The Impact of Substance Use Disorders on Hospital Use

Technical Report

November 2014

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Executive Summary

Background

A better understanding of the impact of substance use disorders (SUDs) on Canada's hospitals will inform decision making and resource allocation for prevention, education and treatment to improve client care and reduce system costs. Although there have been reports assessing the impact of SUDs on hospital use (Canadian Institute for Health Information, 2008, 2012, 2013b), research to date has examined all SUDs together as a undifferentiated group rather than individually by substance. However, the harms associated with different substances and the trends and patterns in their use vary considerably. This report is the first to examine hospital use by substance (e.g., alcohol, opioids, cannabis and solvents).

Methods

Data and information about inpatient stays or separations are collected by the Canadian Institute for Health Information (CIHI). The Canadian Centre on Substance Abuse (CCSA) analyzed the data on number of hospital stays, number of days stayed in hospital and cost associated with hospitalization where the primary diagnosis was a substance-related disorder for the six fiscal years spanning 2006–2007 to 2011–2012. The analysis further broke down the data according to substance, age and gender.

The inpatient separations considered in this report are those for which the primary reason for hospital stay was mental and behavioural disorders due to psychoactive substance use, referred to as substance use disorder or SUD. The analysis does not include hospital stays in which the patient's condition may be indirectly attributable to SUD (e.g., someone admitted to hospital with liver disease attributable to chronic alcohol consumption would be assigned a primary diagnosis of liver disease, not mental and behavioural disorder due to use of alcohol). As a result, the numbers presented in the report underestimate the extent to which substance use impacts the use of hospital services. Although the magnitude of this underestimation is not known, it is likely very large.

Results

In 2011, about 1.2% of all hospital stays were due to a primary diagnosis of substance use disorder.

As of 2011, the SUDs that consume the most hospital resources in terms of number of stays, days stayed and cost are those associated with, in descending order, alcohol, opioids, cannabinoids, cocaine, and other stimulants.[1]

Though the majority of the hospitalizations related to SUDs occur in general hospitals, stays in psychiatric hospitals for SUDs are on average about three times longer than stays in general hospitals.

Most Canadians who access services for SUDs do so outside of the hospital system. The National Treatment Indicators project reported on 236,193 episodes[2] in publicly funded substance use treatment services in 2011–2012 versus the 34,746 hospital stays[3] attributable to SUDs identified in this report.

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1 This ranking excludes those diagnosed with "mental and behavioural disorders due to multiple drug use and use of other psychoactive substances," as this category lacked specificity and was difficult to interpret. For more on why this category was excluded please refer to the methods section.

2 This figure does not include data from Quebec, New Brunswick, the Northwest Territories or Nunavut. An episode refers to admission to a specific treatment service. A person can access several different services or re-enter the same service more than once in a given year and therefore have multiple episodes.

3 This figure includes all provinces and territories.

Among SUDs, **alcohol** is responsible for the greatest use of hospital resources:

- In 2011, the number of hospital stays for those with an alcohol-related disorder was more than 10 times greater than for those with an opioid-related disorder (the next highest).

- The number of hospital stays for alcohol-related disorders increased **over 15%** between 2006 and 2011. This increase was three times greater than the increase for those diagnosed with disorders due to the use of all other psychoactive substances combined (5%).

- Days spent in hospital due to alcohol-related disorders **increased by 8%** from 2006 to 2011.

- The increase in days stayed in hospital due to alcohol-related disorders was largely because of an increase among males and those aged 45 to 64.

Opioids in 2011 surpassed cocaine as being the family of drugs responsible for the second greatest use of hospital resources:

- From 2006 to 2011 there was a **23% increase** in hospital stays due to opioid-related disorders.

- The number of days stayed in hospital due to opioid-related disorders **increased 48**% from 2006 to 2011.

- The largest number of days stayed in hospital due to opioid-related disorders (over 8,500 in 2011) occurred among individuals aged 25 to 44.

- Between 2006 and 2011, the largest increase in days stayed in hospital for opioid-related disorders was among those aged 65 and older at 142%.

Cannabinoids[4] steadily increased between 2006 and 2011 as a reason for the use of hospital resources, mainly because of increases in cannabinoid-related disorders among youth age 15 to 24.

- Hospital stays due to cannabinoid-related disorders **increased by about 44%.**

- Days spent in hospital due to cannabinoid-related disorders **increased by 40%.**

- Youth aged 15 to 24 spent the largest number of days in hospital due to use of cannabinoids. The days spent in hospital among this age group increased by almost **40%.**

Cocaine dramatically decreased as a cause of hospitalizations between 2006 and 2011.

- The number of hospital stays for cocaine-related disorders **decreased by over 55%.**

- The number of days stayed in hospital due to cocaine-related disorders **decreased by 48%.**

- Decreases were mainly due to a drop in admissions among those aged 25 to 44.

Cost

The cost associated with hospitalization for those with a primary diagnosis of substance use disorder **increased by 22%** from approximately $219 million in 2006 to $267 million in 2011.

- The majority of these costs were due to hospitalizations for alcohol-related disorders (more than $140 million in 2011).

- The cost estimates represent a small proportion of the direct healthcare costs attributable to SUDs.

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4 The term cannabinoid is used instead of cannabis or marijuana because any hospitalizations for synthetic cannabinoid use would also be included in this category.

Polysubstance Use

Data analyzed suggest that the number of hospital stays for disorders attributable to polysubstance use was large, second only to alcohol. However, due to the manner in which the data were collected (combining polysubstance use and other unidentified substances), this category was ambiguous and it was impossible to accurately assess the number of hospitals stays attributable to polysubstance use.

Implications

The most effective way to reduce the impact of SUDs on hospital resources is by preventing the harms associated with SUDs from reaching a level of severity where hospitalization is necessary.

Alcohol

- There is substantial evidence establishing the efficacy of the Screening, Brief Intervention, and Referral to Treatment model in primary healthcare settings as a means to prevent or reduce the serious long-term harms associated with excessive alcohol use

- *Canada's Low-Risk Alcohol Drinking Guidelines* provide another tool to reduce the harms associated with alcohol use by, for example, identifying gender-based consumption limits.

Opioids

- The current report indicates the need to focus intervention efforts in particular on adults aged 25–44 and on seniors aged 65 and over given their increased rates of hospitalization due to opioid-related disorders. It also highlights the importance of age- and substance-specific interventions.

Cannabinoids

- The younger age of those with cannabinoid-related hospitalizations provides further evidence of the importance of targeted programming. Unfortunately, there are significant gaps in knowledge and capacity for preventing and treating illicit drug use among youth. These knowledge gaps are being addressed, for example, through the development of standards for effective prevention programming, the validation of screening tools for youth and research on the specific needs of youth in transition between child, youth and adult services (e.g., CCSA's *Canadian Standards for Youth Substance Abuse Prevention*; Chaim & Henderson, 2013).

Conclusions and Next Steps

This report is a first step toward a better understanding of the impact substance use disorders have on Canada's hospitals. The information included in this report can be used to target efforts more precisely and effectively so that we may prevent the harms of substance abuse from reaching a level of severity where hospitalization is necessary.

CIHI data on hospitalizations related to substance use add to existing data sources, such as the Canadian Alcohol and Drug Use Monitoring Survey, the Canadian Community Health Survey and the National Treatment Indicators, to contribute to a comprehensive national picture. CCSA anticipates continuing to work with CIHI and other partners to conduct further analyses — for example looking at re-admission rates and overdose data — that will contribute to a proactive, effective and evidence-based approach to reducing the harms of substance use in Canada.

Introduction

Substance use impacts all Canadians, through individual experience, friends, colleagues or loved ones who have experienced problems or through the shared economic burden of health, criminal justice and lost productivity. According to the 2012 Canadian Community Health Survey, 4.4% of Canadians aged 15 and older met the criteria for a substance use disorder (SUD) in the past 12 months (Statistics Canada, 2013). Not all of these people access specialized substance use treatment, however, those who do are most likely to access services in the community. National treatment indicators data for addictions indicates that in 2011–2012, about 63% of treatment episodes were non-residential and that figure increases to 87% when withdrawal management is excluded (Pirie, Jesseman, Di Gioacchino, & National Treatment Indicators Working Group, 2014).

In addition, some Canadians access the hospital system to get help for problems related to substance abuse. In a report on hospital mental health services in Canada, the Canadian Institute for Health Information (CIHI) reported that people with a primary or secondary diagnosis of substance-related disorders accounted for almost 4% of all general hospital stays in 2009–2010 (Canadian Institute for Health Information, 2012). This report indicated that SUDs accounted for the third largest number of stays for those diagnosed with mental disorders, after mood disorders, and schizophrenic and psychotic disorders.

Although there have been reports assessing the impact of SUDs on hospital use (Canadian Institute for Health Information, 2008, 2012, 2013b), research to date has not looked at these impacts by individual substance. However, the harms associated with different substances, and trends and patterns in their use, vary considerably. This report is the first to analyze variables related to hospital use, such as number and length of hospital stay, according to substance. A better understanding of the impact of different substances on Canada's hospitals will inform decision making and resource allocation for prevention, education and treatment to improve client care and reduce system costs.

Methods

This report draws primarily on data from the Hospital Mental Health Database (HMHDB) for the six fiscal years spanning from 2006–2007 to 2011–2012.[5] The HMHDB is a comprehensive, pan-Canadian database administered by CIHI that contains demographic and medical diagnosis information on inpatient hospital stays for psychiatric conditions from both general and psychiatric hospitals. HMHDB data is gathered from four sources at CIHI: the Discharge Abstract Database (DAD), the Hospital Morbidity Database (HMDB), the Ontario Mental Health Reporting System (OMHRS) and the Hospital Mental Health Survey (HMHS). More detailed information on the HMHDB can be found elsewhere (Canadian Institute for Health Information, 2011, 2013a)

Capturing Information on Substance Use Disorders

When patients are discharged from hospitals in Canada, they are assigned a code indicating the main reason for their hospital stay, referred to as the individual's primary diagnosis. Unless otherwise stated, all analyses included in this report are based on patients' primary diagnosis.

