs were also higher for cannabis (14.8%) and cocaine (6.1%), while the per-person costs for other CNS depressants decreased (31.4%).



**Figure 12.** Per-person lost productivity costs attributable to substance use in Canada by substance, 2007–2020



Substance	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Alcohol	169	171	170	168	174	177	175	180	183	188	194	194	187	207
Tobacco	181	178	172	168	164	162	157	153	152	153	148	148	143	138
Cannabis	11	11	9	10	10	11	11	11	12	13	12	14	12	13
Opioids	69	69	70	76	74	77	74	80	87	96	122	125	105	139
Other CNS depressants	19	17	16	16	14	15	14	14	14	15	14	13	13	13
Cocaine	35	32	24	22	22	21	21	21	25	27	30	36	31	37
Other CNS stimulants	22	22	17	21	16	18	18	21	26	29	26	35	33	41
Other substances	2	2	2	2	2	2	2	2	3	2	2	2	2	2

**Note:** At the time of writing this report, the data on premature deaths in Yukon (2017 to 2020 only) required to calculate costs of potential years of productive life lost were not available from Statistics Canada's Vital Statistics database. These per-person costs are likely conservative by about 0.5%.

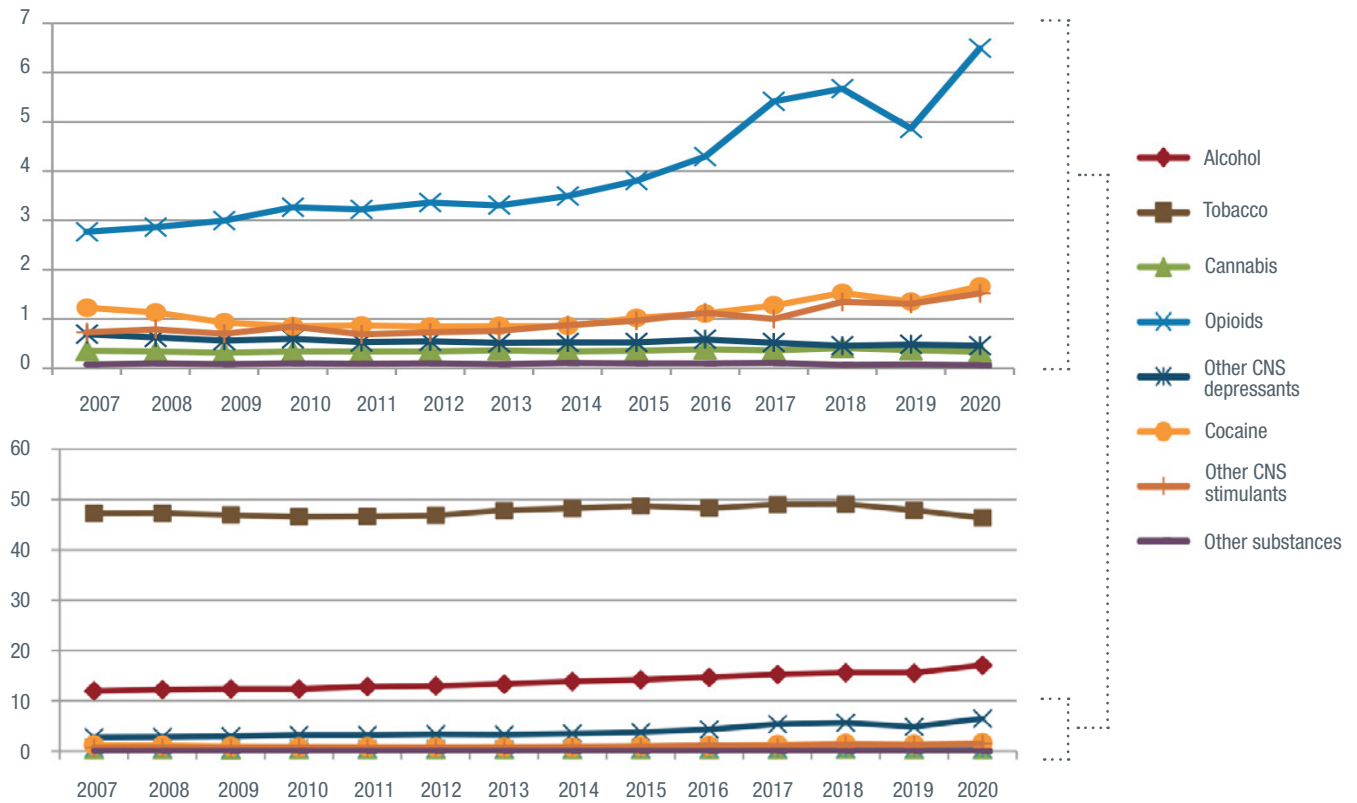
Underlying these costs are the estimated numbers of deaths and the potential years of productive life lost, as shown in figures 13 and 14, respectively. Tobacco use was the leading cause of the 73,994 SU-attributable deaths with 46,366 deaths in 2020, followed by alcohol use with 17,098 deaths and opioid use with 6,491 deaths.<sup>20</sup> The number of deaths attributable to use of cocaine and other CNS stimulants were similar in 2020, at 1,662 and 1,518 deaths, respectively. One measure of the economic toll of SU-attributable deaths is the total number of potential years of productive life lost (PYPLL). This measure is calculated based on the number of deaths occurring up to 65 years of age, which amounted to 24,346 deaths in 2020.

<sup>20</sup> Numbers of deaths include those occurring at any age.



Opioids were the leading contributor to the 345,091 SU-attributable PYPLLs with 112,768 in 2020. Opioid-attributable PYPLL have risen exponentially since 2013, largely due to the young age of many opioid-attributable deaths. Alcohol use accounted for 103,907 PYPLL in 2020.

