



Original Article

## **SELF-REPORTED HEALTH AND HEALTH SERVICE USE AMONG CANADIAN ADULTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)<sup>1</sup>**

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### **ABSTRACT**

Chronic Obstructive Pulmonary Disease (COPD) is a complex chronic condition that causes a large health burden on both individuals and on the health care system. Those living with this condition have been found to use significant amounts of health care services, particularly costly acute care services. The exploration of health service use and overall self-reported health is warranted. The objectives of the study were: 1) to describe self-reported health and other health-related variables among those living with (COPD) and 2) to determine the association between self-reported health and health services used by those living with COPD. An analysis of the Canadian Community Health Survey (CCHS) 2017-2018 was undertaken to examine the impact of COPD on self-rated health and health service use. Chi square, logistic regression, and poisson regression were used. Persons living with COPD are more likely to report poorer self-rated health (OR = 4.96, CI = 4.67-5.27) and mental health (OR = 2.54, CI = 2.36-2.72). Those with COPD were not more likely to report accessing health care providers beyond primary health care than those without COPD. COPD is associated with poorer self-rated health and mental health compared to those not living with COPD. Persons living with COPD were less likely to report accessing health care service from those beyond their primary care provider.

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**Keywords:** *Chronic Obstructive Pulmonary Disease (COPD), Self-reported Health, Health Service Use*

## **I. INTRODUCTION**

Chronic obstructive pulmonary disease (COPD), a non-curable, debilitating and degenerative lung disease, is recognized as the third leading cause of death worldwide. It accounts for 6% of all deaths globally (Halpin et al., 2019a; 2019b). The Canadian age-standardized prevalence of COPD increased from about 7% in 2000 – 2001 to 9.4% in 2011 – 2012 for adults aged 35 to 79 years (Public Health Agency of Canada, 2018). In Canada's most populous province, it is estimated that over 850, 000 Ontarians, 11.8%, aged 35 and over, have been diagnosed with COPD (Gershon et al., 2013). It is generally accepted that the reported prevalence rates of COPD are underestimated with respect to early multi-component services to mitigate the burgeoning services demands with respect to illness trajectory (Baldomero et al., 2022; Gershon et al., 2010; Hill et al., 2010; Labonte et al., 2016; Mannino & Holguin, 2006; Public Health Agency of Canada, 2018).

COPD is characterized by progressive, partially reversible airflow obstruction, systemic manifestations, and increasing frequency and severity of exacerbations (GOLD, 2023). Cardinal symptoms include dyspnea or shortness of breath and limitations in activity. Symptoms are insidious in onset and progressive. Dyspnea is the subjective experience of shortness of breath and is the most disabling symptom in COPD (Bailey et al., 2013; Bakthavatsalu et al., 2021; Bourbeau et al., 2019; GOLD, 2023). As such, there is a substantial individual human burden of COPD. Breathlessness, persistent cough, and fatigue impede persons' abilities to sustain their roles during their productive years. Multiple studies show a negative association between COPD symptomatology and functioning, social inclusion and health-related quality of life (Bailey, 2004; Boyles et al., 2011; Goodridge et al., 2011; Putcha et al., 2013). Many persons living with COPD also has other co-morbid conditions. Heart disease, depression, and diabetes are common comorbid conditions (Barnes & Celli, 2009). The presence of co-morbid conditions is associated with worsening health, an increase in symptoms like dyspnea, frequent exacerbations, and higher rates of hospitalizations (Chen et al., 2017; Hillas et al., 2015; Lee et al., 2017; Mannino et al., 2015; Putcha et al., 2013).

As a leading cause of morbidity and mortality, the impact of COPD on individual health has been studied quantitatively is recognized as a leading source of economic and human burden. The COPD burden is projected to increase because of exposure to COPD risk factors and the aging population (Mathers & Loncar, 2006). In addition, the burden is also underestimated due to under-diagnosis and the lack of consistent use of targeted lung function testing (Arne et al, 2010; Evans et al., 2014; Gershon et al., 2014; Statistics Canada, 2017).

The human or individual burden is substantial. For adult Canadians, COPD imposes multiple physical, emotional, and social limitations (Celli et al., 2017; Verma et al., 2018). The impact of COPD on health has been studied quantitatively (Halting & Grov, 2017, Putcha et al., 2013) and qualitatively (Bakthavatsalu et al., 2022; Stridsman et al., 2015). Measures of quality of life and health are often scored using established tools. Health has also been measured through self-report, asking persons how they would rate their own health.

At a community level, COPD is identified as an economic and social burden. A measure of burden at a community level is a disability-adjusted life year, an estimate of the fraction of mortality and disability attributable to a major disease. Globally, in 2013, COPD was the fifth leading cause of disability-adjusted life years lost (Global Burden of Disease Chronic Respiratory Disease Collaborators, 2020). In the United States, it is the second leading cause of disability-adjusted life years lost (Murray et al., 2013). In addition, the burden is also underestimated due to under-diagnosis and the lack of consistent use of targeted lung function testing (Arne et al., 2010; Baldomero et al., 2022; Evans et al., 2014; Gershon et al., 2014; Najafzadeh et al., 2012).

