COPD in Alberta

Examining the Characteristics and Health Care Use of High Users

Canadian Institute for Health Information
Institut canadien d'information sur la santé

Production of this document is made possible by financial contributions from Health Canada and provincial and territorial governments. The views expressed herein do not necessarily represent the views of Health Canada or any provincial or territorial government.

Unless otherwise indicated, this product uses data provided by Canada's provinces and territories.

Canadian Institute for Health Information
495 Richmond Road, Suite 600
Ottawa, Ontario K2A 4H6

Phone: 613-241-7860
Fax: 613-241-8120
www.cihi.ca
copyright@cihi.ca

ISBN 978-1-77109-591-4 (PDF)

How to cite this document:
Canadian Institute for Health Information. *COPD in Alberta: Examining the Characteristics and Health Care Use of High Users*. Ottawa, ON: CIHI; 2017.

Cette publication est aussi disponible en français sous le titre *La MPOC en Alberta : les caractéristiques des grands utilisateurs et leur utilisation des soins de santé*.
ISBN 978-1-77109-592-1 (PDF)

Table of contents

Acknowledgements

The Canadian Institute for Health Information (CIHI) wishes to acknowledge and thank members of the project team from the Canadian Population Health Initiative (CPHI) for their dedication and contributions to *COPD in Alberta: Examining the Characteristics and Health Care Use of High Users*. We would also like to extend our gratitude to our many colleagues from across the organization who contributed to this project; this report would not have been possible without their guidance and expertise.

CIHI would also like to thank the Expert Advisory Group for its invaluable advice:

- **Dr. Andrea Gershon,** Research Director and Staff Respirologist, Division of Respirology, Sunnybrook Health Sciences Centre; Scientist, Institute for Clinical Evaluative Sciences (ICES) and Sunnybrook Research Institute; and Associate Professor, Department of Medicine and the Institute for Health Policy, Management and Evaluation, University of Toronto
- **Tamara Kulyk,** Manager, Strategic Policy and Planning, Health Services, Alberta Health
- **Dr. Graeme Rocker,** Professor, Dalhousie University, Division of Respirology, Department of Medicine, QEII Health Sciences Centre, Nova Scotia
- **Dr. Brian H. Rowe,** Professor, Department of Emergency Medicine, University of Alberta; Emergency Physician, University of Alberta Hospital; and Scientific Director, Institute of Circulatory and Respiratory Health for Canadian Institutes of Health Research and the Emergency Strategic Clinical Network for Alberta Health Services
- **Shelley Valaire,** Senior Provincial Director, Respiratory Health Strategic Clinical Network and the Cardiovascular Health and Stroke Strategic Clinical Network, Alberta Health Services

CIHI would also like to thank peer reviewers of the report:

- **Dr. Shawn Aaron,** Chief, Division of Respiratory Medicine, The Ottawa Hospital; Professor, Division of Respirology, University of Ottawa; and Senior Scientist, Ottawa Hospital Research Institute
- **Dr. Pat Camp,** Associate Professor, Department of Physical Therapy, University of British Columbia; Principal Investigator, Centre for Heart Lung Innovation; Head, St. Paul's Hospital Pulmonary Rehabilitation Clinic; and Michael Smith Foundation for Health Research Scholar
- **Dr. Maria Ospina,** Assistant Professor, Department of Obstetrics and Gynecology, Faculty of Medicine and Dentistry, University of Alberta

The estimates for COPD prevalence among First Nations in Alberta were compiled by the Alberta Ministry of Health in collaboration with the Alberta First Nations Information Governance Centre. We are grateful for their contribution.

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

About this report

Chronic obstructive pulmonary disease (COPD) is a progressive lung disease and a leading cause of hospitalization and readmissions in Canada.[1, 2] In 2013, in Alberta, where COPD hospitalizations were higher than the Canadian average,[3] about half of the $254 million spent on treating COPD was for hospital care.[4] Alberta Health Services (AHS) has identified COPD management as a strategic priority. The Respiratory Health and Emergency Strategic Clinical Networks developed by AHS aim to improve the quality of care and health outcomes for people living with COPD.[5] Comparing the characteristics and health care use of people with COPD who are frequent users of hospital services with those who are less frequent users may help to inform opportunities to improve management and care, and to reduce hospital use and costs. Data available from Alberta enabled us to describe health care use across sectors of care for people with COPD, and in particular, among high users of acute care services.

The objectives of this report are to

- Compare the characteristics and health care use of people with COPD who have been identified as high users of inpatient hospital care (referred to in this report as COPD high users) — using CIHI's High Users of Hospital Beds indicator — with the characteristics and health care use of low/moderate users (see text box below); and
- Compare the prevalence of COPD and the health care use of COPD high users across Alberta's health zones.

High Users of Hospital Beds indicator

CIHI's High Users of Hospital Beds indicator defines a high user of hospital beds as a person who was hospitalized 3 or more times for any reason and was in the hospital for more than 30 days cumulatively within 1 year. This indicator enables us to identify people who use a significant portion of hospital resources. In 2014–2015, 1 in 20 Albertans who were hospitalized were high users of hospital beds, according to these criteria. Check out CIHI's Your Health System web tool for more results.

Key messages

In Alberta, in 2012–2013 and 2013–2014, COPD high users were medically complex, with high health care needs.

- **COPD high users were in hospital (on average) 73 days cumulatively within a year, were readmitted frequently and received high-acuity care.** Implementing early discharge planning and identifying post-discharge care may help reduce readmissions through the management of COPD in the community.
- **COPD high users were mostly seniors with multiple health conditions and frequent emergency department (ED) and physician visits.** Understanding the characteristics and health care use of high users helps to target interventions, including integration of care, for this complex group and reduce their need for hospitalization.
- **COPD high users age 66 and older had an average of 18 drug claims in 1 year to treat their multiple health conditions.** Reviewing data on drug and health services use, as well as treatment guidelines, provides insight into the appropriateness of medication use and level of non-adherence.
- **About 25% of COPD high users died in hospital, compared with 12% of COPD low/moderate users.** Of the COPD high users who died in hospital, 17% received palliative care in hospital. End-of-life and palliative care planning is an area of focus to improve quality of life and potentially reduce the need for hospital care.
- **While the prevalence of COPD was highest in the North Zone of Alberta, it was the zone with the lowest use of primary care and specialist physicians, and the highest use of EDs and inpatient care.** Providing access to different types of care in the community setting may reduce ED and acute care use.

Throughout this report, the term “COPD high user” refers to people who have been identified both as having a COPD diagnosis and as being a high user of inpatient services using the High Users of Hospital Beds indicator (see text box on previous page). The term “COPD low/moderate user” refers to people with COPD who had been hospitalized at least once but did not meet the criteria to be defined as a high user. Hospital visits for COPD high users and low/moderate users were for any reason.

Introduction

What is COPD?

COPD is an incurable, progressive lung disease that is associated with shortness of breath, chronic cough and mucous production.[6] When these symptoms worsen, it is referred to as an acute exacerbation, or more commonly a lung attack. Exacerbations are often caused by lung infections.[7] Over time, the frequency of exacerbations usually increases, leading to a decline in overall health and quality of life and increased health care use.[8] People with COPD often have other health conditions such as heart failure and diabetes.[6] Depression, anxiety and fatigue are also common among people with COPD, as the disease can substantially impact their ability to function in day-to-day life.[9, 10]

In Canada, COPD is a leading cause of morbidity and mortality.[11] It is a common reason for hospitalization,[12] intensive care unit (ICU) stays[13] and readmissions.[14] COPD is estimated to contribute more than $1.5 billion annually to direct health care costs.[15] In addition, it places a substantial burden on society by limiting employment and contributing to disability.[16, 17]

Prevalence, diagnosis and risk factors

In 2014, the self-reported prevalence of COPD in Canada was approximately 4%.[18] However, COPD is commonly underdiagnosed; the most recent cycles of the Canadian Health Measures Survey (2012–2013 and 2014–2015) estimated that the prevalence of COPD in Canada may be as high as 12%.[19]

People are often diagnosed with COPD after experiencing difficulty with breathing, chronic cough or mucous production.[6] A medical history, physical examination and breathing test (spirometry) are considered together to diagnose COPD.[6]

Diagnosing COPD

Spirometry is the most common lung function test and the most valid method for establishing a COPD diagnosis.[20] This test is important for the early identification and treatment of COPD:[21] however, estimates suggest that only one-third of people with COPD are diagnosed using spirometry.[22] COPD can be misdiagnosed, as some of the signs and symptoms are similar to those for asthma.[23]