**Figure 13.** Number of deaths (in thousands) attributable to substance use by substance, 2007–2020

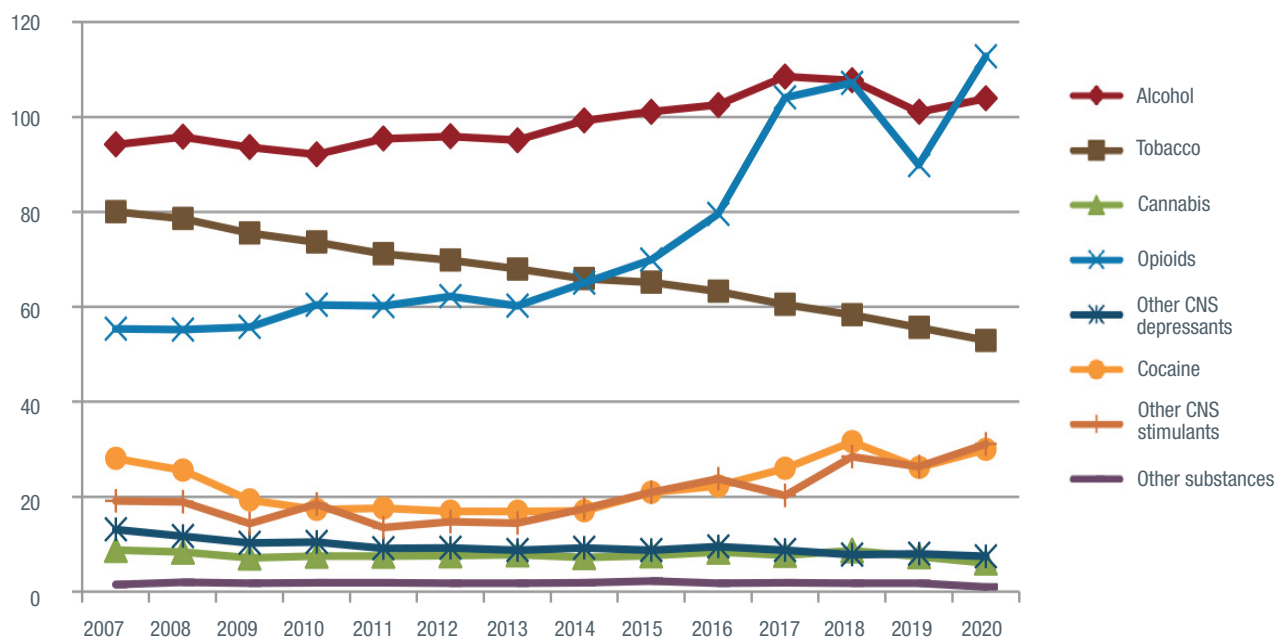


Substance	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Alcohol	11,956	12,274	12,407	12,367	12,840	12,990	13,353	13,870	14,196	14,695	15,257	15,610	15,575	17,098
Tobacco	47,252	47,290	46,919	46,590	46,650	46,870	47,821	48,231	48,744	48,278	49,030	49,110	47,880	46,366
Cannabis	354	343	315	338	338	340	366	341	355	386	364	410	371	336
Opioids	2,770	2,865	2,997	3,268	3,226	3,360	3,307	3,496	3,806	4,291	5,416	5,672	4,867	6,491
Other CNS depressants	690	627	561	600	532	546	515	526	523	586	520	456	484	458
Cocaine	1,229	1,133	931	855	868	848	858	858	1,023	1,113	1,275	1,531	1,353	1,662
Other CNS stimulants	729	791	697	848	688	730	761	875	961	1,129	1,001	1,345	1,309	1,518
Other substances	79	96	82	97	95	97	83	104	100	97	108	73	81	64

**Note:** Includes deaths occurring at all ages. At the time of this report, data on premature deaths in Yukon (2017 to 2020 only) were not available from Statistics Canada’s Vital Statistics database.



**Figure 14.** Number of potential years of productive life lost (in thousands) due to substance use-attributable premature deaths by substance, 2007–2020



Substance	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Alcohol	94,211	95,803	93,585	92,100	95,440	95,896	95,097	99,217	101,071	102,495	108,511	107,721	101,024	103,907
Tobacco	80,029	78,574	75,497	73,638	71,143	69,793	67,969	65,945	65,173	63,240	60,521	58,323	55,606	52,932
Cannabis	8,761	8,321	7,069	7,519	7,454	7,609	7,743	7,188	7,551	8,358	7,700	8,640	7,435	6,026
Opioids	55,345	55,197	55,777	60,397	60,161	62,233	60,228	65,061	69,907	79,556	104,072	107,158	89,855	112,768
Other CNS depressants	13,080	11,646	10,267	10,424	9,138	9,199	8,726	9,245	8,690	9,502	8,743	7,805	7,950	7,440
Cocaine	28,091	25,613	19,302	17,297	17,569	16,946	16,894	17,035	20,933	22,221	25,977	31,547	26,133	29,955
Other CNS stimulants	19,146	18,916	14,359	18,435	13,516	14,739	14,441	17,517	20,867	23,740	20,286	28,454	26,371	31,081
Other substances	1,510	1,989	1,784	1,873	1,833	1,773	1,752	1,851	2,231	1,790	1,917	1,745	1,814	982

**Note:** Calculated based on deaths occurring between the ages of 0 to 64 years. At the time of writing this report, data on premature deaths in Yukon (2017 to 2020 only) were not available from Statistics Canada's Vital Statistics database.





## Limitations

The vital statistics database is a “living” database: records of deaths are added as investigations into the circumstances of deaths are closed. This results in an underestimation of deaths for the most recent years. This underestimation is more severe for substance poisoning and other injury-related deaths because they take longer to investigate (Statistics Canada, 2022). We adjusted for this by applying a small “uplift” to counts of intentional and unintentional injury deaths (which include poisonings). However, our estimates for the number of deaths and resulting premature mortality costs for 2018, 2019 and 2020 are likely conservative.

To meet its data confidentiality requirements, Statistics Canada used a disclosure method called the Laplace mechanism when it provided the mortality data to the research team. This mechanism adds a random amount of noise to each count, which can result in negative estimations when counts are very low. While the negative values were left in the poisoning weights, after the weights were applied to the death counts, all negative counts were truncated to zero. Although this is a widely accepted solution to address negative values after application of the Laplace mechanism (Holohan et al., 2018), it does result in a small positive bias for the final estimates. This bias likely had a greater effect on estimates for less-populous regions (e.g., the territories) that have low counts of premature deaths. In addition to this limitation, when calculating PYPLL we had to use the average ages of death calculated for the 2007–2014 report (Canadian Substance Use Costs and Harms Scientific Working Group, 2018) as Statistics Canada could not release this information due to privacy rules.

Lastly, estimates for long-term disability are likely conservative as counts of individuals experiencing long-term disability were based on the number of people who qualify for the Canada Pension Plan or Quebec Pension Plan disability benefits (i.e., worked long enough to have contributed enough to either plan). We also had to impute information required for short-term disability for the territories, which were not included in the Labour Force Survey. We used information from the Canadian Community Health Survey (CCHS), which had similar questions assessing absenteeism from work, to derive proportions for the territories that could then be applied to the Labour Force Survey’s provincial estimates.





## Criminal Justice Costs

Criminal justice costs include costs associated with policing, courts (including judges, prosecutors, legal aid and drug treatment court funding) and correctional services. Included in our calculations are expenditures for crimes that are both 100% and partially attributable to SU. The 100% attributable crimes include impaired driving and violations of the *Controlled Drugs and Substances Act* or the *Cannabis Act* concerning the possession, trafficking and production of controlled substances. In addition to fully attributable crimes, we also included crimes that are partially attributable to SU. These include violent *Criminal Code* offences such as homicide or assault, and non-violent offences such as theft or arson.

Attributable fractions for crimes related to SU were estimated based on a comprehensive self-report intake survey. Given to more than 34,000 people as they entered federal prisons, this survey asked about the role SU played in their offences. Specifically, we calculated the proportion of offences committed by people who, at the time of their offence, were intoxicated or under the influence of drugs, or were seeking resources to support their substance use disorder.<sup>21</sup> Attributable fractions were developed for violent and non-violent offences, and were applied to counts of violent and non-violent police-reported incidents (for policing costs), criminal charges (for court costs) and admissions to correctional facilities (for correctional costs).

After obtaining counts of incidents and charges for each offence type, we performed an additional step to account for the time and resources associated with different offences (e.g., homicide versus drug possession). Counts associated with each offence were multiplied by a corresponding “weight” derived from the Crime Severity Index (policing)<sup>22</sup> and from data on the complexity of court cases (courts).<sup>23</sup> The weighted count for each offence was divided by the sum of weighted counts for all offences by year, province and territory. This resulted in the proportion of all incidents or charges attributable to SU, which was then applied to the total costs associated with policing or courts in the same year and region.