The coding systems used to classify those with mental and behavioural disorders differ depending on the database. The DAD and HMDB use the Canadian enhancement of the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10-CA; Canadian Institute

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5 The HMHDB is available on the CIHI website at http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types+of+care/specialized+services/mental+health+and+addictions/hmhdb_metadata.

for Health Information, 2001) to code the diagnosis of the hospital stay. When the primary diagnosis indicates a mental and behavioural disorder due to psychoactive substance use, it also lists the substance or class of substance that is most responsible for the hospital stay. The codes in the ICD-10-CA for mental and behavioural disorders cover the use of alcohol, opioids, cannabinoids, sedatives or hypnotics, cocaine, other stimulants including caffeine, hallucinogens, tobacco,[6] volatile solvents, multiple drug use and other psychoactive substances. In these coding systems, the term "disorder" is broadly applied and includes the acute (e.g., intoxication), chronic (e.g., dependence) or mental (e.g., psychotic disorder) condition that was the primary cause of the hospital stay.

While the DAD and HMDB use the ICD-10-CA, the OMHRS uses the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, text revision (DSM-IV-TR; American Psychiatric Association, 2000) and the HMHS uses a combination of the International Statistical Classification of Diseases and Related Health Problems, 9th Revision, Clinical Modification (ICD-9-CM) and DSM-IV-TR. For comparability across the different coding systems, crosswalks for these diagnostic codes were developed by the CIHI Classifications team.[7]

The coding systems contain a great deal of detail, but there are limitations. First, the classification codes for opioid-related disorders do not distinguish between those admitted to hospital for disorders associated with prescription opioid dependence (e.g., oxycodone, hydromorphone, fentanyl) and for illicit opioid dependence (e.g., heroin). Similar limitations are present with other categorizations; for example, herbal versus synthetic cannabis. Another limitation of using the ICD coding scheme is the exclusion of hospital stays due to overdose, which is listed instead under "poisoning by drugs, medicaments and biological substances." Further, the code "Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances" is not specific and is difficult to interpret. This category is used when two or more psychoactive substances are known to be involved, but it is impossible to assess which substance is contributing most to the disorder. It is also used when the exact identity of some or even all the psychoactive substances being used is uncertain or unknown (ICD-10-CA; Canadian Institute for Health Information, 2001). By combining polysubstance use and other substances in this manner, this category is ambiguous and it is difficult to interpret what is meant by the category when presenting the data.

Indicators of Hospital Use

Hospital Stays

All analyses presented in this report are based on separations, not individuals. A hospital separation is the departure of an inpatient from hospital, due either to discharge or death (Canadian Institute for Health Information, 2012, p. 30). Inpatient separation year is based on fiscal year.[8] All analyses

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6 This category specifically refers to mental and behavioural disorders due to use of tobacco and not health related consequences of tobacco use. As such the number of hospital stays attributable to tobacco SUD accounted for only 0.03% of the total number of stays attributable to SUD.

7 More information about the crosswalks is available upon request. Some classifications could not be dealt with satisfactorily in fitting the DSM-IV-TR data into the ICD-10-CA classifications. "Phencyclidine" appears in the ICD-10 under "multiple drug use and psychoactive substances," whereas the DSM-IV groups it under "Volatile Substances."

Because of the structure of OMHRS and the DSM-IV, some drug types could not be identified. For example, codes where a mental health disorder was caused by substance use can be used for multiple substances and no field captures the specific substance type connected to this diagnosis. For example, in the DSM-IV, diagnoses for withdrawal from drugs other than alcohol (i.e., amphetamine withdrawal, cocaine withdrawal, nicotine withdrawal, opioid withdrawal, other (or unknown) substance withdrawal, and sedative, hypnotic or anxiolytic withdrawals) were all coded using one code. This makes it impossible to distinguish between substances. These are captured as "Undetermined SUDs."

Because of data quality issues, four OMHRS sites were not included in these analyses.

8 The fiscal year (FY) spans April 1 to March 31, inclusive. For the remainder of the report, FY 2006–2007 will be indicated simply as 2006, FY 2007–2008 as 2007, and so on.

exclude newborns, cadaveric donors and stillbirths. Separations are calculated for both general hospitals and psychiatric hospitals (see Appendix A for definitions). Unless otherwise stated the data for both general and psychiatric hospitals are presented together.

The inpatient separations considered in this report are those for which the primary reason for hospital stay was a mental and behavioural disorder due to psychoactive substance use, referred to as a substance use disorder or SUD, specifically those presenting with the following clinical conditions: acute intoxication, harmful use, dependence syndrome, withdrawal state, withdrawal/delirium, residual/late onset/psychotic disorder and amnesiac/other/unspecified.

The analysis does not include hospital stays in which the patient's condition might be indirectly attributable to an SUD. For example, an individual with liver disease attributable to chronic alcohol consumption would be admitted to hospital with a primary diagnosis of liver disease, not mental and behavioural disorder due to use of alcohol. Similarly, someone who broke their arm in a traffic accident that occurred while impaired after consuming cannabis would be admitted to hospital for the broken arm, not for an SUD related to cannabinoids. As a result, the figures underestimate the extent to which substance use impacts the use of hospital services. The magnitude of this underestimation is not known, but is likely very large.

Length of Stay

The HMHDB collects a large amount of information in addition to the number of stays and the primary reason for each stay. Two key pieces of information that can be used to assess impact on hospital resources are the number of days stayed and the average length of stay (ALOS). The number of days stayed was calculated by summing the number of days spent in hospital associated with each individual hospital stay. Average length of stay was calculated by dividing this sum by the number of stays. Calculations for days stayed and ALOS include days spent in alternative levels of care (ALC), as well as service interruptions. This method of calculation might result in the length of stay being inflated for certain conditions and populations (e.g., organic disorders within the elderly population).[9]

Cost

Cost figures cited in this report were calculated using hospital cost estimates, based on CIHI's Cost per Weighted Case indicator from CIHI's Canadian MIS Database (CMDB) and DAD. The estimates were provided by CIHI for patients belonging to specific CIHI Case Mix Groups (CMGs; see Appendix A),[10] which are groups of patients with similar patient characteristics and resource use.[11] The patient populations were sourced from CIHI's DAD and reflect patients who were treated and discharged from Canadian hospitals.

Within each Case Mix Group, patients were grouped further into age groups (0–14, 15–24, 25–44, 45–64 and 65+). The underlying patient data set included not only the cost estimate, but also the total length of stay of the patient, enabling the calculation of an average per diem cost by Case Mix

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9 In addition to the possibility that length of stay might be inflated for certain conditions and populations, there is also the potential for over counting of records and underestimation of LOS. OMHRS captures records for patients cared for in a designated mental health bed. If a patient was admitted to hospital in a non-mental health bed and later moved into a mental health bed (in the case where all mental health beds were full at the time of the patients admission), this patient could have two records, one in the DAD-HMDB and another in OMHRS. This possibility could lead to double counting of the same patient and his or her condition, and could impact the LOS.

10 These include Case Mix Groups related to acute intoxication, harmful use, dependence syndrome, withdrawal state, withdrawal/delirium, residual/late onset/psychotic disorder and amnesiac/other/unspecified.

11 In the present study, the CMGs used were: (1) psychoactive substance use: acute intoxication; (2) psychoactive substance use: harmful use; (3) psychoactive substance use: dependence syndrome; (4) psychoactive substance use: withdrawal state; (5) psychoactive substance use, withdrawal/delirium; (6) psychoactive substance use, residual/late-onset/psychotic disorder; (7) psychoactive substance use, amnesic/other/unspecified.

Group and age group. National per diem costs associated with psychoactive substance use by age group were estimated by averaging across all of the specified Case Mix Groups.

Per diem estimates across all Case Mix Groups were calculated for fiscal years 2009, 2010 and 2011. Per diem estimates for fiscal years 2006, 2007 and 2008 were calculated by adjusting the per diems using an inflation factor (2% per annum). The inflation factor was calculated by examining difference in per diem costs from the original three years of data. The per diem cost estimates reflect the full costs of a hospital stay, including both direct (i.e., patient care) and indirect (i.e., administrative) costs, but do not include physician services costs.

Analytic Strategy

The report is based on descriptive statistics. The numbers reported are a very close approximation of the entire knowable population, so it was not necessary to conduct tests of statistical significance to accurately describe the population over the six years covered by the report. Unless otherwise stated, increases or decreases are calculated by comparing 2006 to 2011. For each outcome indicator, data are presented for alcohol and compared with all other categories. The categories of "undetermined SUDs" and "tobacco" are excluded from the analysis of outcome variables by specific substance.

Results

Hospital Stays

Number of Hospital Stays

In 2011, there were a total of 34,746 hospital stays due to SUDs (up 10.53% from 31,437 in 2006). The number of all hospital stays for those with an SUD related to alcohol represented over half of all SUD-related hospitalizations for all years examined. In other words, the number of alcohol-related stays was larger than the number of hospital stays attributable to all other substances captured by the diagnostic codes used (i.e., cocaine, multiple drug use and use of other psychoactive substances, opioids, cannabinoids, other stimulants, sedatives or hypnotics, hallucinogens and volatile solvents), combined for all included years, and over ten times as large as the number of hospital stays attributable to any other individual substance.

The number of hospital stays for those with an alcohol-related disorder increased over 15% from 16,996 in 2006 to 19,617 in 2011 (see Figure 1) whereas the number of all hospital stays attributable to substances other than alcohol increased at a rate of approximately 5%, from 14,441 in 2006 to 15,129 in 2011, one-third the increase of alcohol-related disorders.

Approximately 90% of stays for alcohol-related disorders and approximately 80% of stays for other substances took place in general hospitals as opposed to psychiatric hospitals for all years assessed.