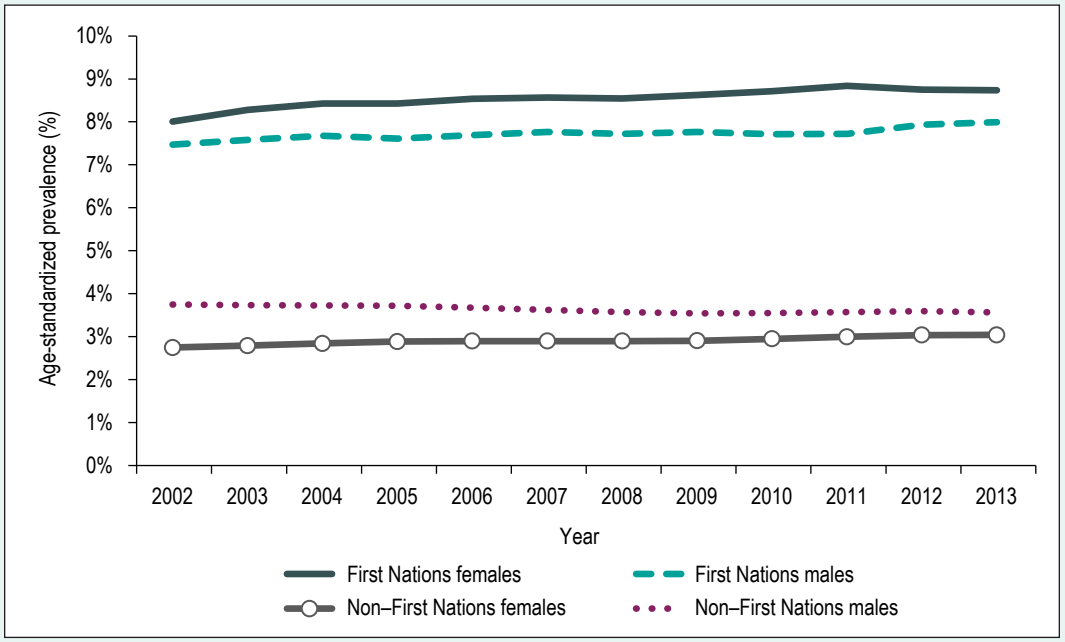
Smoking is the most common risk factor for COPD, particularly in high-income countries.[6] Other risk factors include long-term exposure to second-hand smoke, occupational and indoor pollutants, and smoke from the burning of biofuels (e.g., wood).[6, 24, 25] A history of respiratory infections in childhood and other health conditions, such as poorly controlled asthma, are linked to an increased risk of developing COPD.[6, 24] COPD prevalence tends to be higher among people with lower income, possibly due to these populations having higher rates of smoking, lower smoking cessation rates, occupations with greater exposure to pollutants and poorer housing conditions.[24] Historically, COPD has been more common in men, but with the increased use of tobacco among women, the disease now affects men and women equally.[26] Smoking prevention and cessation are effective ways to reduce the risk of developing COPD and to stop its progression.[6, 27] Despite an overall decline in the rate of smoking, the prevalence of COPD in Canada is expected to grow over the next 15 years, mostly because of population aging.[28]

There is relatively little information on COPD among Indigenous peoples (First Nations, Inuit and Métis) in Canada.[29] Much of the information that is available in Canada comes from Alberta and shows that the prevalence of respiratory conditions,[30] in particular COPD, is higher among Indigenous peoples than the rest of the population.[31] Indigenous peoples in Canada are more likely to experience poverty and other social and economic risk factors over their life course that increase their risk of developing COPD.[31–33] Inequalities in health and access to health care services may also contribute to the prevalence of COPD among Indigenous peoples in Alberta.[30, 33]

Spotlight: COPD prevalence among First Nations in Alberta

Figure 1 shows that in 2013, the age-standardized prevalence of COPD among First Nations in Alberta was nearly 3 times that of non–First Nations. It also shows that among First Nations, the prevalence is higher among females than males, unlike what is observed among non–First Nations Albertans.

Figure 1 Age-standardized COPD prevalence, First Nations versus non-First Nations, 2002 to 2013



Source

The estimates for COPD prevalence among First Nations in Alberta were compiled by the Alberta Ministry of Health in collaboration with the Alberta First Nations Information Governance Centre. They are used with permission from the Alberta Ministry of Health and Alberta First Nations Information Governance Centre and are based on administrative data.

Study methods

Identifying people with COPD in Alberta

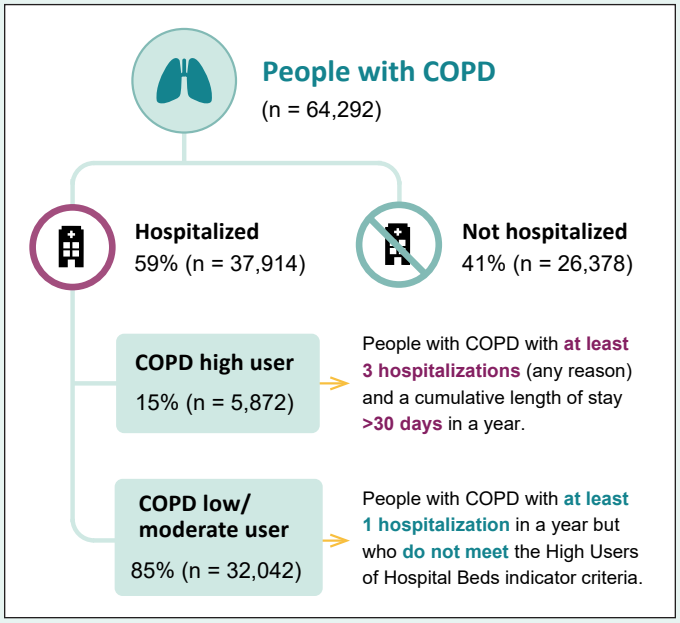
Hospital and physician billing records over a 2-year period were used to identify people with COPD in Alberta (April 1, 2012, to March 31, 2014, for hospital records; April 1, 2011, to March 31, 2013, for physician billing records, which are the most recent physician billing records available to CIHI). People age 35 and older with at least 1 hospital record or at least 2 office-based physician visits with a COPD diagnosis code were identified as having COPD (64,292 people).

This approach has been validated in Ontario.[3,4] A recent study using the same age range and a 2-year window identified a similar number of people with COPD in Alberta.[4]

Identifying COPD high users in Alberta

Of the people identified with COPD, 59% (or 37,914) were hospitalized for any reason at least once between April 1, 2012, and March 31, 2014. Those with at least one hospitalization were categorized as high users or low/moderate users using CIHI's High User of Hospital Beds indicator (see Figure 2). If a person was categorized as a high user in either 2012–2013 or 2013–2014, he or she was considered a COPD high user. People who were not hospitalized were not included in this study.

Figure 2 Identifying COPD high users and low/moderate users in Alberta



Describing characteristics and health care use

The following steps were taken to describe the characteristics and health care use of COPD high users and COPD low/moderate users:

1. Identify each person's index (i.e., most recent) hospitalization record (for any reason) (2012–2013 or 2013–2014).
2. Record the characteristics for each person from his or her index hospitalization record. Health conditions were identified for the 2 years prior to the person's index hospitalization by using CIHI's Population Grouping Methodology.
3. Summarize health care use (physician visits, ED visits, hospitalizations and drug claims) for 1 year preceding the admission date for the index hospitalization and analyze by health zone of residence.
4. Compare characteristics and health care use of high users and low/moderate users.
5. Perform statistical analyses to determine whether differences between groups and health zones were statistically significant.

Results for people with COPD who were hospitalized in 2012–2013 and/or 2013–2014 were combined, and each person was included in the results only once. There were some limitations with this approach; for instance, we could not determine the severity of the disease or whether the COPD diagnosis had been confirmed by spirometry. Also, our method for identifying people with COPD did not capture people with COPD who did not have a hospitalization, ED visit or physician visit for COPD during the study period.

Results for males and females were similar and were combined. For more detailed information on the study methods, see Appendix A. For the characteristics and health care use of COPD high and low/moderate users by health zone, see Appendix B, tables B1 and B2.

Findings

The following sections focus on people with COPD in Alberta who were hospitalized for any reason in the period 2012–2013 to 2013–2014. The first section describes the health care services they received in the preceding year as well as the characteristics of this group, and compares high users and low/moderate users. The second section reports on the geographic variations in COPD prevalence and health care use for high users across Alberta's health zones.

Characteristics and health care use for people with COPD

COPD high users had an average of 4 hospitalizations and spent 73 days in hospital in 1 year

Approximately 15% of people with COPD who were hospitalized in Alberta were identified as high users. As shown in Table 1, in 1 year, COPD high users had an average of 4 hospitalizations, stayed 73 days in hospital, were readmitted frequently and received higher acuity care. COPD was the most common reason (i.e., the most responsible diagnosis) for hospitalization, followed by heart failure and pneumonia.

Table 1 Hospital inpatient use for people with COPD, 2012–2013 and 2013–2014†

Hospital inpatient use in the year before index hospitalization	COPD high users	COPD low/ moderate users
Average number of inpatient admissions	4*	2
Average cumulative length of stay (days)	73*	17
Average percentage of admissions per patient that were a 30-day readmission (all cause)	31*	6
Percentage of patients with at least one ICU stay	31*	18

Notes

† Year of index hospitalization.

* Statistically different from COPD low/moderate users ($p<0.05$).

Sources

Discharge Abstract Database, 2011–2012 to 2013–2014; and National Ambulatory Care Reporting System, 2011–2012 to 2013–2014, Canadian Institute for Health Information.