For correctional costs, we calculated the proportion of SU-attributable admissions to custody and community supervision for each offence type (i.e., divided the number of SU-attributable admissions by the total number of admissions). We then applied these proportions to the total costs associated with each type of supervision. This resulted in a higher (weighted) cost for offences associated with admissions to custody than community supervision because custody is more expensive.

The data sources we used to develop our estimates are listed in Table 6. Details on the methods used to produce the criminal justice cost estimates are available in the technical report.

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<sup>21</sup> The methodology is described in detail in the technical report and elsewhere (Young et al., 2021).

<sup>22</sup> The Crime Severity Index contains a measure of violation severity, known as Crime Seriousness Weights. Weights were calculated for all *Criminal Code* or federal statute violations as the product of the incarceration rate (i.e., proportion of guilty sentences receiving a custody sentence) and the average custody sentence length (Statistics Canada, 2009). We aggregated weights into 32 offence types known as Common Offence Classification categories.

<sup>23</sup> Court case complexity accounts for the average number of criminal case appearances and occurrence of a criminal trial. This indicator was developed for each Common Offence Classification category in consultation with the Canadian Centre for Justice and Community Safety Statistics.

**Table 6.** Data sources used to estimate criminal justice costs attributable to substance use

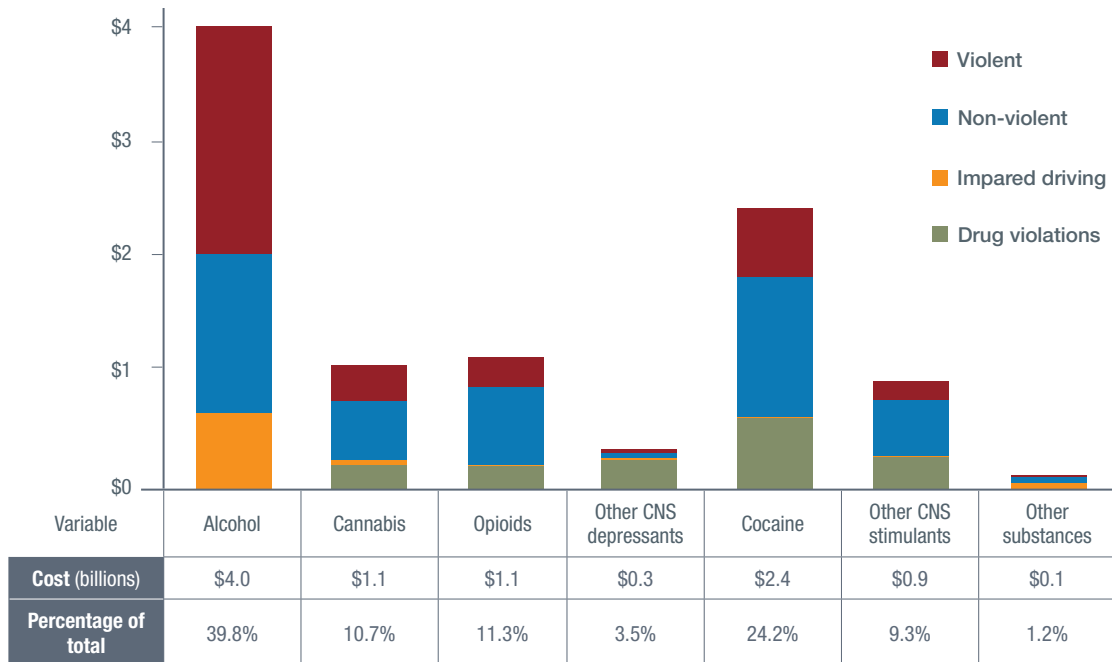
Costs or Harm	Data Source
Crime-related attributable fractions Policing (police-reported incidents)	Correctional Service of Canada: Computerized Assessment of Substance Abuse (CASA) (Kunic & Grant, 2006); Women's CASA (Correctional Service of Canada, 2022)  Uniform Crime Reporting Survey 2009–2020 (counts) (Statistics Canada, 2022t); Police Administration Survey 2006–2007 to 2020–2021 (costs) (Alam & Greenland, 2017; Beattie & Mole, 2007; Burczycka, 2011; Conor, 2018; Conor et al., 2020; Hutchins, 2014; 2015; Mazowita & Greenland, 2016; Statistics Canada, 2008; 2009; 2010; 2013; 2022r); Crime Severity Index 2009–2019 (indicator) (Statistics Canada, 2022l)
Courts (criminal charges)	Integrated Criminal Court Survey 2006–2007 to 2020–2021 (counts) (Statistics Canada, 2022e; 2022x); Office of the Parliamentary Bureau Officer: Expenditure Analysis of Criminal Justice in Canada, 2013 (Story & Yalkin, 2013) and federal and provincial public accounts (costs); Case Complexity Indicator, 2006–2007 to 2019–2020 (indicator) (Statistics Canada, 2022k)
Correctional services (admissions to sentenced custody and community supervision)	Adult Correctional Services 2006–2007 to 2020–2021 (Statistics Canada, 2022a; 2022b); Youth Custody and Community Service Survey 2006–2007 to 2020–2021 (Statistics Canada, 2022v); Integrated Criminal Court Survey 2006–2007 to 2020–2021 (Statistics Canada, 2022c; 2022d; 2022w) and Parole Board of Canada Performance Monitoring Report (counts) (Parole Board of Canada, 2011; 2014; 2019)  Adult Correctional Services 2006–2007 to 2020–2021 (costs) (Statistics Canada, 2022q)
Tobacco enforcement	Federal Tobacco Control Strategy 2006–2007 to 2014–2015 (Treasury Board of Canada Secretariat, 2015); Federal Tobacco Control Strategy 2015–2016 to 2020–2021 (Health Canada, 2016, 2017a, 2017b; 2020)

## Results

In 2020, \$10.0 billion was spent on SU-attributable criminal justice costs. Costs incurred from policing crimes related to SU were the highest, followed by the costs of correctional services and court costs. Alcohol use accounted for the largest proportion of total costs at 39.8%, followed by cocaine use at 24.2% and opioid use at 11.3% (see Figure 15).



**Figure 15.** Criminal justice costs (in billions) attributable to substance use in Canada by substance and offence category, 2020



**Note:** This figure excludes criminal justice costs attributable to tobacco use as these cannot be categorized by offence category.

The distribution of criminal justice costs by offence category varied for each substance (Figure 15). In 2020:

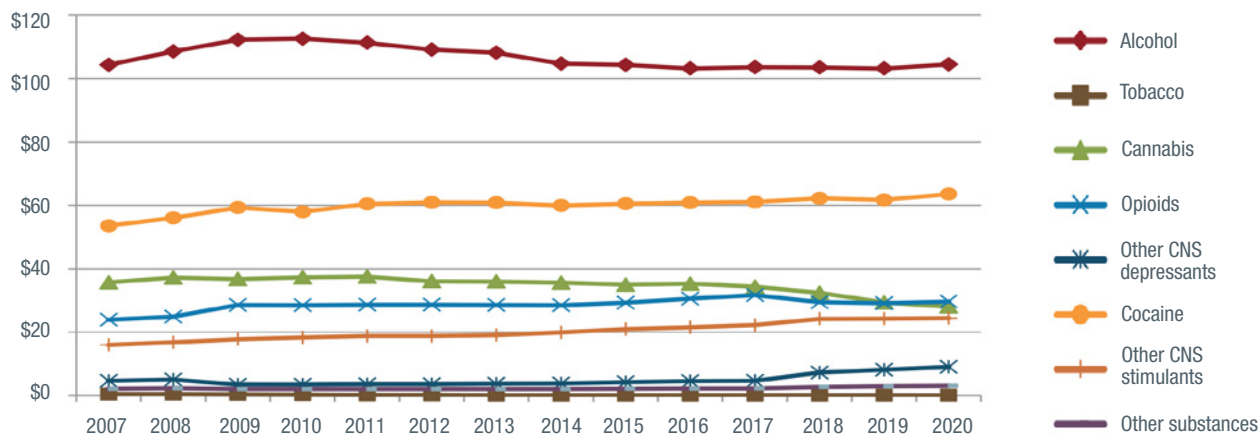
- Violent crime accounted for nearly 50% of all criminal justice costs attributable to alcohol.
- Non-violent crime accounted for a similar proportion of costs attributable to opioids (59.7%), other CNS stimulants (51.4%) and cocaine (49.5%).
- Only 20.1% of costs attributable to cannabis were for drug violations (violations of the *Cannabis Act*).
- Costs associated with impaired driving accounted for 16.8% of costs attributable to alcohol and no more than 8% of costs attributable to the other substances (excluding tobacco).