Figure 1. Number of all hospital stays with primary diagnosis of mental and behavioural disorder due to use of alcohol compared to all other substances
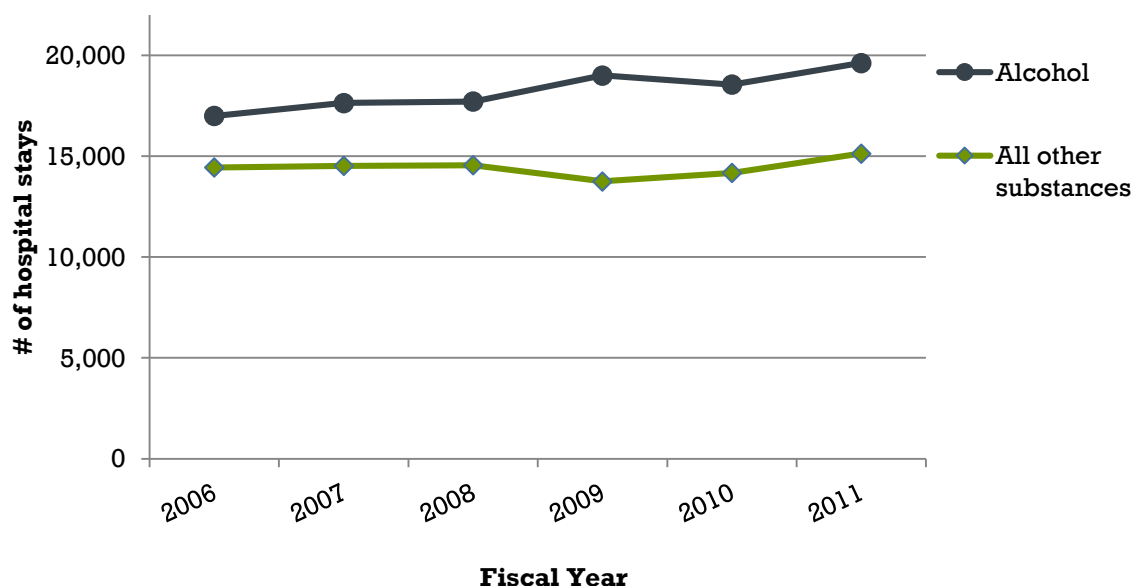

Note. Number of stays for all other substances, excluding alcohol, includes all disorder categories covered in this report (cocaine, opioids, cannabinoids, other stimulants, sedatives or hypnotics, hallucinogens and volatile solvents), as well as the category "undetermined substance use disorder" and "tobacco."

The data indicate a number of notable trends among substances other than alcohol. The number of hospital stays due to multiple drug use and use of other psychoactive substances decreased by approximately 18% from 3,757 in 2006 to 3,076 in 2009, then increased 26% from 2009 to 2011 (3,888). The number of hospital stays for cocaine-related disorders decreased by over 55% from 3,899 in 2006 to 1,737 in 2011 (Figure 2). In contrast, the number of hospital stays for those with a primary diagnosis of disorders due to the use of opioids, cannabinoids and other stimulants rose during the same time. Hospital stays for opioid-related disorders remained relatively stable for 2006 and 2007, at approximately 1,500. However, from 2006 to 2011, there was a 23% increase from 1,495 to 1,842, surpassing the number of stays related to cocaine and becoming second only to alcohol.

Figure 2. Number of all hospital stays with primary diagnosis of mental and behavioural disorder due to use of cocaine, multiple drug use and other psychoactive substances, opioids, cannabinoids, other stimulants, sedatives or hypnotics, hallucinogens, and volatile solvents
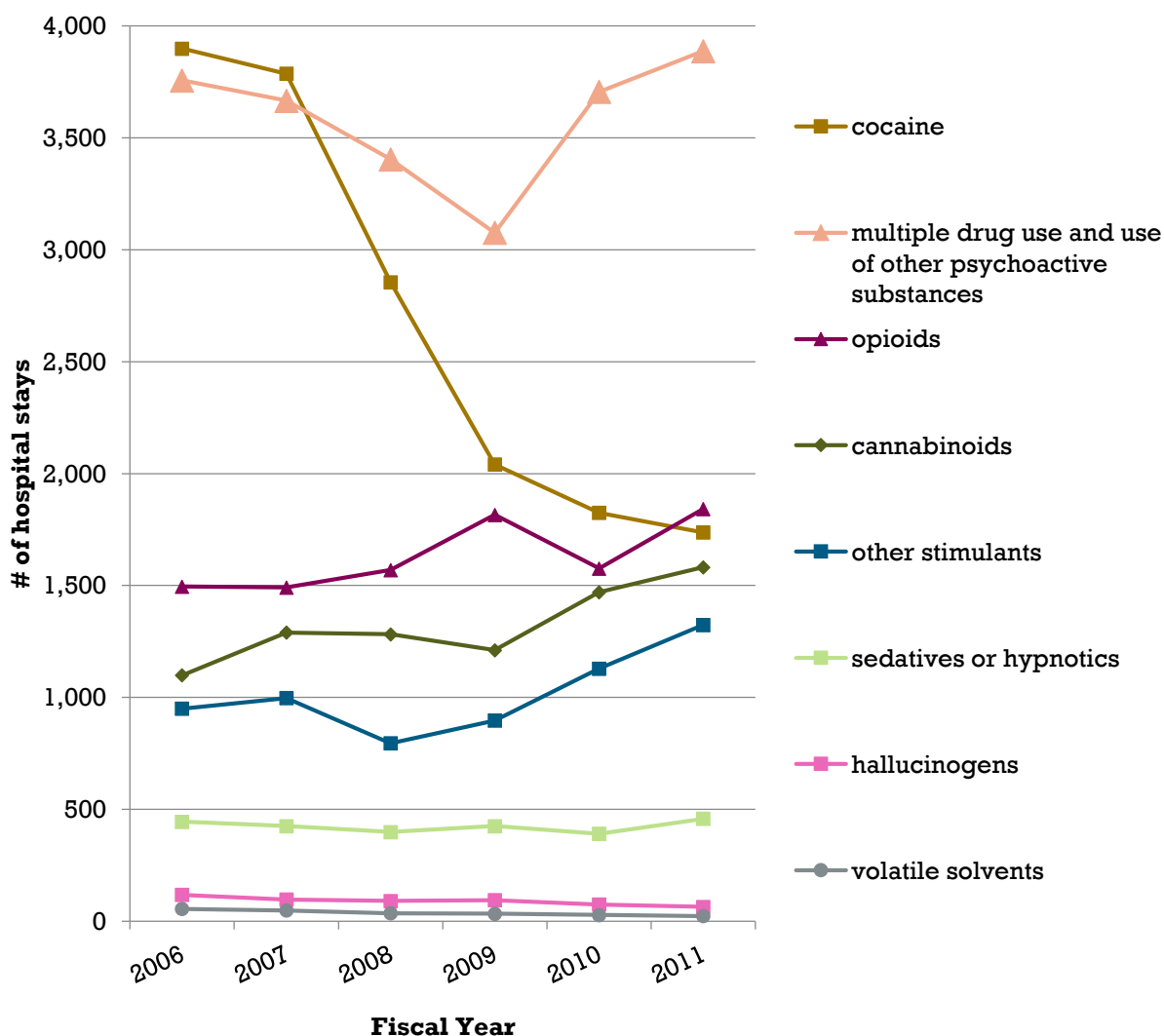
Hospital stays due to cannabinoid-related disorders remained comparatively low in number (less than 1,600 per year), but the numbers increased by approximately 44% from 1,099 in 2006 to 1,582 in 2011. A similar trend was observed among hospital stays for other stimulants, which increased by 39% from 950 in 2006 to 1,324 in 2011. The number of hospital stays attributable to sedatives or hypnotics, hallucinogens and volatile solvents remained stable and relatively low at less than 500 per year from 2006 to 2011.

Percentage of Hospital Stays

To provide some context, the number of hospital stays attributable to SUDs were compared with the number of general hospital stays attributable to any disorder in Canada. Overall, the number of hospital stays attributable to a primary diagnosis of SUD account for just over 1% of all hospital stays.

Length of Stay

While the number of hospital stays is an indicator of the extent to which individuals with SUDs seek treatment in a hospital setting, days stayed in hospital is an indicator of the degree to which various SUDs consume hospital resources. Overall days stayed for SUDs increased 9.44% from 309,645 in 2006 to 338,876 in 2011. Individuals with a primary diagnosis of an alcohol-related disorder account for the greatest number of days spent in general hospitals due to SUDs (55.26%), exceeding the combined total of all other SUDs for all six fiscal years included in the analysis (Figure 3). Days spent in hospital due to alcohol disorders increased by 8% from 173,209 days in 2006 to 187,254 days in 2011, whereas the number of days spent in hospital for other SUDs increased by 10% from 136,436 days in 2006 to 151,622 days in 2011.

Figure 3. Days stayed in hospitals for those with a primary diagnosis of mental and behavioural disorder due to use of alcohol and all other substances excluding alcohol
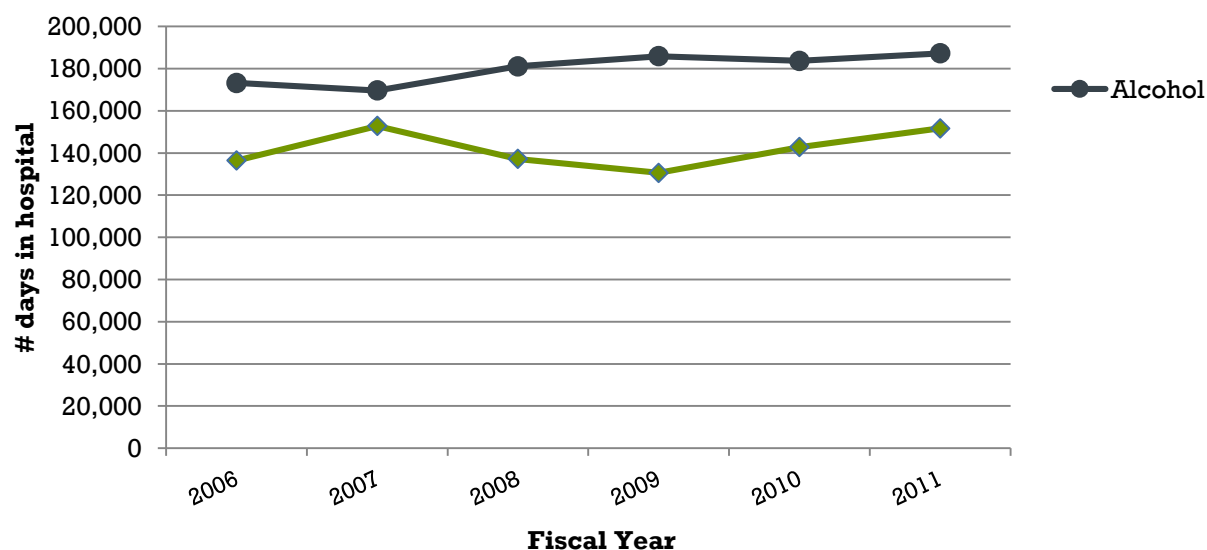
Among drugs other than alcohol, the greatest number of days spent in hospital were for multiple substance use or other psychoactive substance use, increasing by 37% from 32,266 days in 2006 to 44,072 days in 2011. The number of days stayed in hospital due to cocaine-related disorders dropped sharply by almost half (48%) from 31,263 in 2006 to 16,283 in 2011. In contrast, days spent in hospital due to opioid, cannabinoid and other stimulant-related disorders increased between 2006 and 2011: 48% from 12,461 to 18,517 for opioid-related disorders, 39% from 12,321 to 17,196 for cannabinoid-related disorders, and 63% from 6,625 to 10,808 for other stimulants (Figure 4). By 2011, both opioid and cannabinoids surpassed cocaine for number of days spent in hospital, with opioids coming second only to alcohol.