COPD high users were seniors with multiple health conditions

Table 2 shows that COPD high users were mostly seniors (age 65 and older) and were more likely to be from lower-income neighbourhoods.[i] COPD high users also had higher prevalence of health conditions than low/moderate users.

i. The lowest-income neighbourhoods have an average income in the bottom 20% for their city or region.

Table 2 Characteristics and common health conditions among people with COPD, 2012–2013 and 2013–2014†

Characteristics	COPD high users	COPD low/moderate users
Average age	75*	72
Age 65 and older	79%*	71%
Male	51%	52%
Live in lowest-income neighbourhoods	29%*	26%
Health conditions		
Hypertension	77%*	63%
Pneumonia	66%*	41%
Heart failure	53%*	26%
Arrhythmia	46%*	28%
Coronary artery disease	40%*	25%
Diabetes	39%*	28%
Depression	32%*	17%
Anxiety	20%*	11%
Osteoporosis	17%*	7%
Lung cancer	9%*	7%

Notes

† Year of index hospitalization.

* Statistically different from COPD low/moderate users ($p<0.05$).

Characteristics based on index record, and health conditions based on conditions identified 2 years before the index hospitalization, using the Population Grouping Methodology. For more information on the Population Grouping Methodology, see Appendix A.

Sources

Discharge Abstract Database, 2011–2012 to 2013–2014; National Ambulatory Care Reporting System, 2011–2012 to 2013–2014; Patient-Level Physician Billing Data, 2011–2012 and 2012–2013; and Population Grouping Methodology beta version, Canadian Institute for Health Information.

COPD high users had multiple primary care physician, specialist and ED visits

Primary care plays an important role in the prevention, diagnosis and management of COPD.[35] Primary care for COPD includes the prevention and management of acute exacerbations, self-management programs (often including education, exercise, nutrition and smoking cessation counselling),[35] regular flu vaccination, management of other health conditions,[6] routine follow-up,[6] hospital discharge follow-up[36] and advance care planning.[9]

Most (78%) Canadians with COPD report that their primary care physician is most responsible for their care.[37] However, referral to a respiratory specialist (respirologist) may be appropriate in some circumstances, including a rapid decline in lung function, severe symptoms and symptoms at a young age.[35] People with COPD may also require specialist care for their other health conditions. As COPD progresses, symptoms worsen and exacerbations occur more frequently, with some exacerbations becoming severe enough to require ED care and hospitalization.[4]

In addition to frequent and lengthy hospital stays, COPD high users had many other interactions with health care services (see Table 3).

Table 3 Primary care physician, specialist and ED use for people with COPD, 2012–2013 and 2013–2014†

Health care use in the year before index hospitalization	COPD high users	COPD low/ moderate users
Average number of primary care physician visits	14*	11
Average number of specialist visits (including respirologists)	5*	4
Average number of respirologists visits‡	2	2
Average number of ED visits including those resulting in admission to hospital	8*	3
Average number of ED visits excluding those resulting in admission to hospital	4*	2
Average number of primary care physician, specialist and ED visits (excluding those resulting in admission to hospital)	23*	16

Notes

† Year of index hospitalization.

* Statistically different from COPD low/moderate users ($p<0.05$).

‡ Among those with at least one respirologist visit.

Information on primary care and specialist visits reflects only people with COPD with an index hospitalization in 2012–2013 (n = 16,007).

Sources

Discharge Abstract Database 2011–2012 to 2013–2014; National Ambulatory Care Reporting System, 2011–2012 to 2013–2014; and Patient-Level Physician Billing Data, 2011–2012 and 2012–2013, Canadian Institute for Health Information.

Primary care physician use: COPD high users and low/moderate users visited primary care physicians more frequently than the average of 7 visits per year for all seniors in Alberta.[38] On average, COPD high users saw the same primary care physician 75% of the time. This was significantly lower than the 79% of visits for low/moderate users. In comparison, a previous report found that the average senior in Alberta had lower usual provider continuity,[ii] seeing the same primary care physician 72% of the time.[38]

ii. Usual Provider Continuity Index.[38]

Specialist use: Significantly more COPD high users (76% versus 72% for low/moderate users) visited any specialist, while 20% of both COPD high users and low/moderate users visited a respirologist in a year.

ED use: COPD high users had significantly more ED visits in a year compared with low/moderate users. Also, significantly more of the ED visits for COPD high users resulted in admission compared with ED visits for low/moderate users (63% versus 58%). About 74% of ED visits for COPD high users and low/moderate users were triaged as resuscitation, emergent or urgent. COPD, heart failure and pneumonia were the most common reasons for visits to the ED for both COPD high users and low/moderate users.

COPD high users age 66 and older had claims for multiple drugs to treat their COPD and other health conditions

Prescription drug treatment is an important part of care for COPD[35] and varies depending on the severity of symptoms and a person's risk for an exacerbation.[6] Prescription drug claims data is available for Albertans age 65 and older who are eligible for publicly funded prescription drug coverage.[iii] The analysis was restricted to seniors age 66 and older to examine drug claims in the year before their index hospitalization.

COPD drugs

Prescription drug treatment for COPD often includes bronchodilators, which treat shortness of breath by opening airways, and inhaled corticosteroids (steroids), which reduce inflammation.[6] Oral steroids prednisone and prednisolone, in combination with other COPD drugs, are used to treat and prevent acute exacerbations.[6]

COPD high users and low/moderate users had claims for an average of 3 drugs to treat their COPD. However, the types of drugs used by COPD high users and low/moderate users were different, likely due to differences in disease severity between the 2 groups. Specifically, more COPD high users had claims for COPD drugs that are typically used to treat moderate or severe COPD and acute exacerbations, compared with COPD low/moderate users. For more detailed COPD drug claims information, see Appendix B, Table B3.

On average, seniors who were COPD high users had claims for 18 different drugs compared with 12 for low/moderate users, likely reflecting their more complex health needs. The prescription drug profile of COPD high users mirrored the most common health conditions presented in Table 2. (For more information about the specific drug classes claimed by seniors with COPD, see Appendix B, Table B4.) While the use of multiple prescription medications may be needed to manage many chronic conditions, including COPD, it also increases the risk of adverse drug events and medication non-adherence.[39, 40]

iii. More information about Alberta's Drug Plan Coverage can be found in NPDUIS Database documentation.

25% of COPD high users died in hospital compared with 12% of low/moderate users

In 1 year, COPD high users were twice as likely as low/moderate users to die in hospital (25% versus 12%). This is not surprising, as people are more likely to become high users of hospital beds at the end of life.[2] About 17% of COPD high users who died in hospital were hospitalized for palliative care, versus 13% of COPD low/moderate users. In comparison, an earlier study of cancer patients found that 53% of cancer patients who died in hospital were hospitalized for palliative care.[41] While these studies include only palliative care in inpatient acute care, research suggests that in Canada, people with chronic diseases other than cancer, including COPD, are less likely to receive palliative care in both community and inpatient settings.[42]

INSPIRED: Reducing hospital and ED use for people with COPD

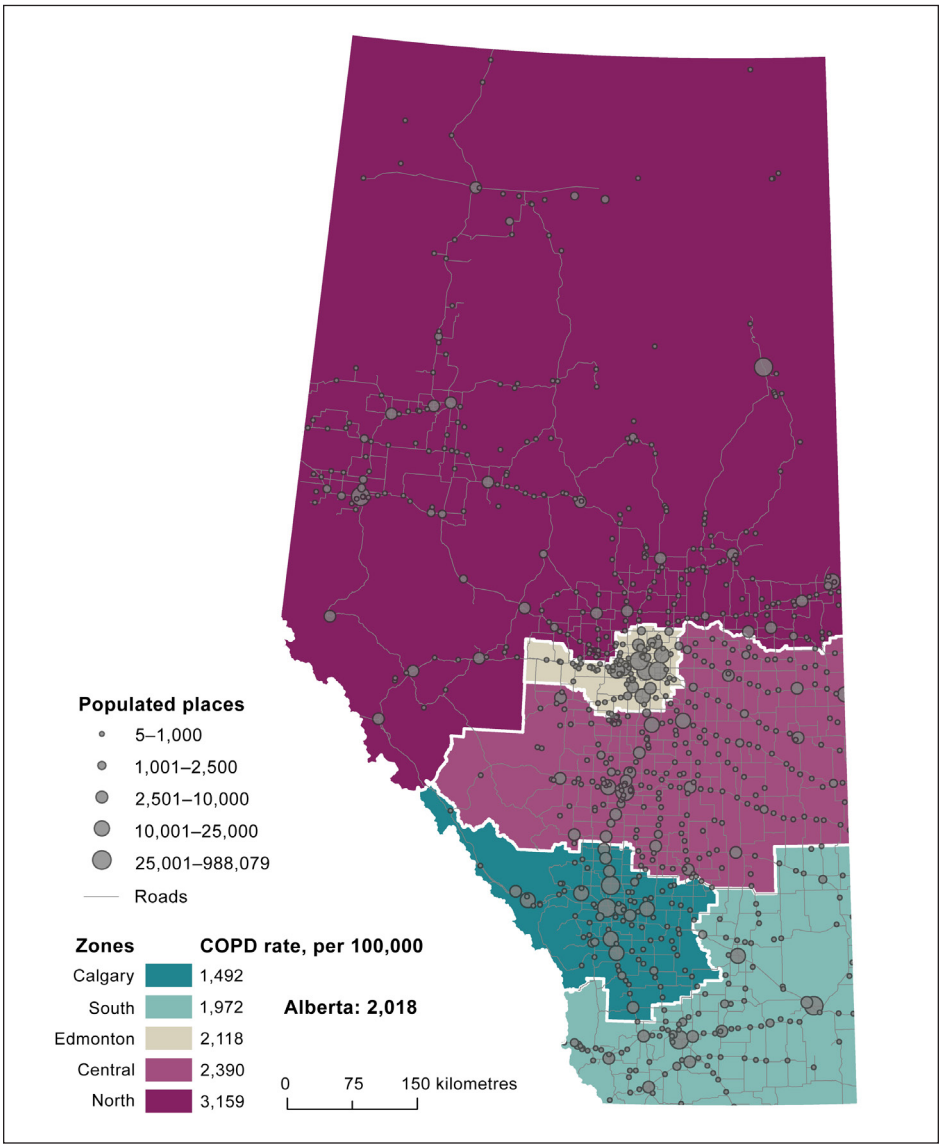
INSPIRED — **I**mplementing a **N**ovel and **S**upportive **P**rogram of **I**ndividualized Care for patients and families living with **Re**spiratory **D**isease — is an initiative developed to help patients and their families improve the management of advanced COPD in the community following hospitalization.[43, 44] The INSPIRED program begins in the hospital where links with staff are established, action plans are reviewed and early discharge support is provided.[44] The program continues into the community with home visits, individualized plans for self-care, psychosocial and spiritual support, telephone help and advance care planning.[44] First developed and implemented in 2010 in Halifax, Nova Scotia, INSPIRED has since expanded into other parts of the country and has reduced ED visits and hospitalizations.[44]