The criminal justice costs of SU in 2020 were \$262 per person. These costs were lowest in New Brunswick and dramatically higher in the territories (see Figure 16).

**Table 16.** Per-person criminal justice costs attributable to substance use in Canada by province and territory, 2020

Province or territory	Total Cost
Newfoundland and Labrador	\$246
Prince Edward Island	\$260
Nova Scotia	\$261
New Brunswick	\$224
Quebec	\$232
Ontario	\$268
Manitoba	\$350
Saskatchewan	\$361
Alberta	\$242
British Columbia	\$248
Yukon	\$903
Northwest Territories	\$1,508
Nunavut	\$1,945
Canada	\$262

Total per-person criminal justice costs increased 9.0% between 2007 and 2020. However, there were differences by substance. Criminal justice costs associated with alcohol use remained unchanged at \$104 per person in both years (0.2% increase) (see Figure 17). Per-person criminal justice costs attributable to cannabis use decreased 21.0% from \$34 in 2007 to \$27 in 2020, owing to fewer incidents, charges and admissions for cannabis possession after the introduction of the *Cannabis Act* in 2018. During that same time, per-person criminal justice costs associated with the use of other CNS stimulants and other CNS depressants increased by 50.6% and 58.0%, respectively.

**Table 17.** Per-person criminal justice costs attributable to substance use in Canada by substance, 2007–2020

continued



Table 17. continued

Substance	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Alcohol	104	109	112	113	111	109	108	105	104	103	104	103	103	104
Tobacco	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cannabis	36	37	37	37	38	36	36	36	35	35	34	32	29	28
Opioids	24	25	29	28	29	29	29	29	29	31	32	29	29	30
Other CNS depressants	5	5	3	3	4	4	4	4	4	5	5	7	8	9
Cocaine	54	56	59	58	60	61	61	60	61	61	61	62	62	64
Other CNS stimulants	16	17	18	18	19	19	19	20	21	22	22	24	24	24
Other substances	2	2	2	2	2	2	2	2	2	2	2	3	3	3

## Limitations

Despite having relatively comprehensive data, some manipulation was required to calculate estimates. For example, we needed to reorganize correctional admissions data by offence category (i.e., impaired driving violations, violations of the *Controlled Drugs and Substances Act*, and violent and non-violent crimes). To do so, we allocated correctional admissions to the relevant offence categories according to the same distribution as that observed for court cases with guilty verdicts and sentencing to custody or community supervision. Further, only policing data have information on the substance involved in impaired driving and drug-violation offences (e.g., alcohol- and drug-impaired driving, or cannabis or cocaine possession). We used policing data to allocate court charges and correctional admissions to specific violations under these offence categories.

We accounted for both the frequency (count) and “weight” of a given offence to estimate costs. In particular, we used data from the Crime Severity Index to estimate policing costs more accurately. This method assumed that police spend more time and resources on more serious crimes (e.g., drug trafficking or homicide). This is true in many but not all cases. This method may have resulted in an underestimation of costs for crimes deemed less serious in the Crime Severity Index, such as impaired driving. However, in the absence of other standardized, nationally representative data sources on policing resources by offence type, this approach has greatly improved the precision of our estimates.

We also needed to impute some missing data. While we retrieved policing and corrections costing data directly from nationally representative surveys, there was no equivalent data source for courts. We obtained courts costing data directly from federal and provincial public accounts for the four largest provinces and made imputations to distribute costs across the provinces and territories for which there were no data.

Criminal justice costs associated with tobacco use include costs for federal control and enforcement only. These costs should therefore be considered underestimates as we were unable to obtain provincial or territorial estimates for these costs or for other federal policing, courts and correctional services costs related to tobacco use (e.g., incidents related to tobacco smuggling).







## Other Direct Costs

Other direct costs include estimates for expenditures related to SU across several categories. They include costs for research and prevention, which are considered policy costs (Single et al., 2003), and costs associated with fire and damage to motor vehicles. Other direct costs also include workplace costs not already covered in our review of lost productivity costs: costs related to employee assistance programs, social assistance programs<sup>24</sup> and drug testing programs, and administrative costs associated with workers' compensation.

Our methods to estimate SU-attributable costs varied significantly across the different categories. Some expenditures, such as costs associated with workplace drug testing and federal spending dedicated to SU research and prevention, are considered 100% attributable to SU. For other categories, such as property damage from fires or damage to motor vehicles attributable to the use of a particular substance, we used the attributable fraction approach to estimate the proportion of costs attributable to SU. Methods used for each category are described in detail in the technical report. The data sources used to develop the cost estimates are listed in Table 7.

**Table 7.** Data sources used to estimate other direct costs attributable to substance use

Costs or Harm	Data Source
Research and prevention	Health Canada Substance Use and Addictions Program; Canadian Institute for Health Research; Heart and Stroke Foundation; Canadian Cancer Society; Canadian Lung Association Canadian Partnership Against Cancer; Canadian Council for Tobacco Control; Traffic Injury Research Foundation; Treasury Board of Canada Secretariat: Tobacco Control Strategy 2007–2020
Fire damage	Provincial or territorial fire marshal and fire commissioners reports 2007–2020; personal communications with provincial or territorial fire marshals and fire commissioners
Damage to motor vehicles	National Collision Database (Transport Canada, 2022) (counts); General Insurance Statistical Agency (2022) (costs)
Workplace drug testing programs	Recent Alcohol and Drug Workplace Policies in Canada: Considerations for the Nuclear Industry (Barbara Butler & Associates Inc., 2012) (counts and costs)
Employee assistance programs	Survey of Employment, Payrolls and Hours 2007–2020 (Statistics Canada, 2022n); Labour Force Survey 2007–2020 (Statistics Canada 2022q); The Prevalence and Characteristics of Employee Assistance, Health Promotion and Drug Testing Programs in Ontario (Macdonald & Wells, 1995) (counts); personal communications with Morneau Shepell (costs)

*continued*

<sup>24</sup> Canada Pension Plan and Quebec Pension Plan disability benefits.