The annual economic burden to the Ontario health care system was approximately \$3.3 billion dollars in 2011, a figure that is projected to increase substantially in the future (Smetanin et al., 2011). In part, the high care cost is attributed to the high number of hospital admissions and readmissions of persons with COPD. In Ontario, those with COPD is associated with nearly one-third of all hospitalizations, emergency department visits, ambulatory care visits, admissions to long-term care settings, and homecare use (Gershon et al., 2013). Others have also described the burden COPD places on health care systems (Gershon et al., 2010; Gershon et al., 2011; Gershon et al., 2015; Gershon et al., 2017; Kuwornu et al., 2017; Mannino & Buist, 2007; May & Li, 2015; Najafzadeh et al., 2012)

The number of persons living with COPD is increasing and is likely underestimated. In turn, the complexity of this chronic condition will necessitate further development of comprehensive management and follow up services (Bourbeau et al., 2019; GOLD, 2023). Those living with COPD will require coordinated health and social services. Access to primary (e.g., family doctor, nurse practitioner) and specialty services (e.g., rehabilitation) varies across Canada and has implications for the provision of appropriate services.

Health service use by Canadians is often quantified through health administrative data sets (Gershon et al., 2013; Kuwornu et al., 2017; Statistics Canada, 2020). These data sets provide detailed information about health, medical outcomes, and people's interactions with the health care system. There are several limitations to this approach. One limitation is that people with COPD living in rural, northern, or underserved areas will be comparatively poorly represented. Second, administrative data sets typically do not capture self-reported health; which is central to persons living with COPD.

The Canadian Community Health Survey (CCHS) is a nationally representative sample that captures data on self-reported chronic illnesses, self-reported health status and self-reported

health service use. Data are collected from adults who live in the community, outside of an institution (e.g., long-term care). No previous studies have yet reported on the situation of Canadians living with COPD using this data set. It provides a unique opportunity to explore the impact of COPD on self-reported health status and provide additional information regarding the amount and type of health services used within this population.

This study describes associations between COPD, self-rated health, and the amount and type of health care services that are self-reported in a population of Canadian community dwelling adults. This study aims to answer the following research questions:

(1) What is the demographic profile of persons living with COPD nationally? How do those with COPD self-report their health and how does that compare to those without COPD? Are there differences in self-reported health by age?

(2) What health services are used by persons living with COPD nationally? Is the rate of service usage driven by self-reported health?

## **II. MATERIALS AND METHODS**

### **2.1. Design and sample**

This quantitative secondary analysis was performed using the 2017-2018 Canadian Community Health Survey (CCHS) data available through the Public Use Micro-data file (Statistics Canada, 2020). This national cross-sectional survey is recognized as one of the largest population-based repository of health data. It surveys a large sample of respondents, produces useful data, and is designed to provide reliable estimates at the health region level. The Public Use Micro-data file includes data collected over a two-year period (Statistics Canada, 2020). It includes variables addressing health status, health care utilization, and health determinants at local, provincial and national levels. The publicly available data are available for the purposes of secondary analysis in order to support health surveillance programs and to provide timely data as a single data source for health research.

The CCHS survey uses multi-staged sampling method. The provinces are divided into clusters. Clusters are geographic regions of 100-600 dwellings. In the first stage of sampling, a sample of primary sampling units, corresponding to geographic regions called clusters, are selected. In the second stage, dwelling lists are prepared for each selected cluster and dwellings are selected from these lists through systematic sampling.

The total surveyed sample for 2017-2018 CCHS was 113,289 Canadians, aged 12 and older, residing in one of 10 provinces and the three territories or 110 health regions. Excluded from the survey's coverage are persons: living on reserves and other Aboriginal settlements; who are full-time members of the Canadian Forces; residing in institutions (e.g., long term care, jails), and

living in the Quebec health regions of Région du Nunavik and Région des Terres-Cries--de-la-Baie-James.

In the chronic condition items of the CCHS survey, one nominally measured item addresses the cohort of interest for this secondary analysis. It states: "Do you have a chronic bronchitis, emphysema or chronic obstructive pulmonary disease or COPD?" The total number participants who responded 'yes' was 4,859 Canadians.

## 2.2. Data extraction

For this cohort, the following health-related and health service use variables were extracted.