Regional variations in COPD prevalence and health care use

Prevalence of COPD highest in the North Zone

To facilitate health service planning and delivery, AHS has organized the province into 5 health zones that have distinct geographies and population characteristics. As shown in Figure 3, the Edmonton and Calgary Zones, which are mostly urban, have the largest populations, while the South, Central and North Zones are mostly rural with smaller populations.[45] Figure 3 also shows that the prevalence (age-standardized rate) of COPD in the North Zone was more than twice that in the Calgary Zone. The prevalence of COPD in both the North and Central Zones was significantly higher than the provincial average, while the prevalence in the Calgary Zone was significantly lower. Table 4 presents contextual information for each zone.

Figure 3 Age-standardized rate of COPD (per 100,000) in Alberta by health zone, 2012–2013 and 2013–2014



Notes

Geographical variations in COPD prevalence are similar to those reported by AHS.[46]

Age-standardized rates were calculated by direct standardization to the 2011 Canadian population.

Sources

Discharge Abstract Database, 2012–2013 and 2013–2014; National Ambulatory Care Reporting System, 2012–2013 and 2013–2014; and Patient-Level Physician Billing Data, 2011–2012 and 2012–2013, Canadian Institute for Health Information; and Natural Resources Canada, Mapping Information Branch, *Atlas of Canada*, 2009 (2006 data).

Table 4 Contextual information for Alberta

Contextual measure	Alberta (provincial average)	Zone				
		South Zone	Calgary Zone	Central Zone	Edmonton Zone	North Zone
Rate of smoking (12 years and older) (2014)†	**19%**	18%	17%	21%	20%	24%
First Nations, Métis, Inuit population (2011)*	**6%**	6%	3%	7%	5%	17%
Median household total income in 2010 (2011)*	**$78,632**	$63,357	$82,598	$69,860	$79,025	$87,136
No certificate, diploma or degree (15 years and older) (2011)*	**19%**	23%	15%	25%	17%	28%
Seniors (age 65+) population (2013)‡	**11%**	14%	10%	13%	12%	9%

Sources

† Statistics Canada, CANSIM Table 105-0501 (Canadian Community Health Survey 2014, Current smoker, daily or occasional).

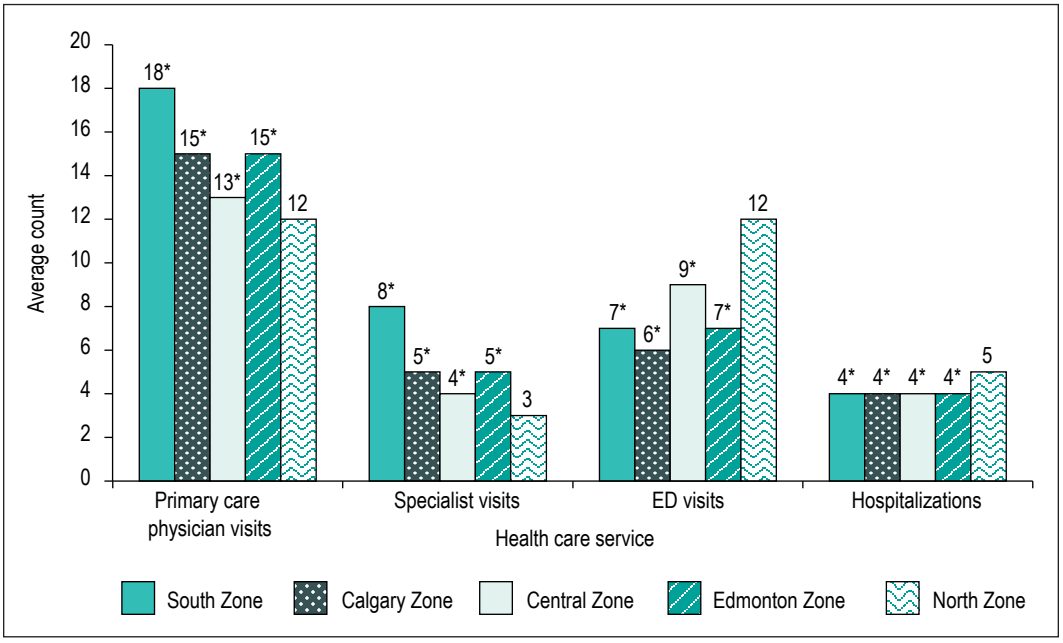
* Statistics Canada, Alberta (Code 48) (table). 2011 National Household Survey.

‡ Statistics Canada, Demography Division, 2013 population estimate.

Use of primary physician and specialist care lowest in the North Zone; ED and inpatient hospital use highest

Health care use for COPD high users varies across health zones. As shown in Figure 4, the number of hospitalizations for COPD high users was similar across the health zones with the exception of the North Zone, where it was significantly higher. There were also differences in the average number of visits to an ED, primary care physician and specialist across the zones. (For detailed results by zone, see Appendix B, tables B1 and B2.)

Figure 4 Health care use in the year before index hospitalization for COPD high users, by Alberta health zone, 2012–2013 and 2013–2014†



Notes

† Year of index hospitalization.

* Statistically different from the North Zone ($p<0.05$).

The average count of primary care and specialist visits in this table reflects only people with COPD with an index hospitalization in 2012–2013 (n = 2,661).

Sources

Discharge Abstract Database, 2011–2012 to 2013–2014; National Ambulatory Care Reporting System, 2011–2012 to 2013–2014; and Patient-Level Physician Billing Data, 2011–2012 and 2012–2013, Canadian Institute for Health Information; and Postal Code Conversion File Plus, version 6A1, Statistics Canada.

Variations in health care use across the health zones may partly reflect the unique challenges that rural areas experience in providing care.[47] As seen in Figure 4, the number of visits to primary care and specialist physicians was lowest in the North Zone, where the number of ED visits was highest. This may be because there are both fewer family doctors per capita and fewer specialists per capita in the North Zone.[48] The ED has become a place where people in many rural communities seek care if they cannot access primary care in a timely manner.[47] Consistent with this observation, a higher proportion of residents of the North Zone visited the ED for less urgent care (50% of ED visits) compared with Calgary Zone residents (13% of ED visits). A study of people with COPD in Ontario also found that the rates of physician visits were lower and ED visits higher in the northern regions of the province.[49]