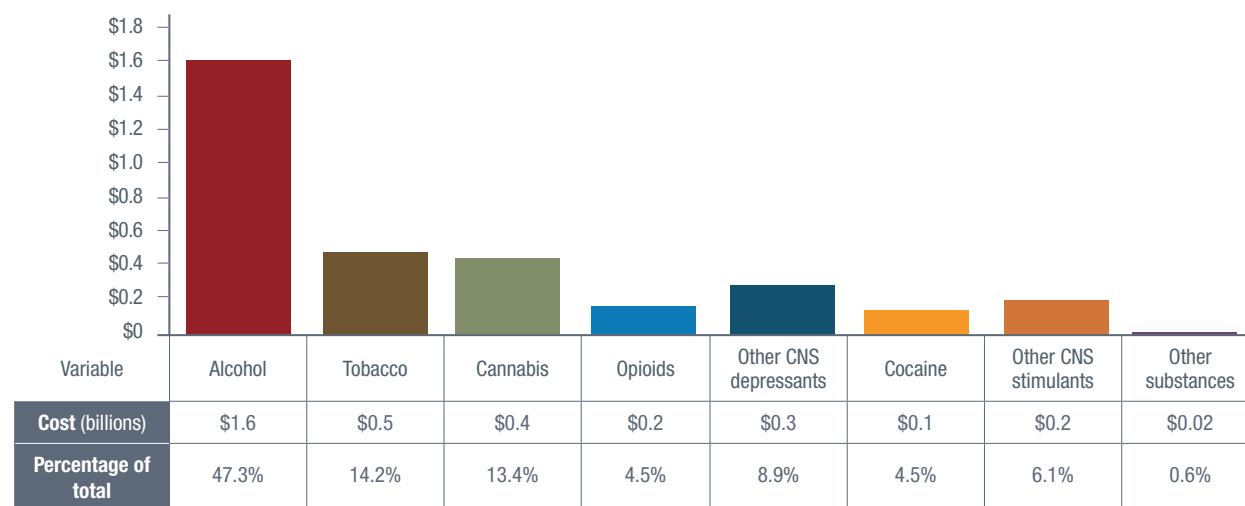
Table 7. continued

Workers' compensation administrative costs	Provincial or territorial workers' compensation boards annual reports 2007–2020
Social assistance	Canadian Pension Plan (CPP) Disability Benefits by Class of Diagnosis (Employment and Social Development Canada, 2022) and Quebec Pension Plan (QPP) Disability Benefits (Government and Municipalities of Quebec, 2022) (counts and costs)

## Results

In 2020, over \$3.3 billion was spent on other direct costs attributable to SU. Close to half (47.3%) of these costs were attributable to alcohol use (see Figure 18). Tobacco use accounted for the second-highest proportion of other direct costs at 14.2%.

**Figure 18.** Other direct costs (in billions) attributable to substance use in Canada by substance, 2020

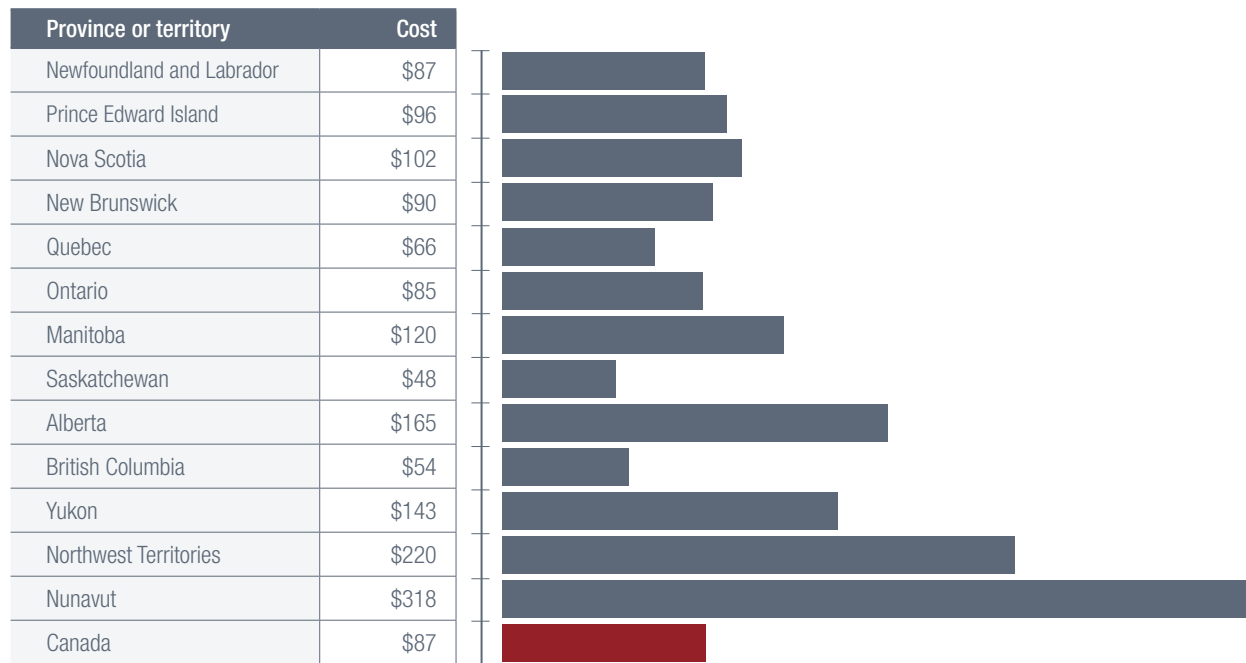


The largest proportion of other direct costs was associated with damage to motor vehicles, which accounted for nearly 40% (\$1.3 billion) of the costs. This was followed by fire damage to property, which amounted to \$897 million in costs.

Other direct costs attributable to SU per person are shown in Figure 19. In 2020, for Canada as a whole, \$87 per person was spent on other direct costs attributable to SU. The range in costs was fairly wide across the country with a low of \$48 spent per person in Saskatchewan and a high of \$318 spent per person in Nunavut.



**Figure 19.** Other direct costs per person attributable to substance use in Canada by province and territory, 2020



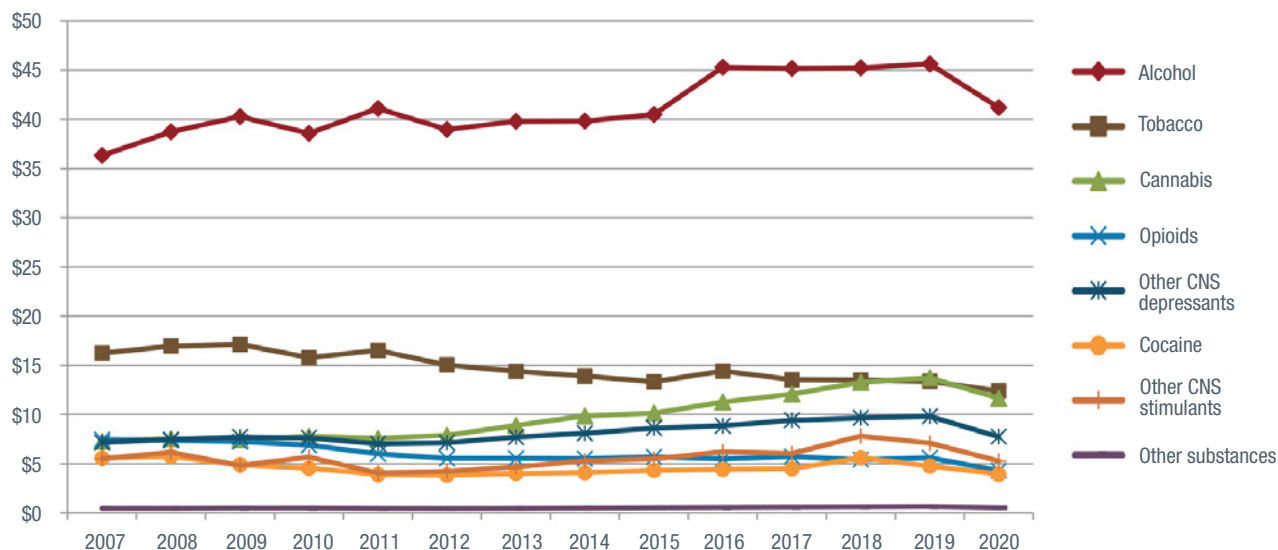
The other direct costs per person attributable to SU increased just 1.2% from 2007 to 2020 (see Figure 20). More specifically, in this period:

- Per-person costs associated with alcohol use increased 13.4% from \$36 to \$41.
- Cannabis-attributable costs increased 60.4% from \$7 to \$12.
- Per-person costs associated with opioid use decreased the most of any substance category, at 42.3% (from \$7 to \$4 per person).