There were a few notable irregularities in the trend data. There was a sharp decrease in the number of days stayed due to cannabinoid-related disorders in 2009 and an increase in the number of days stayed due to solvent-related disorders in 2010. It is not known what could account for these fluctuations.

The majority of hospital stays were in general hospitals. The percentage of days stayed in general hospitals ranged from 64% to 72% for alcohol and 57% to 61% for substances other than alcohol. Table 1 includes the average length of stay for alcohol versus other substance-related disorders according to hospital type. Stays in psychiatric hospitals for SUDs are on average over three times as long as stays in general hospitals.

**Table 1. ALOS in days involving primary diagnosis of substance-related disorders by hospital type**

	General Hospital	Psychiatric Hospital	All Hospitals
All substance related disorders	7–8	23–28	10
Alcohol	7–8	25–37	9–10
All other substances (excluding alcohol)	7	20–25	9–11

Note. Numbers included in the cells are the range of ALOS for 2006–2011.

Figure 4. Days stayed in hospitals for those with a primary diagnosis of mental and behavioural disorder due to use of cocaine, multiple drug use and other psychoactive substances, opioids, cannabinoids, other stimulants, sedatives or hypnotics, hallucinogens, volatile solvents
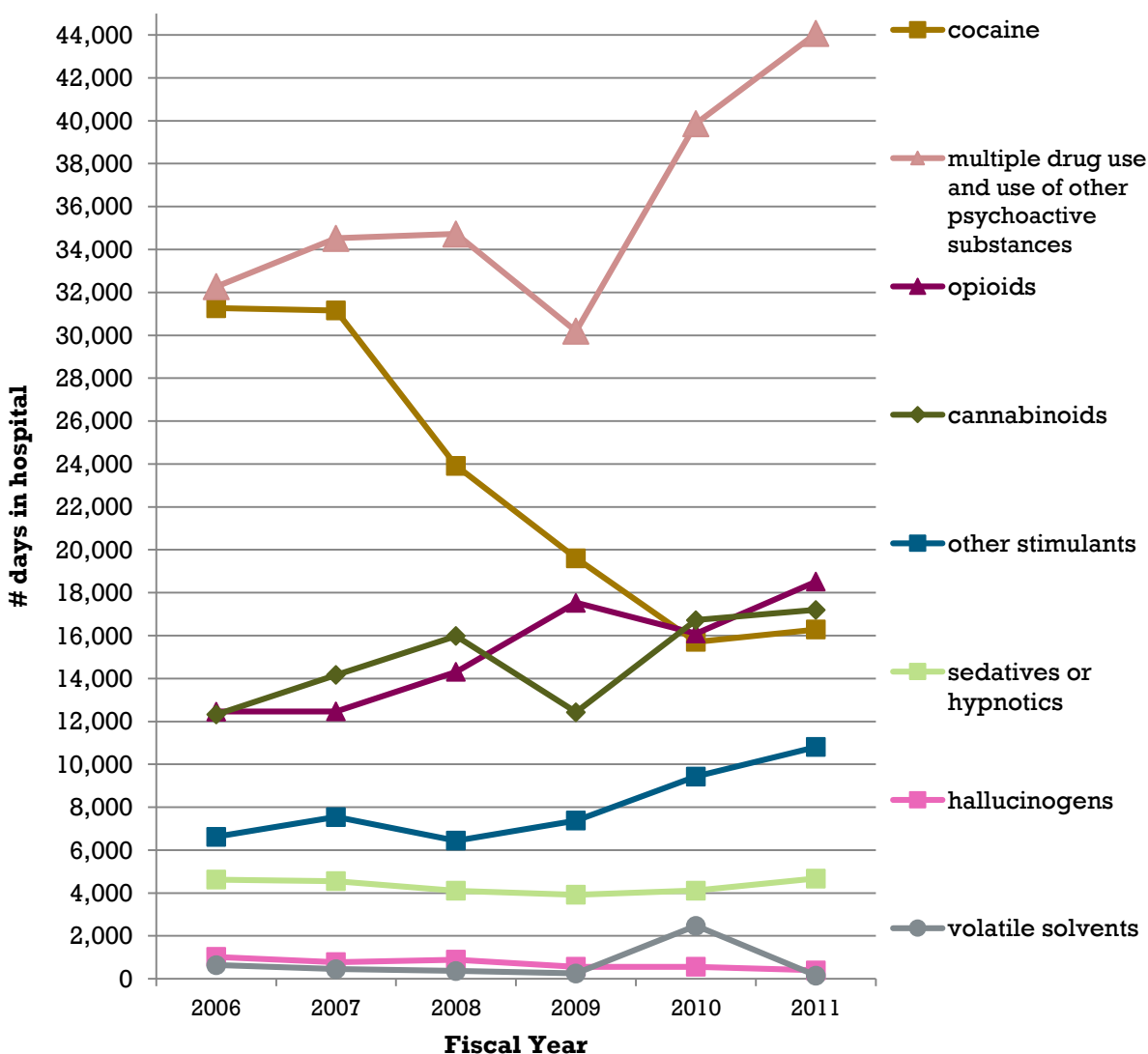
Days in Hospital for Alcohol

To further examine the increased number of days spent in hospital due to alcohol-related disorders, the data were analyzed by age and sex. The increase in days stayed in hospital due to alcohol is largely due to increased days stayed by those aged 45 to 64 (29% increase) and 25 to 44 (17% increase). Days spent in hospital by those 24 and younger remained stable, while days stayed by those 65 and older decreased by 15% (Figure 5). Increases in days spent in hospital due to alcohol-related disorders are mainly accounted for by males. The number of days stayed in hospitals for alcohol by males increased 11% from 2006 to 2011, while the number of days spent by females remained relatively stable (Figure 6).

Figure 5. Days stayed in hospitals for those with a primary diagnosis of mental and behavioural disorder due to use of alcohol by age group

Figure 6. Days stayed in hospitals for those with primary diagnosis of mental and behavioural disorder due to use of alcohol by sex

Days in Hospital for Opioids

Though there is substantial variability, the largest number of days stayed in hospitals for opioid-related disorders was among the 25–44 age group (Figure 7). The number of days spent in hospital increased among all age groups except those under 14 years old: a 56% increase for those aged 45–64, a 30% increase for those 25–44 and a 50% increase for those 15–24. However, the largest

increase in days spent in hospital was for those aged 65 and older. Days stayed in hospital due to opioid-related disorders increased 142% from 1,025 in 2006 to 2,481 in 2011. The increase in number of stays among seniors was not as large (15% from 775 in 2006 to 891 in 2011). Therefore the increase in hospital service use among seniors was due to a combination of a greater number of seniors requiring care for opioid misuse, as well as longer stays in hospital among seniors requiring help. There was also a notable one-year departure from the trend in increased length of stay among those aged 25–44; dropping from 8.406 in 2009 to 6,717 in 2010, and returning to 8,583 in 2011. While days spent in hospital due to opioid-related disorders increased for both males and females, the increase was 75% among males versus 25% among females (Figure 8).

Figure 7. Days stayed in hospitals for those with a primary diagnosis of mental and behavioural disorder due to use of opioids by age group
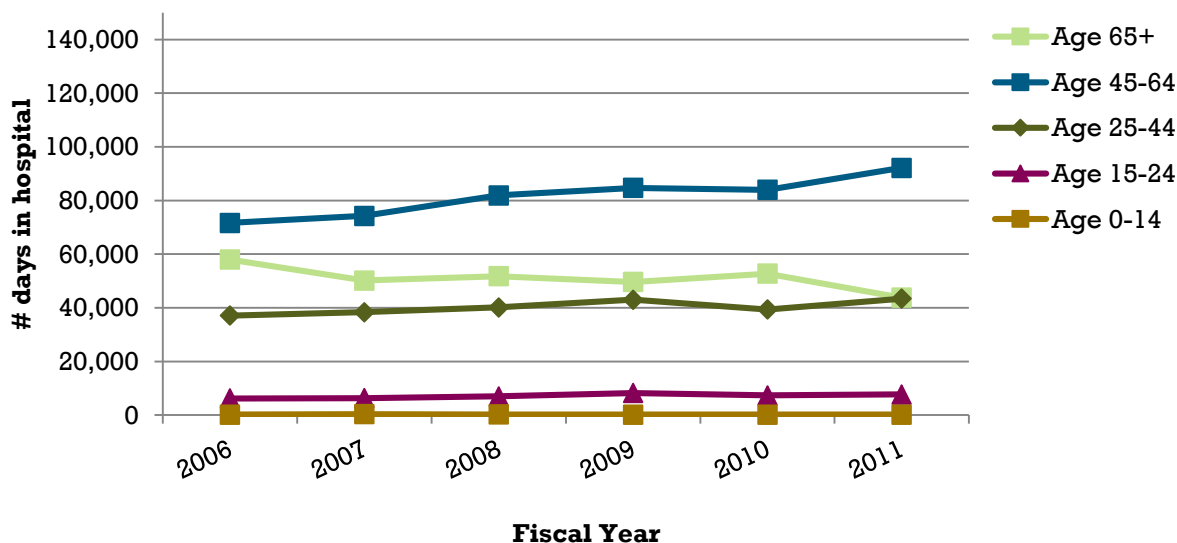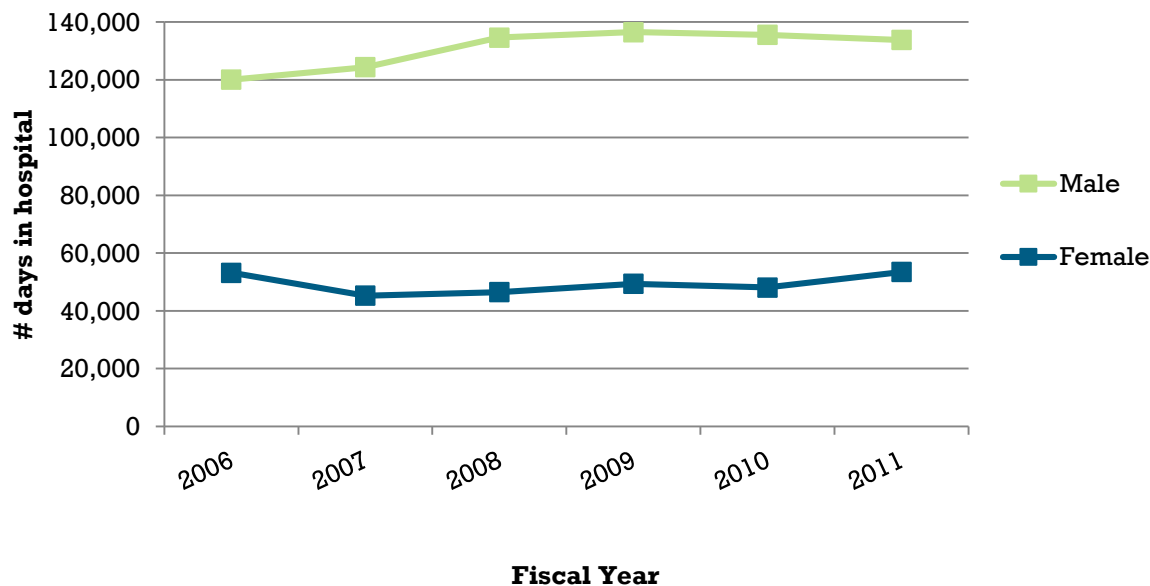