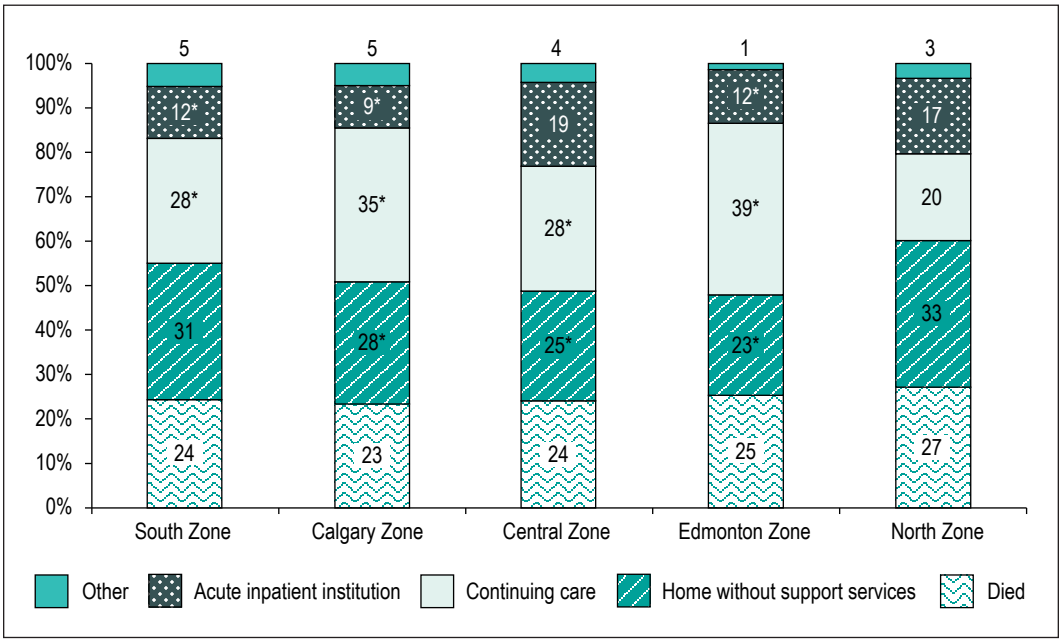
A previous CIHI report found that physician follow-up after a COPD hospitalization was also lower in the North Zone, with 29% of people having a follow-up visit within a week of hospital discharge, compared with 35% for all Albertans.[50]

COPD high users who lived in the Edmonton Zone were twice as likely to visit a respirologist compared with those in the North Zone (25% versus 13%). Despite having the highest prevalence of COPD in the province, the North Zone has no respirologists.[51] In 2012, most respirologists in Alberta were located in the Calgary (38) and Edmonton (30) zones, with a few in the Central (4) and South (2) zones.[51]

Fewer COPD high users in the North Zone discharged from hospital with continuing care services

Where COPD high users were discharged to (discharge destination) after their index hospitalization also varied by health zone. Figure 5 shows that fewer COPD high users residing in the North Zone were discharged with continuing care (includes home care, long-term home care, supportive living, and long-term care) compared with high users residing in other zones.

Figure 5 Discharge destination for COPD high users, by Alberta health zone, 2012–2013 and 2013–2014†



Notes

† Year of index hospitalization.

* Statistically different from the North Zone ($p<0.05$).

Sources

Discharge Abstract Database, 2011–2012 to 2013–2014; National Ambulatory Care Reporting System, 2011–2012 to 2013–2014; and Patient-Level Physician Billing Data, 2011–2012 and 2012–2013, Canadian Institute for Health Information; and Postal Code Conversion File Plus, version 6A1, Statistics Canada.

The lower proportion of people with COPD discharged with continuing care may reflect some of the challenges associated with providing continuing care services in rural settings, such as the availability of care personnel and appropriate level of care facilities.[47]

Implications for policy, practice and future research

Integrated care for complex patients

The COPD high users in this study were mostly seniors with multiple health conditions, including other chronic conditions, who spent on average 73 days in hospital. COPD high users also had many other interactions with the health care system for primary care physician, specialist and ED care and are likely to benefit from integrated care. This study, however, cannot draw direct conclusions about the integration or quality of services provided.

Chronic disease management strategies that are proactive and that integrate care may help to reduce the physical and psychological burden often experienced by people with complex conditions such as COPD.[52] For example, an integrated model of care for the self-management of COPD has been found to simplify the patient's pathway through the health care system, reduce variations in care and improve outcomes.[53] This model involved a respiratory therapist and a case manager who provided education on self-management strategies and coordinated referrals to appropriate COPD resources.[53]

This study found that the use of multiple prescription drugs (polypharmacy) was common among the seniors with COPD, in particular among high users. While the use of multiple prescription drugs is often appropriate to treat multiple health conditions and is common among seniors in general,[39] it puts them at increased risk of adverse drug events.[39, 54] Reviewing drug claims data, together with data on the timing and type of health services used and treatment guidelines, may provide insight into the appropriateness of polypharmacy and adherence to treatment guidelines.

This study also found that many COPD high users died in hospital and that a small proportion were receiving palliative care in hospital at that time. Receiving palliative care in the community can be an effective method to control symptoms even before people require end-of-life care.[9] Validated tools that identify people who may benefit from early palliative care, shareable electronic records and patient-centred community-based care (e.g., specialist care teams, paramedics providing care in peoples' homes) may help to improve palliative and end-of-life care for people with COPD.[42] As well, future studies to help to understand palliative care needs and use among people with COPD are warranted.

While not the focus of this report, a large proportion (41%) of people were identified as having COPD but were not admitted to hospital during the study period. This group likely represents people with early-stage or mild COPD who would benefit from early and targeted interventions such as self-management, smoking cessation and exercise promotion.[55]

Policy in action in Alberta

In 2014, Alberta Health Services launched its **Respiratory Health Strategic Clinical Network (SCN)** with an aim to improve the diagnosis and management of COPD and reduce hospital stays. One initiative of this network is to standardize admission order sets (a list of medical orders for COPD) in EDs to improve prescription practices and communication between providers, and to standardize care.[5]

The **Emergency SCN** aims to bring about innovative ways to make the best use of resources, improve equitable access to care and reduce costs while ensuring high-quality emergency care for everyone in Alberta.[56] This initiative has facilitated development and uptake of evidence-based clinical standards to standardize COPD emergency care, including documentation tools, guidelines and patient education materials.[57] Working together with the Respiratory Health SCN, the Emergency SCN also developed discharge care bundles (a list of care practices to be implemented before discharge) for people with COPD to support their transition back into the community and to help prevent returns to the ED and hospital.[56, 58]

Access and equity

This study found that while the prevalence of COPD was highest in Alberta's North Zone, people with COPD in this zone had the fewest visits to primary care physicians and specialists and used hospital-based care (ED and inpatient) more frequently. While there are many challenges to delivering primary and specialized care in rural and remote regions, improving access to services in the community may improve outcomes and reduce ED visits and hospitalizations. Providing care through mobile services, in-home services and telemedicine may improve access for people in rural areas. For example, traditional pulmonary rehabilitation for COPD is often not available in rural areas, but it has been delivered through other means such as telemedicine.[59] Other allied health professionals, including nurses and nurse practitioners, also play an important role in providing health care in rural and remote communities.[52] Addressing gaps in CIHI's data for specialized services (e.g., pulmonary rehabilitation, continuing care) and for services provided by allied professionals (e.g., nurse practitioners) would help to support future work assessing the use and accessibility of these other health care services for people with COPD.

There is a substantial gap in the prevalence of COPD between Indigenous and non-Indigenous populations in Alberta.[31] Despite this, little is known about the interaction between different risk factors for COPD in Indigenous populations and their use of health care services for COPD across Canada. Further work could be undertaken to better understand and improve COPD prevention, treatment and management strategies for Indigenous peoples. One Alberta-based study found that despite being more likely to visit the ED or a physician for asthma or COPD, First Nations people with asthma or COPD were less likely to see a specialist (including respirologists) or receive spirometry testing.[30] These differences may be partly explained by difficulty accessing care in rural and remote areas and on reserve. Indigenous peoples may experience additional barriers to accessing appropriate and timely health care, including a lack of culturally appropriate and sensitive health care services.[33]

Although COPD is more prevalent among people with lower income, this report found that the average number of hospital admissions, and of primary care, specialist and ED visits were similar across neighbourhood income levels. A study in Ontario found that low income is associated with both an increased likelihood of developing COPD and poorer outcomes including hospitalization and death.[60] Efforts to reduce the prevalence of COPD and to improve health outcomes should consider the impact of inequalities in income as well as other social determinants of health such as level of education.

Conclusion

COPD high users in Alberta were mostly seniors with complex health needs. In addition to frequent and lengthy hospitalizations, they also had many interactions with health care providers and services (primary care physician, specialists and ED services), and also had claims for multiple drugs. The prevalence of COPD was highest in the North Zone. This region was also where primary care physician and specialist use was lowest and ED and hospital use was highest. Interventions targeting the integration of health services and access to care for COPD high users may improve the management and care of this population, and reduce their need for costly inpatient hospital care.

Appendix A: Data sources, definitions and methods

Additional data sources

Statistics Canada's Postal Code Conversion File Plus version 6A1 was used to retrieve area-based identifiers (neighbourhood income level and resident's region). CIHI's Population Grouping Methodology was used to identify health conditions for each person over a consecutive 2-year period from multiple data sources: Patient-Level Physician Billing Data (PLPB), Discharge Abstract Database (DAD), National Ambulatory Care Reporting System (NACRS) and Continuing Care Reporting System (CCRS).

Identifying COPD

COPD was identified using the following ICD-9 codes in PLPB: 491, 4910, 4911, 4912, 4918, 4919, 492 and 496. In NACRS and the DAD, COPD was identified using the following ICD-10-CA codes: J410, J411, J418, J42, J430, J431, J432, J438, J439, J440, J441, J448 and J449. The diagnostic codes for COPD could be in any valid field.