These yearly cost trends largely mirror those of damage to motor vehicles, which is consistent with the major contribution of this cost category to the total amount of other direct costs. For this reason, a large decline in overall motor vehicle damage costs between 2019 and 2020 — likely due to decreased driving during the pandemic — drove a 13.3% decrease in total other direct costs in this time.



**Figure 20.** Other direct costs per person attributable to substance use in Canada by substance, 2007–2020

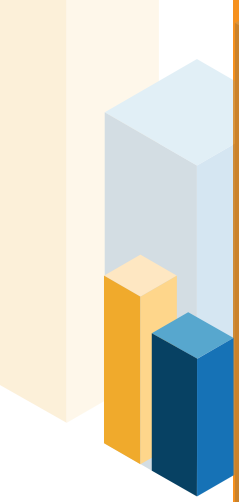


Substance	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Alcohol	36	39	40	39	41	39	40	40	40	45	45	45	46	41
Tobacco	16	17	17	16	17	15	14	14	13	14	14	13	13	12
Cannabis	7	8	7	8	8	8	9	10	10	11	12	13	14	12
Opioids	7	7	7	7	6	6	6	6	6	5	6	5	6	4
Other CNS depressants	7	7	8	8	7	7	8	8	9	9	9	10	10	8
Cocaine	6	6	5	5	4	4	4	4	4	4	4	6	5	4
Other CNS stimulants	6	6	5	6	4	4	5	5	5	6	6	8	7	5
Other substances	0	0	0	0	0	0	0	1	1	1	1	1	1	1

## Limitations

The datasets that were used to estimate other direct costs attributable to SU varied significantly. The unique limitations associated with each dataset are described in the technical report. In general, the other direct costs attributable to SU were largely accounted for by expenditures on damage to motor vehicles (39.6% in 2020) and fire damage (27.1%) and so were largely influenced by the limitations associated with these datasets. Cost estimates for substance use research and prevention are conservative as we were not able to include federal programs primarily for mental health services, which may contain some substance use-related components, nor provincial and territorial substance use research and prevention programs due to a lack of centralized data sources for all regions. Costs of social assistance disability benefits are also conservative because we based our estimates only on Canada Pension Plan or Quebec Pension Plan disability payments. In the future, we will explore including costs of provincial or territorial disability benefits and other forms of social assistance as the data become available.







## Discussion

In 2020, SU cost Canada more than \$49 billion or \$1,291 for every person. SU also resulted in the equivalent of 742 hospitalizations and 203 lives lost per day. The resulting grief felt by communities across Canada is unquantifiable. While total per-person costs increased over 11% between 2007 and 2020, the trajectory in costs and harms varied by substance.

### Alcohol and Tobacco

Alcohol and tobacco were responsible for at least 60% of the total cost of SU for the past 14 years. However, the share of costs and harms shifted over this time: costs attributable to alcohol grew about 21%, while those for tobacco declined almost 20%. Although tobacco was by far the deadliest substance for every year examined, alcohol use led the way in total costs for all study years because it can be attributed to injuries and deaths of people at a younger age and was therefore responsible for more lost years of productive life. Alcohol use also accounts for nearly 40% of all criminal justice costs due to its role in violent and non-violent crime and impaired driving.

The diverging costs of alcohol and tobacco use may be explained by the presence of strong public health policies designed to curb tobacco use. Examples include package warning labels, increased taxation and advertising restrictions. Fewer equivalent, recently updated policies exist for alcohol. For instance, alcohol advertising restrictions have not been updated in recent decades. These modifiable factors shape the economic and physical availability of alcohol and, in turn, rates of alcohol use. Increased education about the health risks associated with different levels of alcohol use may also play a role in reducing alcohol-attributable costs and harms (Paradis et al., 2023).

Costs and harms of alcohol use presented in this report are conservative as they account for some health benefits associated with low levels of alcohol use (i.e., represent net, not gross, costs of alcohol use). Different research groups make different assumptions about whether the use of alcohol in moderation can protect against heart disease. In general, the scientific basis for these protective effects is increasingly questioned (Ortolá et al., 2019; World Heart Federation, 2022). The impact of applying these different assumptions on estimates of alcohol-attributable harms has been explored by Sherk et al. (2019). In the future, we will explore separating the estimated health harms and benefits of alcohol use to provide both gross and net estimates of attributable costs and harms.

Estimates of harms attributable to tobacco are restricted to outcomes of smoking tobacco and tobacco or nicotine poisoning. While vaping nicotine is likely associated with fewer health risks than smoking tobacco, evidence on the association between vaping nicotine and respiratory conditions is unclear (O'Leary et al., 2017). It is also difficult to differentiate health impacts caused by smoking tobacco and vaping nicotine products among those who have used both products. We will continue to monitor the evidence on vaping nicotine as it accumulates and incorporate estimates of costs and harms accordingly.

### Cannabis

By 2020, we estimated that just under one in five people in Canada used cannabis in the past year. This represents roughly a two-fold increase from 2007. In contrast, overall per-person costs attributable to cannabis use increased just over 5% in this time, to the equivalent of \$2.4 billion in 2020. Notably, per-person costs of cannabis use decreased about 9% between 2018 and 2020 following legalization of recreational use. This compares to a 16% increase between 2007 and 2018. While it is difficult to tease apart the effects of legalization and the impacts of the pandemic on SU levels and patterns, it appears that reduced criminal justice costs (14% between 2018 and 2020, owing to fewer policing incidents, charges and



admissions for cannabis-related drug violations) were not offset by increasing healthcare or lost productivity costs. However, our estimates do not include costs associated with regulation and compliance for legal retail cannabis, which likely increased substantially following legalization. As Canada approaches five years after the introduction of the *Cannabis Act* and navigates recovery from the pandemic, it will be important to monitor rates of harm in different population groups, such as poisoning among children and youth due to the availability of high-potency cannabis edibles and extracts.

## Opioids

Opioid use accounted for the third-highest costs at \$7.1 billion or 14.4% of the total costs. Nearly 75% of these costs were related to lost productivity and, more specifically, people dying at a young age from opioid use. More than twice as many people in Canada died of opioid use in 2020 as did in 2007. The acceleration in our estimates of opioid-attributable costs clearly corresponds with the proliferation of fentanyl and a range of harmful substances in the unregulated drug supply (CCENDU, 2013, 2020a). Costs and harms of opioid use reached their highest level in 2020 as the COVID-19 pandemic made the drug supply even more toxic and unpredictable, and disrupted access to services (CCENDU, 2020).