Figure 8. Days stayed in hospitals for those with primary diagnosis of mental and behavioural disorder due to use of opioids by sex
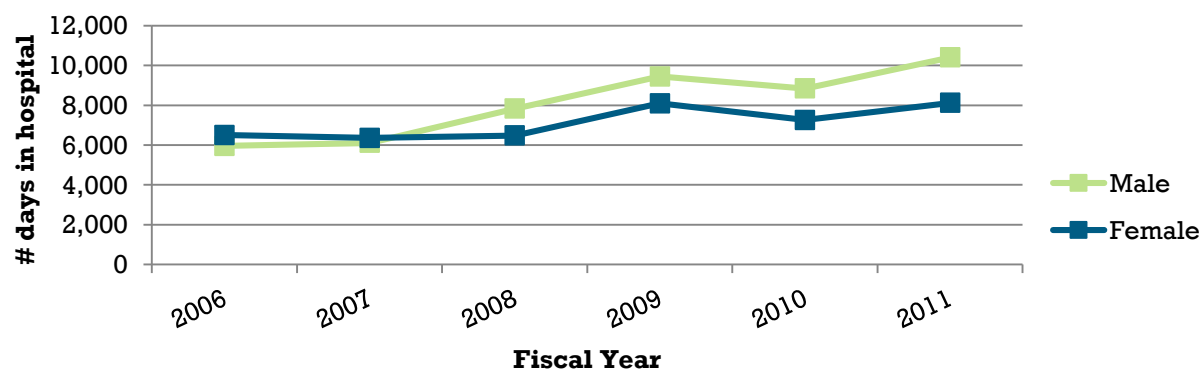
Days in Hospital for Cannabinoids

Between 2006 and 2011, days spent in hospital due to cannabinoid-related disorders increased by over 40%. Of all age groups, youth aged 15 to 24 consistently spent the largest number of days in hospital due to cannabinoid-related disorders. Days spent in hospital by this age group increased almost 40% (39.47%) from 2006 to 2011 (Figure 9). Though days spent in hospital due to cannabinoid-related disorders increased among both genders, the increase was greater for males (42.3% from 9,438 in 2006 to 13,430 in 2011) than for females (30.6% from 2,883 in 2006 to

3,766 in 2011) (Figure 10). There was a decline in days stayed for all age groups in 2009, followed by a return to trend in 2011.

Figure 9. Days stayed in hospitals for those with a primary diagnosis of mental and behavioural disorder due to use of cannabinoids by age group
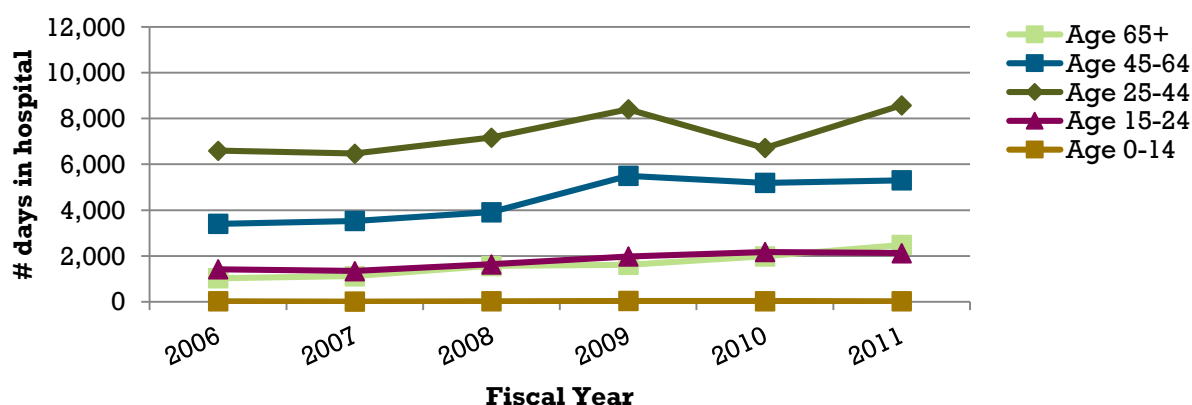

Figure 10. Days stayed in hospitals for those with primary diagnosis of mental and behavioural disorder due to use of cannabinoids by sex

Days in Hospital for Cocaine

Decreases in days spent in hospital due to cocaine-related disorders occurred primarily among those aged 25 to 44, for a decrease of 51.5% from 20,598 in 2006 to 9,984 in 2011 (Figure 11). Decreases in days spent in hospital due to use of cocaine occurred among males (47.0% from 20,209 in 2006 to 10,712 in 2011) and females (49.5% from 11,026 in 2006 to 5,571 in 2011) (Figure 12).

Figure 11. Days stayed in hospitals for those with primary diagnosis of mental and behavioural disorder due to use of cocaine by age