Identifying health care use and prescription drug claims the year before index hospitalization

This study identified health care use and prescription drug claims for patients in the 365 days before their index hospitalization using CIHI's standard linkage methodology. Use of the following services and prescription drug claims was identified as follows:

- **Inpatient hospitalizations** were identified using DAD records for acute care facilities. Hospitalizations for COPD had an ICD-10-CA code for COPD as the most responsible diagnosis.
- **Primary care visits** were identified using PLPB data and included visits to family medicine physicians occurring in physicians' offices, patients' homes or outpatient clinics. Primary care visits for COPD were records with an ICD-9 code for COPD. Primary care visits were counted only for people with an index discharge in 2012–2013.
- **Specialist visits** were identified using PLPB data and included visits to all physicians, excluding family medicine physicians, in all outpatient settings, excluding EDs. Specialist visits were counted only for people in our sample with an index discharge in 2012–2013.

- **ED visits** were identified using NACRS records and included only unscheduled visits to EDs and excluded visits to urgent care centres. ED visits for COPD were visits with an ICD-10-CA code for COPD as the primary problem.
- **Prescription drugs** were identified from the National Prescription Drug Utilization Information System (NPDUIS) Database and represent the number of distinct chemicals at Anatomical Therapeutic Chemical (ATC) Classification Level 5. Prescription drugs for COPD were described and identified using ATC Level 5 codes; all other prescription drugs were described and identified at ATC Level 3. Prescription drugs were counted for people age 66 and older who were not residents of long-term care facilities for a year or more before the index hospitalization. CCRS data was used to exclude the residents of long-term care facilities because drug claim information from these residents is not submitted to the NPDUIS Database. Also, drugs used during hospitalization were not included because this information is not submitted to the NPDUIS Database. Information on drug programs included as part of this analysis can be found in NPDUIS Database documentation.

Defining discharge disposition

At hospital discharge, the patient's destination is recorded on his or her hospital record. The destination is based on the documentation provided in the patient's medical chart. Options for the discharge destination (from the DAD Abstracting Manual) include the following:

- Home or a home setting with support services (senior's lodge, attendant care, home care, meals on wheels homemaking, supportive housing, etc.);
- Home (patient functions independently with no support service from an external agency required);
- Died (in hospital);
- Continuing care (of another facility or level of care other than acute within a reporting facility that provides continuing medical and allied medical staff; includes facilities that are considered to be a patient's temporary or permanent residence);
- Acute care (other acute, subacute, psychiatric, acute rehab, acute cancer centre, etc.); and
- Other, including ambulatory care that consists of emergency, day surgery and clinics in another facility or within the same reporting facility; palliative care facility/hospice; addiction treatment centre; jail; sign-out, patient left against medical advice; patients who do not return from a pass (permission given to patient to temporarily leave facility for reasons such as medical appointments, outpatient visits at same or another facility, trial discharges, familial visits etc.).

Defining COPD prescription drugs

COPD drugs considered for this report include salbutamol, terbutaline, salmeterol, formoterol, indacaterol, orciprenaline, salmeterol and fluticasone, formoterol and budesonide, salbutamol and ipratropium bromide, beclomethasone, budesonide, fluticasone, mometasone, ciclesonide, ipratropium bromide, tiotropium bromide, aclidinium bromide, glycopyrronium bromide, choline theophyllinate, theophylline, aminophylline, theophylline (combinations excluding psycholeptics), and prednisolone and prednisone (when claimed with a drug listed above).

Statistical testing

Chi-square, t-test, and linear and logistic regression were performed to determine whether differences in characteristics and health care use were statistically significant between COPD high users and COPD low/moderate users and between Alberta health zones for COPD high users. Results were considered statistically significant at the 0.05 level. Statistical significance for the prevalence of COPD in the zones was based on non-overlapping 95% confidence intervals with the Alberta average. Please direct methodological questions to cphi@cihi.ca.

Appendix B: Data tables

Table B1 Characteristics and health care use of COPD high users, by Alberta zone, 2012–2013 and 2013–2014[†]

Characteristics	South Zone	Calgary Zone	Central Zone	Edmonton Zone	North Zone
Number of COPD high users	563	1,401	1,029	1,984	895
Inpatient use in 1 year					
Average number of inpatient admissions	4	4	4	4	5
Average cumulative length of stay (days)	66	77	75	73	71
Average percentage of admissions per patient that were 30-day readmission (all cause)	32	29	31	32	35
Patients with at least one ICU stay (%)	38	26	33	31	32
Demographics					
Average age (years)	75	75	76	74	74
Age 65 and older (%)	78	81	84	77	77
Male (%)	52	51	52	50	51
Live in lowest-income neighbourhoods (%)	28	29	22	32	29
Other health care use in the year before index hospitalization					
At least one primary care physician visit (%)	95	95	99	93	98
Average number of primary care physician visits	18	15	13	15	12
Average percentage of time person saw the same provider (Usual Provider Continuity Index)	77	76	71	77	75
At least one specialist visit (%)	83	77	71	80	66
Average number of specialist visits (including respirologists)	8	5	4	5	3
At least one respirologist visit (%)	20	20	19	25	13
Average number of respirologist visits	2	2	1	2	2
Number of seniors with at least one drug claim	424	1,052	823	1,442	660
Seniors with at least one drug claim (%)	100	98	99	99	98
Had at least one drug claim for a COPD drug (%)	79	82	78	77	82
Average number of drug claims	19	17	17	18	18
Average number of COPD drug claims	3	3	3	3	3

Characteristics	South Zone	Calgary Zone	Central Zone	Edmonton Zone	North Zone
At least one ED visit (%)	100	100	99	100	100
Average number of ED visits (including those resulting in admission)	7	6	9	7	12
Average number of ED visits (excluding those resulting in admission)	4	2	5	3	8
Average percentage of ED visits triaged as resuscitation, emergent or urgent	65	88	56	86	50
Average percentage of ED visits that led to a hospitalization	59	72	55	69	48
Of those who died in hospital, percentage who were hospitalized for palliative care on index hospitalization	23	12	18	13	25

Notes

† Year of index hospitalization.

Information on primary care and specialist visits in this table reflect people with COPD with an index hospitalization in 2012–2013 (n = 2,661).

Information on drug claims reflects the drugs claimed by community-dwelling seniors (age 66+) not residing in a long-term care facility for 1 year or more in the year before index hospitalization (n = 4,401).

Sources

Discharge Abstract Database, 2011–2012 to 2013–2014; National Ambulatory Care Reporting System, 2011–2012 to 2013–2014; Patient-Level Physician Billing Data, 2011–2012 and 2012–2013; National Prescription Drug Utilization Information System Database, 2011–2012 to 2013–2014; and Continuing Care Reporting System, 2011–2012 to 2013–2014, Canadian Institute for Health Information; and Postal Code Conversion File Plus, version 6A1, Statistics Canada.

Table B2 Characteristics and health care use of COPD low/moderate users, by Alberta zone, 2012–2013 and 2013–2014†

Characteristics	South Zone	Calgary Zone	Central Zone	Edmonton Zone	North Zone
Number of COPD low/moderate users	2,795	8,086	5,151	11,434	4,576
Inpatient use in 1 year					
Average number of inpatient admissions	2	2	2	2	2
Average cumulative length of stay (days)	16	18	18	18	15
Average percentage of admissions per patient that were 30-day readmission (all cause)	6	5	6	6	7
Patients with at least one ICU stay (%)	21	16	18	18	17
Demographics					
Average age (years)	72	72	72	72	69
Age 65 and older (%)	73	72	72	72	64
Male (%)	53	52	54	51	54
Live in lowest-income neighbourhoods (%)	28	25	21	29	27
Other health care use in the year before index hospitalization					
At least one primary care physician visit (%)	94	94	97	93	94
Average number of primary health care visits	12	11	9	12	9
Average percentage of time person saw the same provider (Usual Provider Continuity Index)	80	78	75	80	79
At least one specialist visit (%)	76	76	68	74	60
Average number of specialist visits (including respirologists)	5	4	3	4	2
At least one respirologist visit (%)	20	20	18	24	10
Average number of respirologist visits	2	2	2	2	2
Number of seniors with at least one drug claim	1,895	5,267	3,431	7,337	2,635
Seniors with at least one drug claim (%)	98	97	98	97	96
At least one drug claim for a COPD drug (%)	74	75	75	70	70
Average number of drug claims	13	12	12	12	12
Average number of COPD drug claims	3	2	3	3	3
At least one ED visit (%)	93	91	93	91	95
Average number of ED visits (including those resulting in admission)	3	2	4	3	5
Average number of ED visits (excluding those resulting in admission)	2	1	3	2	4
Average percentage of ED visits triaged as resuscitation, emergent or urgent	63	87	58	85	50
Average percentage of ED visits led to a hospitalization	56	67	50	63	41

Characteristics	South Zone	Calgary Zone	Central Zone	Edmonton Zone	North Zone
Discharge disposition on index hospitalization					
Discharged home without support services from index hospitalization (%)	58	60	58	49	65
Discharged to continuing care from index hospitalization (%)	16	19	17	26	11
Discharged to acute inpatient care from index hospitalization (%)	9	7	12	10	12
Died in hospital on index hospitalization (%)	15	11	10	13	10
Of those who died in hospital, percentage who were hospitalized for palliative care on index hospitalization	13	7	15	14	19

Notes

† Year of index hospitalization.

Information on primary care and specialist visits in this table reflects people with COPD with an index hospitalization in 2012–2013 (n = 13,346).