While the costs of opioid use peaked in 2020, there were signs of improvement between 2018 and 2019. This may be explained by national efforts across the spectrum of harm reduction, treatment and awareness, such as increased access to naloxone, observed consumption and drug checking services, and opioid-agonist therapy (Strike & Watson, 2019). Continued investment and adaptation of these initiatives will be required to further reduce opioid harms. For instance, opioids are now most commonly smoked (as opposed to injected) in some regions (BC Coroners Service, 2022; Cheng et al., 2022). Further research may inform policy making and program planning to ensure people who smoke drugs have access to services such as safer inhalation supplies, observed inhalation facilities and smokable safer supply options.

Estimates of opioid-attributable deaths presented in this report differ from those released by the Government of Canada. In September 2022, the Special Advisory Committee on the Epidemic of Opioid Overdoses (2022) released public health surveillance data with updated numbers of apparent opioid-related deaths. Estimates presented here are higher. For example, the Government of Canada reported 3,703 deaths in 2019 and 6,415 in 2020. In contrast we estimated 4,867 deaths in 2019 and 6,491 in 2020.

Our estimates are different for several reasons:

- The counts provided by the Government of Canada only include poisoning (toxicity) deaths. Our estimates include poisoning as well as other partially attributable conditions, such as infectious diseases attributable to opioid use and motor vehicle collisions.
- The Government of Canada public health surveillance estimates include all deaths caused by a poisoning (intoxication or toxicity) resulting from SU, where one or more of the substances was an opioid. Additionally, in certain years, estimates for some regions include deaths from all illicit substances (British Columbia) or all substances (Quebec) (Special Advisory Committee on the Epidemic of Opioid Overdoses, 2022). We attributed only a portion of polysubstance poisoning deaths involving opioids to opioids.
- The data sources for the two updates were different. We acquired national vital statistics data from Statistics Canada, while the Government of Canada acquired its public health surveillance data from provincial and territorial offices of chief coroners or chief medical examiners. These data differ for numerous reasons that vary by province and territory and over time. For instance, public health surveillance data include cases with ongoing investigations into the cause of death, while vital statistics data only include cases with closed investigations. Hence, our estimates are likely conservative for recent years.



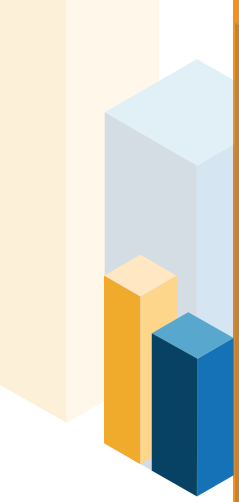


## Cocaine and Other CNS Stimulants

In 2020, costs attributable to cocaine and other CNS stimulant use were \$4.2 billion and \$3.0 billion, or 8.5% and 6.2% of the total costs, respectively. Total per-person costs attributable to other CNS stimulant use increased the most of any substance (nearly 72%) between 2007 and 2020. These costs are likely driven by methamphetamine use (CCENDU, 2019, 2022). Costs attributable to cocaine use decreased from the years 2007–2013 but changed course from 2014 onwards, largely mirroring the trends in costs due to opioid and other CNS stimulant use: a decrease in 2019 following years of steady increases, and then a sharp rebound in 2020. The growth in stimulant-related harms and similar trajectory with opioid-related harms likely reflect increasing polysubstance use among people who use drugs from the unregulated supply. This may be done intentionally to offset or enhance the effects of each drug (Boileau-Falardeau et al., 2022). Polysubstance use may also be unintentional; for instance, synthetic opioids like fentanyl can be present in substances that people expect to be stimulants (CCENDU, 2020).

## The COVID-19 Pandemic and Substance Use

In general, the lockdowns introduced to counter the COVID-19 pandemic were associated with increased use and some related harms associated with most types of SU. It should be noted, however, that reductions in healthcare costs were observed in 2020, likely due to difficulties in people with non-COVID-19 related illnesses accessing treatment during this time. Looking beyond 2020, it is possible these delays in care may result in increased costs and harms associated with SU-attributable health conditions such as cancer for which early intervention is critical.





## Strengths and Limitations

Making comprehensive estimates of costs associated with healthcare, lost productivity, criminal justice and other direct costs for eight categories of substances, 13 provinces and territories, and across 14 years is a substantial undertaking. Throughout this work, we used best practice methodologies and drew upon the most up-to-date relevant survey and administrative data sources available to us.

Notable strengths of the project include:

- Use of the latest World Health Organization methodologies to assess burden of disease (Degenhardt et al., 2016) and estimates for the contributions of SU to disease and injury as, for example, summarized in the International Model of Alcohol Harms and Policies (Sherk et al., 2017; Sherk et al., 2020);
- Comprehensive modelled estimates of SU prevalence by age, sex, province and territory, year and type of substance. These estimates incorporate data from about 150,000 people living in Canada who have completed various national, provincial and territorial surveys, as well as multiple national datasets on retail sales and hospitalization data specific to SU;
- Application of recommended modern methods for estimating impacts on lost productivity resulting from both long-term disability and premature death (Schroeder, 2012; see also Sorge et al, 2019); and
- Use of a comprehensive survey administered to people when they are admitted to federal penitentiaries that specifically asks about the role psychoactive substances played in their crimes.

These strengths are the foundation of the Canadian Substance Use Costs and Harms project and have remained largely the same since our first report. However, we were able to improve our methodologies for the calculation of new estimates for the period of 2007 to 2020. The following section describes major differences in methods used for the current report as compared with the two previous reports.

## Methodological Differences from Previous Reports

In many cases, we improved upon the limitations of methods used in previous Canadian Substance Use Costs and Harms reports by incorporating more timely, accurate or complementary data sources. In other cases, data sources used previously were no longer available. For full details of the methods used, see the technical report.

### ***Substance Use Prevalence Estimates***

We have refined our approach to modelling substance use prevalence estimates with each Canadian Substance Use Costs and Harms report. For estimates presented in this report, we incorporated two auxiliary datasets to enhance the precision of estimates for illegal substances (e.g., data on hospitalizations 100% attributable to substance use and police drug seizures). The addition of these new data added substantial power to our analytic estimates as they harness relatively large, routinely collected sets of data from each province and territory for each year, and in the case of hospitalization data, for each SU category, by age and sex.



## **Healthcare**

The methods we used to calculate healthcare costs and harms for 2007 to 2020 were largely the same as the ones we used for previous reports. One minor improvement made initially for the 2015–2017 report involved a change to the ICD-10-CA codes included in the “other substances” category. We only included discharges that had a T-code (e.g., injury, poisoning, certain other consequences of external causes) associated with one of the substance categories. This change reduced the count of in-patient hospitalizations, day surgeries and emergency department visits attributed to the “other substances” category compared with the estimates for the 2007–2014 report.

For this present report, we also developed methods to calculate costs of paramedic services attributable to substance use. These estimates are presented in the healthcare costs section.