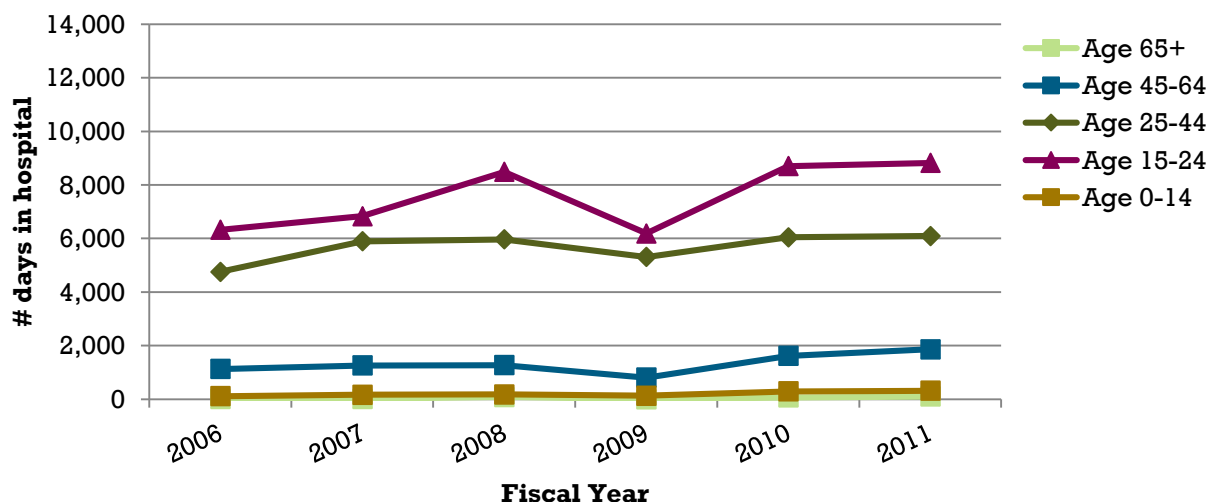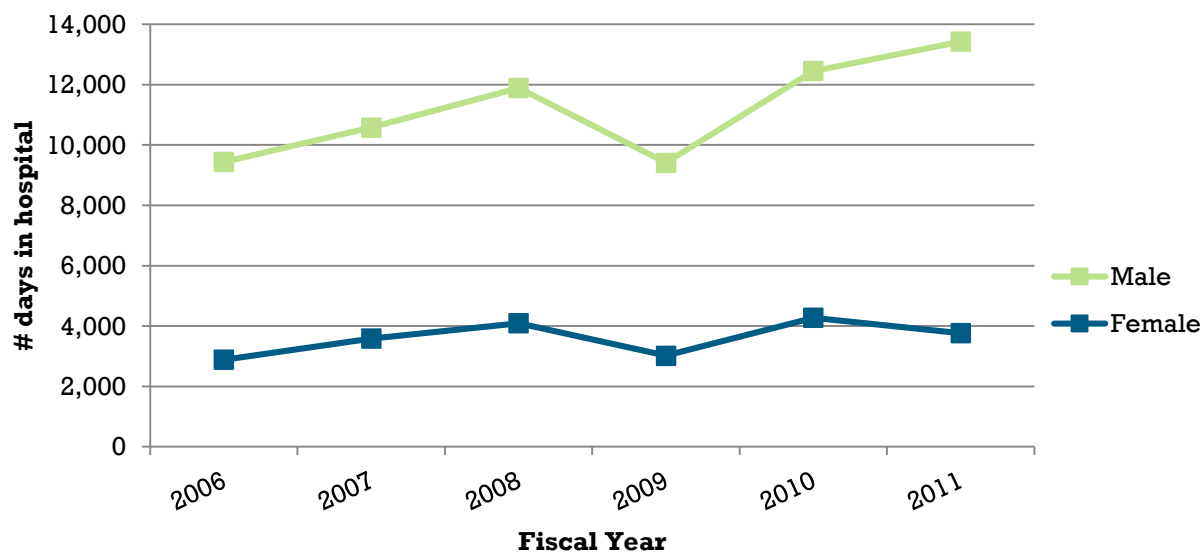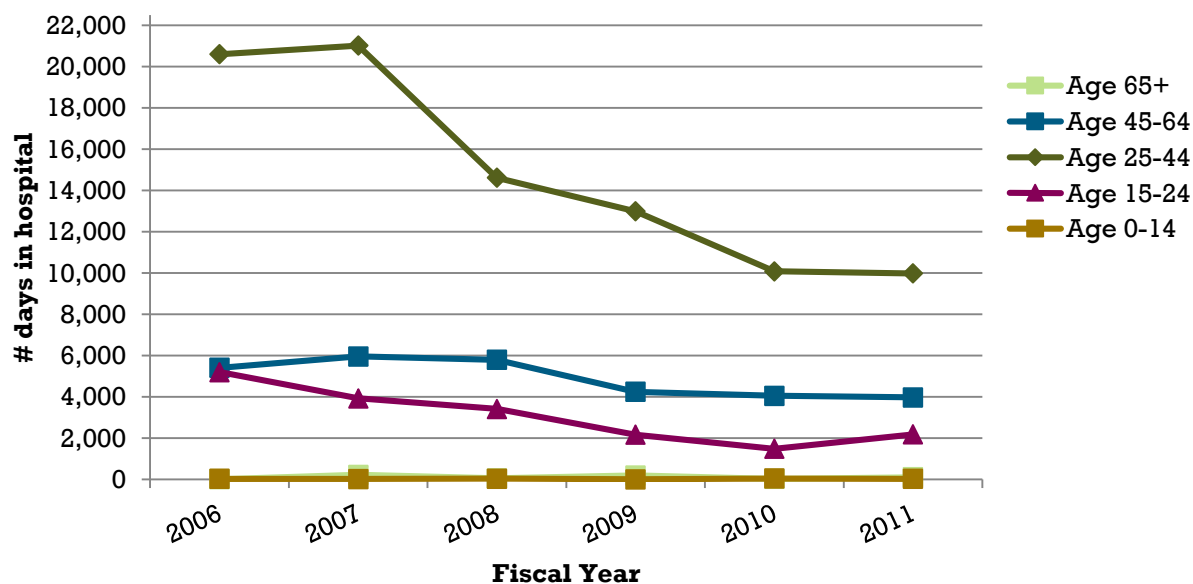**Figure 12. Days stayed in hospitals for those with primary diagnosis of mental and behavioural disorder due to use of cocaine by sex**
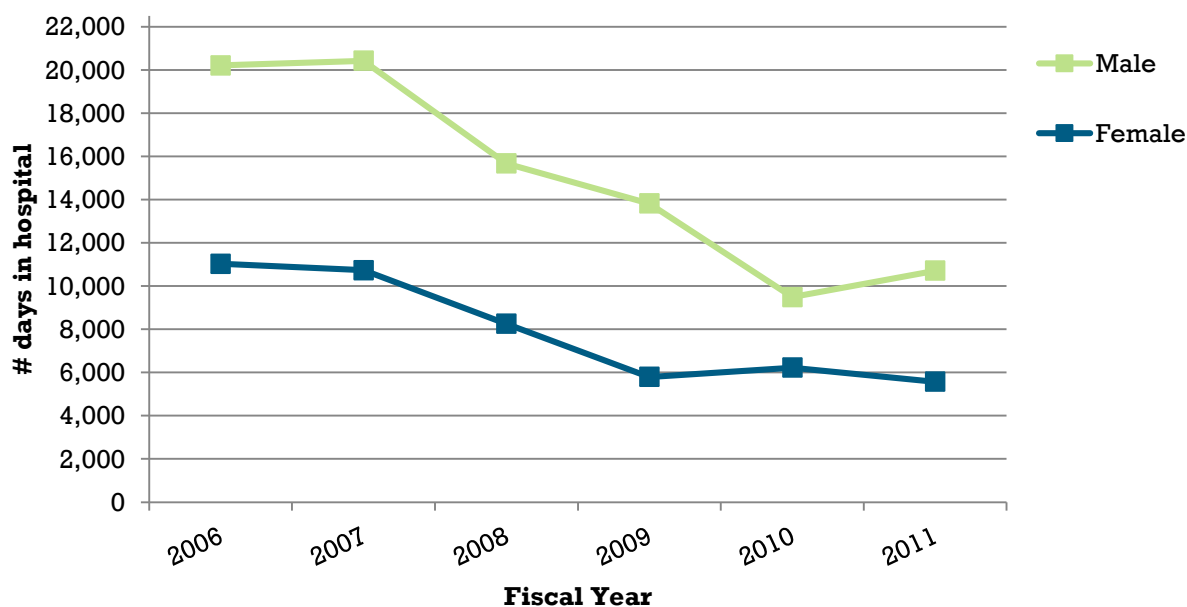
Cost

The cost associated with hospitalizations for those with a primary diagnosis of substance use disorder increased by 22% from approximately $219 million in 2006 to $267 million in 2011 (Figure 13). The majority of these costs (54%) were due to alcohol-related hospitalizations. Of the remaining substances, cocaine-, opioid- and cannabinoid-related disorders were responsible for the greatest share of the costs, with hallucinogens and volatile solvents responsible for the least.

Figure 13. Cost associated with hospitalizations for those with a primary diagnosis of mental and behavioural disorder due to use of alcohol versus all other substances excluding alcohol
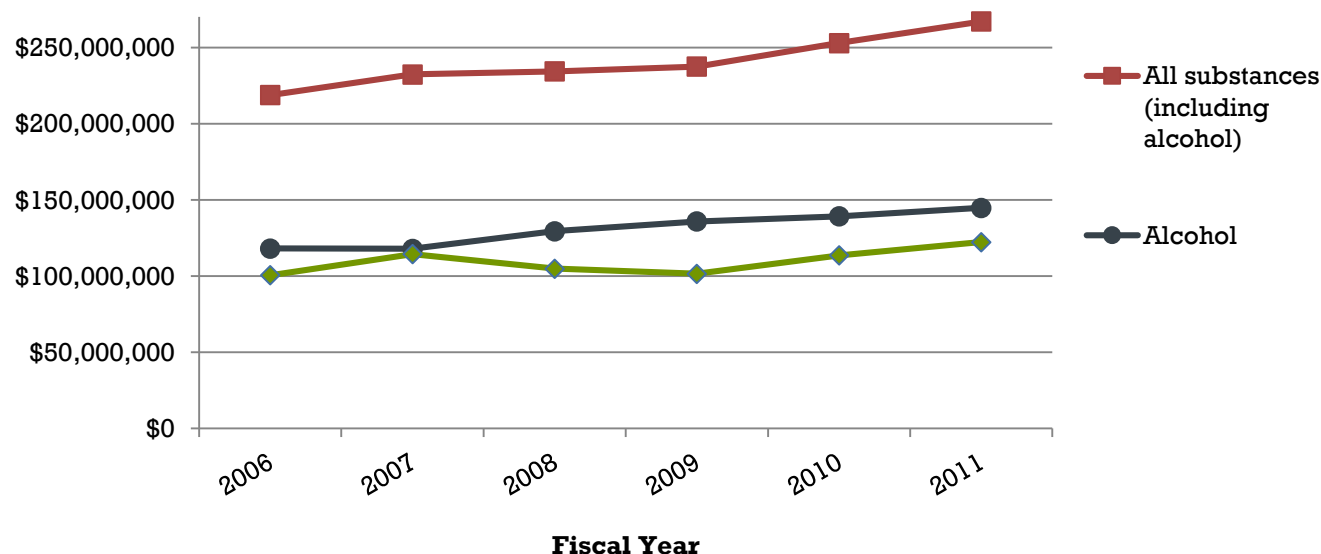
As seen with other indicators of hospital use, costs associated with hospitalizations due to cocaine disorders plummeted from over $23 million in 2006 to just over $13 million in 2011, a reduction of over 43%. However, this decrease was offset by increases among opioids (61%, from approximately $9 million to almost $15 million), cannabinoids (52%, approximately $9 million to $14 million) and other stimulants (75%, almost $5 million to almost $9 million) (Figure 14).

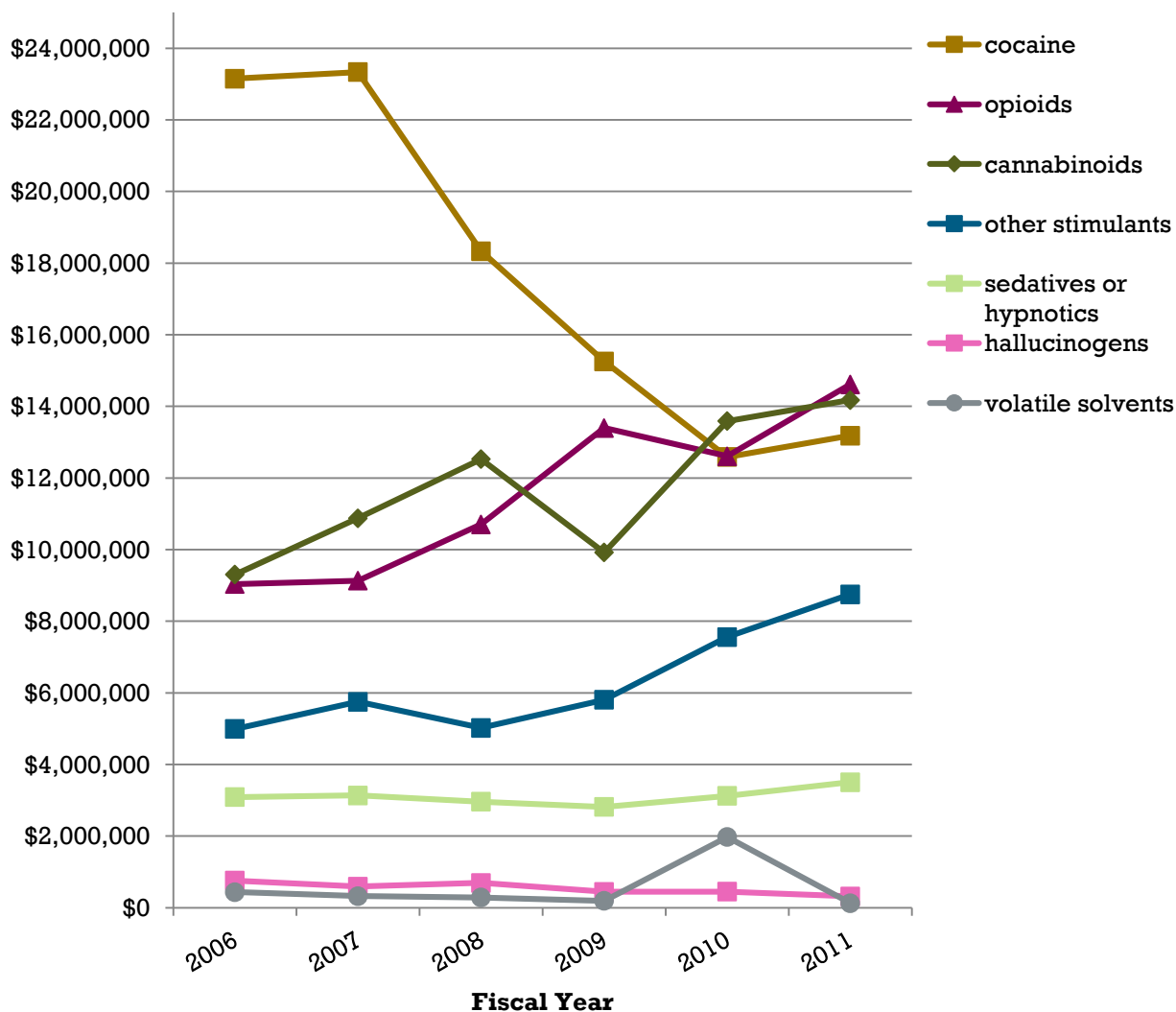**Figure 14. Hospitalization cost associated with hospitalizations for those with a primary diagnosis of mental and behavioural disorder due to use of cocaine, opioids, cannabinoids, other stimulants, sedatives or hypnotics, hallucinogens, and volatile solvents**