Information on drug claims reflects the drugs claimed by community-dwelling seniors (age 66+) not residing in a long-term care facility for 1 year or more in the year before index hospitalization (n = 20,565).

Sources

Discharge Abstract Database, 2011–2012 to 2013–2014; National Ambulatory Care Reporting System, 2011–2012 to 2013–2014; Patient-Level Physician Billing Data, 2011–2012 and 2012–2013; National Prescription Drug Utilization Information System Database, 2011–2012 to 2013–2014; and Continuing Care Reporting System, 2011–2012 to 2013–2014, Canadian Institute for Health Information; and Postal Code Conversion File Plus, version 6A1, Statistics Canada.

Table B3 Claims for prescription drug treatments for seniors with COPD, 2012–2013 and 2013–2014†

Drug treatments	Percentage of COPD high users	Percentage of COPD low/moderate users
Short-acting bronchodilator only	8	8
Long-acting bronchodilator only	4	7
Short- and long-acting bronchodilators	4	4
Long-acting bronchodilator with inhaled corticosteroid	12	20
Short- and long-acting bronchodilators with inhaled corticosteroid	25	25
Oral prednisone or prednisolone in combination with short- or long-acting bronchodilator and/or inhaled corticosteroid	42	31
All other combinations	5	5

Notes

† Year of index hospitalization.

Information on drug claims reflects the drugs claimed by community-dwelling seniors (age 66+) not residing in a long-term care facility for 1 year or more in the year before index hospitalization (n = 18,427).

Drug treatment groups are mutually exclusive.

Sources

National Prescription Drug Utilization Information System Database, 2011–2012 to 2013–2014; Discharge Abstract Database, 2011–2012 to 2013–2014; and National Ambulatory Care Reporting System, 2011–2012 to 2013–2014, Canadian Institute for Health Information.

Table B4 Other common drug classes claimed by seniors with COPD, 2012–2013 and 2013–2014†

Drug class	Common uses	Percentage of COPD high users with claim for drug class	Percentage of COPD low/ moderate users with claim for drug class
Drugs for peptic ulcer and gastroesophageal reflux disease (e.g., pantoprazole, ranitidine)	Treats heartburn and gastric reflux	70	50
Loop diuretics (e.g., furosemide)	Treats congestive heart failure and high blood pressure	60	33
Beta-blocking agents (e.g., atenolol, metoprolol)	Reduces blood pressure, controls and treats heart failure	55	39
Lipid-modifying agents, plain (e.g., atorvastatin, ezetimibe)	Treats high cholesterol	53	49
Quinolone antibacterials (e.g., ciprofloxacin)	Treats infections	53	36
Antithrombotic agents (e.g., warfarin, clopidogrel)	Prevents and treats blood clots	46	29
Opioids (e.g., hydromorphone, codeine)	Treats and relieves pain	44	29
Antidepressants (e.g., amitriptyline, fluoxetine)	Treats depression, but one antidepressant, bupropion, can also be used short term as a smoking cessation medication	43	31

Notes

† Year of index hospitalization.

Information on drug claims reflects the drugs claimed by community-dwelling seniors (age 66+) not residing in a long-term care facility for 1 year or more in the year before index hospitalization (n = 18,427).

Drug treatment groups are mutually exclusive.

Sources

National Prescription Drug Utilization Information System Database, 2011–2012 to 2013–2014; Discharge Abstract Database, 2011–2012 to 2013–2014; and National Ambulatory Care Reporting System, 2011–2012 to 2013–2014, Canadian Institute for Health Information.

Appendix C: Alternative text

Text alternative for Figure 1: Age-standardized COPD prevalence, First Nations versus non–First Nations, 2002 to 2013

The graph shows a gradual increase in age-standardized COPD prevalence, from 8.0% in 2002 to 8.7% in 2013 for First Nations females, which is the highest age-standardized COPD prevalence rate in Alberta. It also shows a gradual increase in the age-standardized COPD prevalence for First Nations males, from 7.4% in 2002 to 7.9% in 2013. For non–First Nations males, there is a slight decrease in the age-standardized COPD prevalence, from 3.7% in 2002 to 3.5% in 2013. For non–First Nations females, there is a slight increase, from 2.7% in 2002 to 3.0% in 2013.

Source

The estimates for COPD prevalence among First Nations in Alberta were compiled by the Alberta Ministry of Health in collaboration with the Alberta First Nations Information Governance Centre. They are used with permission from the Alberta Ministry of Health and Alberta First Nations Information Governance Centre and are based on administrative data.

Text alternative for Figure 2: Identifying COPD high users in Alberta

Of the 64,292 Albertans identified with COPD over the 2-year study period, 59% or 37,914 people were categorized into the Hospitalized group, and the remaining 41% or 26,378 people were categorized into the Not hospitalized group. Among those in the Hospitalized group, 15% or 5,872 were flagged as COPD high users (i.e., those with COPD who had at least 3 hospitalizations and a cumulative length of stay greater than 30 days in a year). While the other 85% or 32,042 people in the Hospitalized group were flagged as low/moderate users (i.e., people with COPD with at least 1 hospitalization in a year but did not meet the High Users of Hospital Beds indicator criteria described in this report).

Data table and text alternative for Figure 3: Age-standardized rate of COPD (per 100, 000) in Alberta by health zone, 2012–2013 and 2013–2014

Measure of COPD	Alberta	South Zone	Calgary Zone	Central Zone	Edmonton Zone	North Zone
Age-standardized rate (per 100,000)	2,018	1,972	1,492	2,390	2,118	3,159

Notes

Geographical variations in COPD prevalence are similar to those reported by AHS.[46]

Age-standardized rates were calculated by direct standardization to the 2011 Canadian population.

Sources

Discharge Abstract Database, 2012–2013 and 2013–2014; National Ambulatory Care Reporting System, 2012–2013 and 2013–2014; and Patient-Level Physician Billing Data, 2011–2012 and 2012–2013, Canadian Institute for Health Information; and Natural Resources Canada, Mapping Information Branch, *Atlas of Canada*, 2009 (2006 data).

Alberta's population is unevenly spread across its health zones. The North Zone, which is located in the northern part of the province, is the largest of the zones and is the most sparsely populated. The Edmonton Zone, which is located just below the North Zone, is the smallest zone in the province but is the most densely populated. The Central Zone, which borders the North and Edmonton Zones, is the second-largest zone in the province and has many highly populated places distributed throughout the zone. The Calgary Zone, which is just below the Central Zone, is smaller in size and is densely populated. The South Zone, which is located in the southern part of the province, has populated places spread across the zone.

Data table for Figure 4: Health care use in the year before index hospitalization for COPD high users, by Alberta health zone, 2012–2013 and 2013–2014†

Region	Primary care physician visits	Specialist visits	ED visits	Hospitalizations
South Zone	18*	8*	7*	4*
Calgary Zone	15*	5*	6*	4*
Central Zone	13*	4*	9*	4*
Edmonton Zone	15*	5*	7*	4*
North Zone	12	3	12	5

Notes

† Year of index hospitalization.

* Statistically different from the North Zone ($p<0.05$).

The average count of primary care and specialist visits in this table reflects only people with COPD with an index hospitalization in 2012–2013 (n = 2,661).

Sources

Discharge Abstract Database, 2011–2012 to 2013–2014; National Ambulatory Care Reporting System, 2011–2012 to 2013–2014; and Patient-Level Physician Billing Data, 2011–2012 and 2012–2013, Canadian Institute for Health Information; and Postal Code Conversion File Plus, version 6A1, Statistics Canada.

Data table for Figure 5: Discharge destination for COPD high users (%), by Alberta health zone, 2012–2013 and 2013–2014†

Region	Died	Home without support services	Continuing care	Acute inpatient institution	Other
South Zone	24	31	28*	12*	5
Calgary Zone	23	28*	35*	9*	5
Central Zone	24	25*	28*	19	4
Edmonton Zone	25	23*	39*	12*	1
North Zone	27	33	20	17	3

Notes

† Year of index hospitalization.

* Statistically different from the North Zone ($p<0.05$).

Sources

Discharge Abstract Database, 2011–2012 to 2013–2014; National Ambulatory Care Reporting System, 2011–2012 to 2013–2014; and Patient-Level Physician Billing Data, 2011–2012 and 2012–2013, Canadian Institute for Health Information; and Postal Code Conversion File Plus, version 6A1, Statistics Canada.

References

1. Wodchis WP, Austin PC, Henry DA. A 3-year study of high-cost users of health care. *CMAJ*. February 2016.

2. Canadian Institute for Health Information. High users of hospital beds. Accessed February 23, 2017.

3. Canadian Institute for Health Information. OECD Interactive Tool: International Comparisons. Accessed February 23, 2017.

4. Waye AE, Jacobs P, Ospina MB, Stickland MK, Mayers I. *Economic Surveillance for Chronic Obstructive Pulmonary Disease (COPD) in Alberta*. 2016.

5. Alberta Health Services. *Alberta's Strategic Clinical Networks: Chronic Obstructive Pulmonary Disease*. No date.

6. Global Initiative for Chronic Obstructive Lung Disease. Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease. 2015.