## **Lost Productivity**

The methods we used to estimate the costs associated with premature mortality were the same as those used for the 2015–2017 report. These methods more accurately distribute polysubstance poisoning deaths into the substance categories compared with methods used for the 2007–2014 report, which relied on in-patient hospitalization proportions for substance poisonings. We also expanded the criteria for defining a SU-attributable death by including three new ICD-10-CA codes for the 2015–2017 and the current reports.<sup>25</sup>

The methods used to estimate long- and short-term disability costs for this report were different from those used in the first two reports. Our previous approach for estimating long-term disability relied on questions from the Canadian Community Health Survey (CCHS) assessing lack of participation in the workforce due to being “permanently unable to work.” However, the questions used for this estimation approach were discontinued. As a result, we updated our methods and used data from the Canadian Pension Plan Disability Benefits and Quebec Pension Plan Disability Benefits detailing the average monthly number of people receiving disability benefits.

For the previous two reports, we estimated short-term disability using a measure of workplace interference due to alcohol or drugs derived from the CCHS. The questions used in those analyses were also removed from the CCHS. Due to these changes, we obtained data from the Labour Force Survey estimating the days lost in a year due to personal illness or disability. These method changes are advantageous as the new data sources are routinely updated and produced estimates that were stable across the entire study period.

## **Criminal Justice**

We enhanced methods to calculate costs related to policing, courts and correctional services in numerous ways. These include:

- Calculating separate crime attributable fractions for males and females, and in turn the costs of criminal justice attributable to substance use by sex;
- Accounting for the differential cost of offences (e.g., homicide versus simple drug possession). This means that our cost estimates for a given offence category reflect not only the frequency of the incident, charge or admission but also the corresponding “weight.” Our previous estimates only accounted for the first component;
- Assigning the offence category of correctional admissions based on court sentencing data. Previously, these categories were assigned based on policing data; and
- Using nationally representative survey data on policing and correctional service expenditure. The previous source for criminal justice expenditure (Story & Yalkin, 2013) only provided estimates to 2012 and for the four largest provinces.

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<sup>25</sup> The three new codes are X44, accidental poisoning by and exposure to other and unspecified drugs, medicaments and biological substances; X64, intentional self-poisoning by and exposure to other and unspecified drugs, medicaments and biological substances; and Y14, poisoning by and exposure to other and unspecified drugs, medicaments and biological substances, undetermined intent.



### **Other Direct Costs**

We used largely the same methods for this report as we did for the first two reports. We used linear regression to substitute estimates in cases where more recent data could not be found. One major change was the addition of social assistance costs to this cost category.

### **Limitations**

While we have made many enhancements to our methods to improve their strengths, there are also limitations and areas of uncertainty that should be recognized when interpreting the estimates and placing them in context. Most of these limitations have already been described in the relevant sections of the report. However, the following limitations apply more broadly.

### **Reliance on Self-Reported Data**

We relied extensively on self-reported data throughout the project. It is well known that self-reported levels of SU, particularly for illegal substances, are underestimated to some degree (Zhao et al., 2009). As a result, we have likely underestimated the prevalence of SU and costs associated with partially SU-attributable health conditions. Fortunately, the majority (about 70%) of health conditions related to illegal SU are wholly attributable to substance use: that is, they can be estimated directly from diagnostic data and do not need to be imputed from self-reported survey data using the attributable fraction methodology. As a result, this area of uncertainty is relatively small.

### **Reliance on Existing Data to Estimate Costs by Sex**

Where possible, we obtained data by sex to improve the precision of our substance use prevalence estimates, attributable fractions and final SU-attributable costs and harms. We defined biological sex in binary terms (i.e., male or female) as data on intersex people were lacking. In a few cases, these data sources contained information on gender identity only, which was used in place of data on biological sex. Additional detail on these limitations is available in the technical report. In the future, we will continue to assess the availability of data by sex and other demographic variables, and improve our estimates where possible.

### **Use of Hospitalizations to Estimate Other Costs**

Like Rehm and colleagues (2006), we relied heavily on estimates of the contribution of SU to hospitalizations given the strong and reliable data available from the Canadian Institute for Health Information. The proportional contributions by substance and year to hospitalizations (called “in-patient hospitalization proportions” in this report) were directly applied to other cost areas, including prescription drugs, specialized treatment, physician time, and long- and short-term disability. We cannot be certain of the extent to which these proportional contributions by different types of substance apply to these diverse areas of health care. We also inherited limitations in each of the major databases we drew upon for our analyses.

### **Contribution of COVID-19 to Substance Use-Attributable Harms**

COVID-19 infection is not included in our list of health conditions attributable to substance use. However, COVID-19 likely contributed to increased substance use costs and harms in 2020 by exacerbating pre-existing health conditions. Roughly 90% of people in Canada who died of COVID-19 between March and December 2020 had at least one comorbidity or complication at the time of their death (Statistics Canada, 2021). There is considerable overlap between the most common comorbidities and SU-attributable health conditions, such as hypertensive disease, ischemic heart disease, chronic lower respiratory diseases, diabetes and cancer.

It is difficult to differentiate the precise roles of COVID-19 infection versus these comorbidities in hospitalizations and deaths, so our estimates may not reflect the true excess burden of costs and harms caused by COVID-19. We will incorporate evidence about the relationship between substance use and COVID-19 in the future as it becomes available.

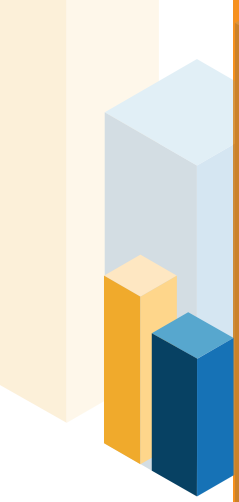


### **Missing Costs**

The list of cost categories included is not exhaustive, and the project would benefit from additional cost categories, such as the costs of harm reduction services and lost productivity due to incarceration. In all cases, we erred toward including costs that could be quantified with available data and research. We will examine additional cost categories to determine whether to include them in future studies. While we believe we have already captured most costs related to SU, we recognize that the addition of new cost categories could further improve our understanding of the costs of SU in Canada.

Despite these limitations and assumptions, we used the most up-to-date, reliable and comprehensive data and methods available in developing our estimates. We will continue to seek out better data and research as it becomes available to continue improving our estimates. Until such data and research become available, we feel confident that we have developed the best estimates possible.









## Conclusions

These estimates paint a picture of the current costs and harms associated with SU in Canada, and how these have evolved over the past 14 years. They are a baseline against which to monitor the impacts of current and future policies designed to improve the health, productivity and experiences of people in Canada as these relate to SU. They also provide some insights into the impacts of recent policy changes and major events such as the COVID-19 pandemic on substance use and associated harms and costs.

Alcohol's status as the substance that contributes the most social and economic costs in Canada has been enhanced in recent years. Alcohol use and related harms increased during the COVID-19 pandemic alongside a continued deregulation of its availability. Lessons learned from Canada's robust public health response to the continuing pandemic of tobacco-related illnesses could be applied to reduce harms of alcohol use.

Costs of opioid use have diverged from rates of use in Canada, reflecting the severe impacts of toxic synthetic opioids present in the unregulated drug supply. We also observed rapid growth in costs associated with stimulants. This speaks to the increasing polysubstance nature of poisoning harms, and a need to tailor policies and services to the needs of people who use multiple substances together, whether intentionally or unintentionally. These initiatives may also be informed by research and evaluation to understand existing gaps in services, such as those for people who smoke drugs.

SU costs and harms can be reduced through investment, implementation and expansion of evidence-based policies and programs across the spectrum of prevention and care. *Canadian Substance Use Costs and Harms* provides evidence upon which to base such efforts and against which to measure their success.



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