Discussion

This report describes trends in the substances used by those hospitalized because of a primary diagnosis of mental and behavioural disorders due to substance use. In 2011, approximately **1.2% of all hospital stays in Canada** were those with this primary diagnosis. Although the percentage seems low, it represents a total of **34,746 stays at a conservatively estimated cost of $267 million**. Further, the numbers presented in this report represent the small proportion of Canadians that experience the most severe and direct harms associated with substance use. Most of those experiencing substance-related harms will either not seek help, seek help from family or friends, or access community treatment facilities before the harms become severe enough to warrant hospitalization.

As of 2011, the psychoactive substances responsible for consuming the greatest amount of hospital resources were, in descending order, alcohol, opioids, cannabinoids, cocaine and other stimulants. Compared to these substances, people with disorders related to sedatives or hypnotics, hallucinogens or volatile solvents accounted for a negligible amount of service use. In 2011, alcohol was by far responsible for the greatest consumption of hospital services. The number of hospital stays for alcohol-related disorders was more than ten times greater than that for opioid-related disorders, which accounted for the next highest number of hospital stays.

Alcohol

Alcohol is the psychoactive substance responsible for the greatest consumption of hospital resources for all six years examined in this report. Alcohol is also the most commonly used substance with 78% of Canadians reporting use in the past year in 2011 (Health Canada, 2012). In addition to being the substance responsible for the largest impact and cost to the healthcare system, alcohol also showed the largest increases in hospital service use between 2006 and 2011. The number of hospital stays for alcohol increased over 15% between 2006 and 2011. This increase was three times greater than hospitalizations related to other SUDs.

According to the most recent national estimate of alcohol abuse, the 2012 cycle of the Canadian Community Health Survey (CCHS), 3.2% of Canadians 15 and older reported having abused or been dependent on alcohol in the past 12 months (Statistics Canada, 2013). In addition, the percentage of Canadians exceeding Canada's low-risk drinking guidelines[12] in the week before completing the survey remained relatively stable at 14–15 % from 2004 to 2011 (Health Canada, 2012).

The reason for increased alcohol-related hospitalization might not be due to a greater proportion of individuals engaging in risky drinking, but could instead be due to a greater proportion of risky drinkers experiencing more extensive harms, particularly among those aged 45 to 64 who experienced a 29% increase in days spent in hospital between 2006 and 2011. Although the rate of those reporting alcohol abuse or dependence in this age group was lower than average (2% versus 3.2%), this age group had a higher population in 2011, compared with other age groups. It is possible that individuals in this group are also more likely to begin experiencing harms associated with longer-term use. The combination of these two factors could account for at least some degree of the increased hospitalizations among those 45–64.

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12 For more information on the guidelines, see Butt et al., (2011).

Opioids

From 2006 to 2011, there was a 23% increase in hospital stays due to opioid-related disorders, whereas for alcohol it was 15%. Further, the number of days stayed in hospital due to opioid-related disorders increased by over 40% during the same time, surpassing the number of stays related to cocaine to become the single family of substances responsible for the second-highest impact on hospital resources, after alcohol.

Nationally, past-year heroin use has been stable and very low. However, retail spending on opioid drugs, per Canadian, more than doubled between 1998–2007 (Rehm, Fischer, & Gittins, 2009). In 2010, Canada was ranked second in the world in per capita prescription opioid consumption (International Narcotics Control Board, 2010). Not surprisingly, from 2008 to 2011 rates of past-year pharmaceutical pain reliever use were relatively high at more than 8 in 50 Canadians 15 years and older (Health Canada, 2012).

This elevated use of prescription pain relievers, as well as misuse of other prescription medication, prompted the development of *First Do No Harm: Responding to Canada's Prescription Drug Crisis* (National Advisory Committee on Prescription Drug Misuse, 2013), a pan-Canadian strategy to respond to this crisis. Given the number of Canadians reporting prescription versus illicit opioid use, it is reasonable to assume that the majority of opioid-related hospital stays are attributable to prescription opioids. What is unknown, however, is the rate of Canadians misusing prescription opioids as opposed to using them as directed by a physician and to what degree each is responsible for hospital stays.

The trend in prescription opioid use does not parallel the trend in hospital stays, however. The proportion of the Canadian population reporting past year use of prescription pain relievers decreased from 21.6% in 2008 to 16.7% in 2011 (Health Canada, 2012). Similar to the situation with alcohol, it is possible that the increase in opioid-related hospitalizations is due to an increase in the number of individuals experiencing opioid-related harm, even though overall the percentage of Canadians who used pharmaceutical pain relievers decreased.

Increased Hospitalization among Seniors

Though increases in days stayed due to opioid-related disorders were observed among most age groups, the largest increase — 142% from 2006 to 2011 — was among those aged 65 and older. Though there is limited data on the prevalence of prescription opioid misuse among seniors, it has been speculated that seniors might be more likely to be prescribed opioid pain relievers because of high rates of chronic pain among this population (Canadian Centre on Substance Abuse, 2013). Some of those prescribed opioid pain relievers will experience use-related harms. Given prescribing rates among seniors combined with an aging Canadian population, researchers predict that rates of seniors experiencing harms from prescription medication misuse and potentially requiring treatment for substance misuse problems will increase (Canadian Centre on Substance Abuse, 2013). The present data support this prediction.

Cannabinoids

Cannabis is the most widely used illicit substance in Canada. In 2011, approximately 9% of Canadians reported having used cannabis in the past year. Although rates of cannabis use in the population have been decreasing (Health Canada, 2012), hospitalization due to use of cannabinoids steadily increased between 2006 and 2011. During this period, hospital stays due to cannabinoid-related disorders increased by approximately 44% and days spent in hospital increased by 40%.

Rates of use among Canadian youth are considerably higher than among adults, with 21.6% of those 15–24 reporting use in the past year versus 6.7% of those 25 and older (Health Canada, 2012). In 2007, almost one in 20 Canadian senior high school students reported using cannabis daily or almost daily (Young et al., 2011). In 2009, Canada had the highest prevalence of 15 year olds who reported using cannabis in the past 30 days (18%) among the 37 countries participating in the Health Behaviour of School Aged Children study (Currie et al., 2012). Predictably, those in the age group of 15–24 spent the largest number of days in hospital due to cannabinoid-related disorders.

Cocaine

Between 2006 and 2011, the number of hospital stays for cocaine-related disorders decreased by over 55% and the number of days stayed in hospital due to cocaine disorders decreased by 48%. This parallels decreased use of cocaine among national survey respondents. According to the 2012 Canadian Alcohol and Drug Use Monitoring Survey, past-year cocaine use declined from a rate of 1.9% in 2004 to 0.9% in 2011 (Health Canada, 2012). However, it is worth noting that stays for other stimulants increased by 39% from 950 in 2006 to 1,324 in 2011. It is possible that there is a substitution effect where other stimulants are replacing the use of cocaine and that this might at least partially account for the increase.

As with opioids, however, it is important to recognize that available data do not capture all cocaine use, particularly for marginalized populations such as those who are street-involved and at higher risk of illicit drug use. Because these populations have fewer social supports and higher health needs, and engage in higher-risk drug use, they could also be more likely to require hospital-based interventions.

Polydrug Use and Use of Other Psychoactive Substances

Polydrug use among drug users is common (Leri, Bruneau, & Stewart, 2003; Roy, Richer, Arruda, Vandermeerschen, & Bruneau, 2013). In a 2012 survey of clients of harm reduction sites across British Columbia, over 70% reported polysubstance use (Kuo, Shamsian, Tzemis, & Buxton, 2014). Data analyzed suggest that the number of hospital stays for disorders attributable to polysubstance use might be high (second only to alcohol). However, due to the manner in which the data were collected, it was impossible to accurately assess the number of hospital stays attributable to polysubstance use.

Implications

The most effective way to reduce the impact of SUDs on hospital resources is by preventing and reducing the harms associated with SUDs from reaching a level of severity where hospitalization is necessary. According to the 2012 Canadian Community Health Survey, 4.4% of Canadians meet the criteria for a substance use disorder. However, the *National Treatment Indicators Report* indicates that only a small minority are accessing publicly funded treatment services provided outside of hospitals (Pirie et al., 2014). Ideally, all Canadians would have access to an evidence-based, comprehensive system of services and supports covering everything from prevention to specialized services (National Treatment Strategy Working Group, 2008). This system would allow SUDs to be addressed before they reach a point of crisis for which hospitalization is necessary, reducing the impact on both the individual and the healthcare system.