7. American Thoracic Society. *Patient Information Series: Exacerbation of COPD*. 2014.

8. Anzueto A. Impact of exacerbations on COPD. *European Respiratory Review*. June 2010.

9. Rocker GM, Simpson AC, Horton R. Palliative care in advanced lung disease: The challenge of integrating palliation into everyday care. *Chest*. September 2015.

10. Breslin E, van der Schans C, Breukink S, et al. Perception of fatigue and quality of life in patients with COPD. *Chest*. October 1998.

11. Evans J, Chen Y, Camp PG, Bowie DM, McRae L. *Estimating the Prevalence of COPD in Canada: Reported Diagnosis Versus Measured Airflow Obstruction*. 2014.

12. Canadian Institute for Health Information. *Inpatient Hospitalizations, Surgeries and Childbirth Indicators in 2013–2014*. 2015.

13. Canadian Institute for Health Information. *Care in Canadian ICUs*. 2016.

14. Canadian Institute for Health Information. *All-Cause Readmission to Acute Care and Return to the Emergency Department*. 2012.

15. Mittmann N, Kuramoto L, Seung SJ, Haddon JM, Bradley-Kennedy C, Fitzgerald JM. The cost of moderate and severe COPD exacerbations to the Canadian healthcare system. *Respiratory Medicine*. March 2008.

16. Chapman KR, Bourbeau J, Rance L. The burden of COPD in Canada: Results from the Confronting COPD survey. *Respiratory Medicine*. March 2003.

17. Patel JG, Nagar SP, Dalal AA. Indirect costs in chronic obstructive pulmonary disease: A review of the economic burden on employers and individuals in the United States. *International Journal of Chronic Obstructive Pulmonary Disease*. 2014.

18. Statistics Canada. Table 105-0501: Health indicator profile, annual estimates, by age group and sex, Canada, provinces, territories, health regions (2013 boundaries) and peer groups, occasional. Accessed February 23, 2017.

19. Statistics Canada. Chronic obstructive pulmonary disease under-diagnosed in Canadian adults: Results from cycles 3 and 4 (2012 to 2015) of the Canadian Health Measures Survey. Accessed February 23, 2017.

20. Coates AL, Graham BL, McFadden RG, et al. Spirometry in primary care. *Canadian Respiratory Journal*. January 2013.

21. Statistics Canada. Chronic obstructive pulmonary disease in adults, 2012–2013. Accessed February 23, 2017.

22. Gershon AS, Hwee J, Croxford R, Aaron SD, To T. Patient and physician factors associated with pulmonary function testing for COPD: A population study. *Chest*. February 2014.

23. Abramson MJ, Perret JL, Dharmage SC, McDonald VM, McDonald CF. Distinguishing adult-onset asthma from COPD: A review and a new approach. *International Journal of Chronic Obstructive Pulmonary Disease*. 2014.

24. Mannino DM, Buist AS. Global burden of COPD: Risk factors, prevalence, and future trends. *Lancet*. September 2007.

25. Tan WC, Sin DD, Bourbeau J, et al. Characteristics of COPD in never-smokers and ever-smokers in the general population: Results from the CanCOLD study. *Thorax*. September 2015.

26. World Health Organization. Burden of COPD. Accessed February 23, 2017.

27. Anthonisen NR, Connett JE, Kiley JP, et al. Effects of smoking intervention and the use of an inhaled anticholinergic bronchodilator on the rate of decline of FEV1. The Lung Health Study. *JAMA*. November 1994.

28. Khakban A, Sin DD, Fitzgerald JM, et al. The Projected Epidemic of COPD Hospitalizations Over the Next 15 Years: A Population Based Perspective. *American Journal of Respiratory and Critical Care Medicine*. September 2016.

29. Ospina MB, Voaklander DC, Stickland MK, King M, Senthilselvan A, Rowe BH. Prevalence of asthma and chronic obstructive pulmonary disease in Aboriginal and non-Aboriginal populations: A systematic review and meta-analysis of epidemiological studies. *Canadian Respiratory Journal*. November 2012.

30. Sin DD, Wells H, Svenson LW, Man SF. Asthma and COPD among Aboriginals in Alberta, Canada. *Chest*. June 2002.

31. Ospina MB, Voaklander D, Senthilselvan A, et al. Incidence and prevalence of chronic obstructive pulmonary disease among Aboriginal peoples in Alberta, Canada. *PLoS One*. 2015.

32. Centre for Aboriginal Health Research. *The Crisis of Chronic Disease Among Aboriginal Peoples: A Challenge for Public Health, Population Health and Social Policy*. 2009.

33. Centre for Rural and Northern Health Research. *Understanding Respiratory Conditions Among Ontario's Aboriginal Population*. 2010.

34. Gershon AS, Wang C, Guan J, Vasilevska-Ristovska J, Cicutto L, To T. Identifying individuals with physcian diagnosed COPD in health administrative databases. *COPD*. October 2009.

35. O'Donnell DE, Hernandez P, Kaplan A, et al. Canadian Thoracic Society recommendations for management of chronic obstructive pulmonary disease: 2008 update — Highlights for primary care. *Canadian Respiratory Journal*. January 2008.

36. Health Quality Ontario and Ministry of Health and Long-Term Care. Quality-Based Procedures: Clinical Handbook for Chronic Obstructive Pulmonary Disease (Acute and Postacute).

37. Public Health Agency of Canada. Fast facts about chronic obstructive pulmonary disease (COPD) 2011. Accessed February 23, 2017.

38. Canadian Institute for Health Information. *Continuity of Care With Family Medicine Physicians: Why It Matters*. 2015.

39. Canadian Institute for Health Information. *Drug Use Among Seniors on Public Drug Programs in Canada, 2012*. 2014.

40. Bourbeau J, Bartlett SJ. Patient adherence in COPD. *Thorax*. September 2008.

41. Canadian Institute for Health Information. End-of-Life Hospital Care for Cancer Patients. 2013.

42. Rocker G, Downar J, Morrison RS. Palliative care for chronic illness: Driving change. *CMAJ*. December 2016.

43. Rocker GM, Cook D. 'INSPIRED' approaches to better care for patients with advanced COPD. *Clinical and Investigative Medicine*. June 2013.

44. Canadian Foundation for Healthcare Improvement. INSPIRED Approaches to COPD Care. No date.

45. Alberta Health Services. *Alberta Health Services Zone Map*. No date.

46. Government of Alberta. Interactive Health Data Application. Accessed February 23, 2017.

47. Starke R, Spenceley S, Caffaro M, et al. *Rural Health Services Review Final Report*. 2015.

48. Canadian Institute for Health Information. *Supply, Distribution and Migration of Physicians in Canada, 2013 : Data Tables*. 2014.

49. Crighton EJ, Ragetlie R, Luo J, To T, Gershon A. A spatial analysis of COPD prevalence, incidence, mortality and health service use in Ontario. *Health Reports*. Statistics Canada. March 2015.

50. Canadian Institute for Health Information. *Physician Follow-Up After Hospital Discharge: Progress in Meeting Best Practices*. 2015.

51. Canadian Institute for Health Information. Scott's Medical Database. 2015.

52. Fromer L. Implementing chronic care for COPD: Planned visits, care coordination, and patient empowerment for improved outcomes. *International Journal of Chronic Obstructive Pulmonary Disease*. 2011.

53. Norrie OS, Dziadekwich R, Fernandez R, Metge CJ. Chronic Obstructive Pulmonary Disease (COPD) Integrated Care Pathway Project: Evaluation of patient outcomes and system efficiencies. J*ournal of Population Therapeutics and Clinical Pharmacology*. September 2016.

54. Corsonello A, Pedone C, Incalzi RA. Age-related pharmacokinetic and pharmacodynamic changes and related risk of adverse drug reactions. *Current Medicinal Chemistry*. 2010.

55. COPDexchange. *Identification and Management of Mild COPD Patients*. May 2013.

56. Alberta Health Services. *Emergency Strategic Clinical Network Newsletter*. February 2015.

57. Alberta Health Services. *Emergency Strategic Clinical Network Newsletter*. September 2015.

58. Alberta Health Services. *Strategic Clinical Network Research Project*. No date.

59. Stickland M, Jourdain T, Wong EY, Rodgers WM, Jendzjowsky NG, Macdonald GF. Using Telehealth technology to deliver pulmonary rehabilitation in chronic obstructive pulmonary disease patients. *Canadian Respiratory Journal*. July 2011.

60. Gershon AS, Dolmage TE, Stephenson A, Jackson B. Chronic obstructive pulmonary disease and socioeconomic status: A systematic review. *COPD*. June 2012.

media@cihi.ca

CIHI Ottawa
495 Richmond Road
Suite 600
Ottawa, Ont.
K2A 4H6
613-241-7860

CIHI Toronto
4110 Yonge Street
Suite 300
Toronto, Ont.
M2P 2B7
416-481-2002

CIHI Victoria
880 Douglas Street
Suite 600
Victoria, B.C.
V8W 2B7
250-220-4100

CIHI Montréal
1010 Sherbrooke Street West
Suite 602
Montréal, Que.
H3A 2R7
514-842-2226

cihi.ca

14880-0417