In a context of limited fiscal and program resources, the current report illustrates the potential value of reducing hospital costs through effective efforts aimed at preventing and reducing harms associated with drug use, as well as through a continuum of treatment options. The different age,

gender and substance use profiles illustrated in the hospital data presented in this report also illustrate the importance of ensuring these services are targeted to meet the needs of different population groups.

This report clearly illustrates that the greatest impact can be achieved by reducing hospitalizations for alcohol-related disorders. Screening, Brief Intervention, and Referral to Treatment (SBIRT) is an early-intervention, public-health approach that provides treatment services to individuals who are not seeking or are unlikely to seek treatment when they first experience harms related to substance use or are at risk of experiencing such harms (Babor et al., 2007). There is a substantial evidence base establishing the efficacy of the SBIRT model in primary healthcare settings as a means to prevent or reduce the serious long-term harms associated with excessive alcohol use (Kahan, Wilson, & Becker, 1995; Reid, Fiellin, & O'Connor, 1999; Wilk, Jensen, & Havighurst, 1997).

Canada's Low-Risk Alcohol Drinking Guidelines provide another tool to reduce the harms associated with alcohol use. These evidence-based guidelines were developed by a team of independent Canadian and international experts to clearly identify patterns of alcohol use that will reduce both acute (e.g., binge drinking) and long-term (e.g., dependency) harms that can lead to hospitalization (Butt et al., 2011).

The increase in opioid-related hospitalizations highlights the importance of better understanding and addressing the problem of opioid misuse in Canada. The strategy presented in *First Do No Harm: Responding to Canada's Prescription Drug Crisis* includes recommendations for improving our capacity to prevent and respond to prescription opioid misuse (National Advisory Committee on Prescription Drug Misuse, 2013). The strategy highlights the importance of research and improved data collection. The current report indicates the need to focus on adults aged 25–44 and on seniors aged 65 and over given their increased rates of hospitalization for opioid-related disorders. It also highlights the importance of age- and substance-specific interventions, given the older profile of opioid-related hospitalizations overall.

The younger profile of those with cannabinoid-related hospitalizations provides further evidence of the importance of targeted programming. Unfortunately, there are significant gaps in knowledge and capacity for addressing cannabis use among youth. The effectiveness of the SBIRT approach has not been demonstrated reliably with drugs other than alcohol (Young et al., 2014). These knowledge gaps are being addressed, for example, through the development of standards for effective prevention programming, the validation of screening tools for youth and research on the specific needs of youth in transition between child, youth and adult services (e.g., CCSA's *Canadian Standards for Youth Substance Abuse Prevention*; Chaim & Henderson, 2013). The implementation of lessons learned from this research, however, will require resources. The current report provides evidence to support investment in efforts that will reduce hospital costs due to SUDs.

Finally, this report contributes to the information available on Canadians requiring treatment for substance use. The National Treatment Indicators project provides the only cross-Canada source of treatment data (Pirie et al, 2014); however, the indicators do not yet include the hospital data provided in the current report. Comparing the two sets of data illustrates that most Canadians who access services for SUDs do so outside of the hospital system, with the National Treatment Indicators reporting on 236,193 episodes in publicly funded services in 2011[13] versus the 19,617 hospital stays attributable to SUDs identified in the current report.

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13 This figure does not include data from Quebec, New Brunswick, the Northwest Territories or Nunavut. An episode refers to admission to a specific treatment service. A person can access several different services or re-enter the same service more than once in a given year and therefore have multiple episodes.

Limitations

The current analysis of the impact of SUDs on hospital system use provides **a very conservative assessment**, for a number of reasons. Data from the current report indicate that in 2011 direct costs for those with a primary diagnosis of alcohol-related disorders were estimated to be almost $145 million. The most recent comprehensive study on the costs of substances abuse, conducted in 2002, estimated the total cost of alcohol-related harm to Canadians to be $14.6 billion per year, $3.3 billion of which was for direct healthcare costs (Rehm et al., 2006). If we make the conservative assumption that this cost has remained stable, the costs identified in the current report represent a very small proportion (roughly 4%) of the direct healthcare costs attributable to alcohol. This figure indicates that a significant proportion of healthcare costs associated with alcohol — and potentially other drugs as well — are spent in outpatient and community treatment services and in hospital stays for diseases such as cancer and liver disease or as a result of accidents in which the patient's condition could be indirectly attributable to alcohol.

Future Research

This is the first time that CIHI data on hospital stays due to a primary diagnosis of SUD has been analyzed according to substance and demographics. The analysis raised more questions than it was possible to address within the scope of this paper. Future work with this data set could include, for example, an analysis of readmission rates. Additional exploration into the ICD coding could also be useful. For instance, the incorporation of stays due to overdose would provide a more complete picture of the impact of SUDs on Canada's hospitals.

The overall trends, indicating an increase in hospitalizations for disorders related to alcohol, opioids and cannabinoids and a marked decrease in hospitalizations for disorders related to cocaine point to many areas for additional research. Research could, for example, look more closely at the relationship between prevalence of use and hospitalization. In future years, expansion of the National Treatment Indicators will make the comparison of hospital stays and treatment episodes associated with specific substances possible. Irregularities in trend data, such as the decrease in 2009 in the number of days stayed in hospital for disorders related to cannabinoids, also indicate areas for further exploration.

Understanding more about the trajectories that people follow prior to and following hospitalization has important implications for system planning and evaluation. Have these individuals accessed treatment in the community? If not, is this because of a lack of awareness that services are available or a lack of service availability and accessibility (e.g., availability and accessibility of services for specific populations defined by gender, ethnocultural background, age, etc.)? Do these individuals access treatment in the community following hospitalization?

Additional research into the nature of the hospital stay will also contribute to a better understanding of the impact of SUDs. For example, withdrawal from alcohol or opioids can be an extremely difficult and physically dangerous process, whereas withdrawal from cannabis does not generally require hospitalization. In many cases, however, even medically assisted withdrawal can be safely conducted in the home or community (Ministry of Health NSW, 2008; Stockwell et al., 1991). Finding out what proportion of hospital stays are due to withdrawal will illustrate the potential savings of increased use of non-hospital settings.

The current data could also be used to contribute to a better understanding of concurrent disorders. In 2010–2011 almost one-third of psychiatric patients were diagnosed with a concurrent mental illness (i.e., a substance use disorder in addition to a mood–anxiety disorder or schizophrenia–

psychotic disorder) (Canadian Institute for Health Information, 2013b). Comparing the rates that different SUDs (e.g., alcohol-use disorder or cannabis-use disorder) co-occur with different mental health disorders would be helpful to indicate specific trends in co-occurrence and help to better understand links that have already been identified. For example, do these data support the emerging acceptance of the link between genetics, cannabis use and mental disorders such as psychotic symptoms and schizophrenia?

The difference in length of stay between general and psychiatric hospitals is also an area for additional exploration. Patients admitted to psychiatric hospitals may present with more complex needs including trauma and concurrent mental health conditions such as anxiety, depression or psychosis. Addressing these complex mental and physical health needs requires different resources than the resources used for addressing the acute harms of substance use, including timely and targeted, integrated treatment programs (Canadian Centre on Substance Abuse, 2009).

Conclusions

This report is a first step toward a better understanding of the impact that different substances of abuse have on the hospital system. The CIHI databases are an untapped wealth of information on the impact of substance use on hospital resources. Cost data is an important way to concretely illustrate the potential savings associated with investments in prevention, early intervention, treatment and programs that aim to reduce the harms associated with alcohol and other drug use. These investments could reduce the need for hospitalization.

The ability to track trends according to substance over time enables researchers to identify target areas for prevention and treatment to reduce both individual harms and costs to the system. This data can also raise questions and provide warning signs about the harms of substance use that are not necessarily captured through population surveys. For example, why have hospital stays associated with cannabinoid-related disorders increased, while rates of cannabis use in the population have decreased. Further exploration is needed to articulate and address these questions, and CCSA anticipates continuing to collaborate with CIHI and other partners to conduct further analyses.

This report adds to existing data sources such as previous CIHI reports, the Canadian Alcohol and Drug Use Monitoring Survey, the Canadian Community Health Survey and the National Treatment Indicators to work toward a comprehensive national picture. This picture is a necessary component of developing a proactive, effective and evidence-based approach to reduce the harms of substance use in Canada.

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Appendix A: Glossary

Unless indicated otherwise, the following definitions are drawn directly from the glossary included in the CIHI report, *Hospital Mental Health Services in Canada, 2009-2010*, available at https://secure.cihi.ca/estore/productFamily.htm?locale=en&pf=PFC1927.

Average length of stay

The average length of stay is the mean number of days stayed in hospital at separation. It is calculated as the total number of inpatient days divided by the associated number of separations.

Case Mix Groups (CMGs)

Is a Canadian patient classification system used to group and describe types of patients discharged from acute-care hospitals. CMGs were developed by CIHI and modeled after the American Diagnosis Related Groups. More information on CMGs may be found at http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/case+mix/casemix_cmg and http://mchp-appserv.cpe.umanitoba.ca/viewConcept.php?conceptID=1094.

Days stayed

Length of hospitalization from date of admission to date of separation.

General hospital

A publicly funded hospital that provides for the diagnosis and treatment of inpatients and clients with a wide range of diseases or injuries. The services of a general hospital are not restricted to a specific age group or sex. Within the HMHDB frame, facility types such as non-teaching general hospitals with or without long-term care units, pediatric hospitals, teaching general hospitals and specialty institutions (cancer, cardiology, maternity, extended and chronic care, rehabilitation, neurological, orthopedic, etc.) are included.

Hospital stay

More technically referred to as a hospital separation, a stay is defined as a departure from hospital through discharge or death.

Primary separation diagnosis

The diagnosis deemed to be most responsible for individual's hospital stay at the time of discharge from hospital or death.

Psychiatric hospital

In Canada, there is no standard definition of a psychiatric hospital. For the purposes of this report and CIHI data collection, psychiatric hospitals are medical hospitals that provide psychiatric services on an inpatient and or outpatient basis and that have been identified by the provinces as specialty psychiatric hospitals.

Substance use disorder (SUD)

Those for whom the primary reason for hospital stay was a mental and behavioural disorder due to psychoactive substance use. Note that for the purposes of this report, this does not include hospital stays in which the patient's condition may be indirectly attributable to substance use such as liver disease attributable to chronic alcohol consumption or injury from a traffic accident that occurred while impaired after consuming cannabis.