- (1) Chronic Obstructive Pulmonary Disease Variable: Respondents were asked if they had a chronic condition. Those who responded "yes" to the question, "Do you have a chronic bronchitis, emphysema or chronic obstructive pulmonary disease or COPD?" were considered to have self-reported COPD.
- (2) Health: Respondents were asked, "In general, would you say your health is excellent, very good, good, fair, or poor?" Those who responded "excellent" or "very good" were grouped together and those who responded "fair or poor" were grouped together.
- (3) Poor Health: The variable 'poor health' was created from the 'health' variable for analysis. Poor health is a nominal, dichotomous yes/no variable. Fair and poor responses were combined to define 'poor health.' In contrast, excellent, very good, and good represented 'good health.'
- (4) Mental health: Respondents were asked, "In general, would you say your mental health is excellent, very good, good, fair, or poor?" Those who responded "excellent" or "very good" were grouped together and those who responded "fair or poor" were grouped together.
- (5) Poor Mental Health: The variable 'poor mental health' was created from the 'mental health' variable for analysis. Poor mental health is a nominal, dichotomous yes/no variable. Fair and poor responses were combined to define 'poor mental health'. In contrast, excellent, very good, and good responses represented 'good mental health'.
- (6) Satisfaction with Life: Respondents were asked, "Using a scale of 0 to 10, where 0 means 'very dissatisfied' and 10 means 'very satisfied', how do you feel about your life as a whole right now?" Those who responded "0, 1, 2, or 3" were grouped together, those who responded "4, 5, or 6" were grouped together, and those who responded "7, 8, 9, or 10" were grouped together.
- (7) Life Stress: Respondents were asked, "Thinking about the amount of stress in your life, would you say that most of your days are not stressful at all, not very stressful, a bit stressful, quite a bit stressful, or extremely stressful?" Those who responded "quite a bit stressful" or "extremely stressful" were grouped together.

- (8) Level of Coordination between health care providers: Respondents were asked, “In general, how would you rate the level of coordination between your regular health care provider and other health professionals who provide you with regular care? Would you say the coordination is excellent, very good, good, fair, or poor?” Those who responded “excellent” or “very good” were grouped together and those who responded “fair or poor” were grouped together.
- (9) Poor Level of Coordination between health care providers: The variable ‘poor level of coordination between health care providers’ was created from the ‘level of coordination between health care providers’ variable for analysis. Poor level of coordination between health care providers variable is a nominal, dichotomous yes/no variable. Fair and poor responses were combined to define ‘poor level of coordination between health care providers. In contrast, excellent, very good, and good represented good level of coordination between health care providers.
- (10) Health Service Use: In the CCHS, persons were asked if they have a regular health care provider, a primary health care provider that they regularly see or talk to when needing care or health advice. Persons were also asked if, in addition to their regular health care provider, they saw any other health care providers. A series of possible provider types was provided. We consider both these individual provider types and the total number of services accessed as proxies for the capacity to access health services as needed. Because a substantial proportion of respondents did not access any additional services, the number of total services was modelled using a poisson regression for this analysis.
- (11) Covariates and Demographic Variables: Age, gender, marital status, income, and education level were used to describe the sample and were used as covariates in adjusted models.

### 2.3. Statistical analysis

Extracted data for Canadians with COPD were analyzed as follows. To examine self-reported overall health and health service usage between community dwelling adult Canadians with and without a diagnosis of COPD the following statistical tests were performed. A descriptive analysis of the study population was completed. Those living with COPD were described nationally according to gender, marital status, age, highest level of education, and household income. Descriptive statistics were used to analyze each health and service use variable. Differences between subjects with COPD and without COPD were tested with Chi-square tests. To determine factors associated with varying levels of health and age, logistic regression analyses were used. Poisson regression was used to determine the rate of health service use. In these analyses, adjustments were made for age, sex, marital status, income, and education level. A p-value of <0.05 was considered statistically significant,

All analyses were performed using Stata v16.1 statistical software (StataCorp, 2019). Population weights were applied according to Statistics Canada guidelines to ensure accurate measures of variance, and to eliminate the possibility of groups being over or under represented (Statistics Canada, 2020).

### III. RESULTS

The demographic characteristics examined included: sex, age, marital status, highest level of education, and household income.

**Table 1. Demographic Characteristics of persons living with COPD**

<b>Sex (N = 4859)</b>	<b>Percentage %*</b>
Male	43.4
Female	56.6
<b>Marital status (N = 4842)</b>	
Married or common-law	43.8
Widowed/divorced/separated	41.8
Single	14.4
<b>Age (N = 4859)</b>	
Age 35-49	7.7
Age 50-69	49.0
Age 70 and older	43.3
<b>Highest level of education (N = 4771)</b>	
Less than secondary school graduation	31.5
Secondary school graduate	24.0
Post-secondary certificate, diploma or degree	44.5
<b>Income (Total household income) (N = 4857)</b>	
Less than \$39 999	48.0
\$40 000-\$79 999	31.0
Greater than \$80 000	21.0

\*p<0.05 for all variables

Nationally, slightly more females report having COPD than males (56 to 43%) and about half are between age of 50 and 69 (49%) and 43% are over age 70 (Table 1). They are married or common-law (44%) or widowed or divorced (42%). Fewer report being single (14%). The majority of those with COPD report secondary school graduation or less (55%). About half (48%)

of persons with COPD have an income of less than \$39 999 and about half report an annual income greater than \$40 000 (52%). Overall, fewer persons have an annual income of greater than \$80 000, approximately 21% of the sample population.

**Table 2. Self-reported General Health, Mental Health, Life and Work Stress**

	Self-reported COPD*	Does not report COPD*
<b>Perceived Overall Health (N = 82199)</b>	<b>Percentage %</b>	
Excellent/ Very Good	18.9	55.3
Good	31.8	30.2
Fair/ Poor	49.3	14.5
<b>Perceived Mental Health (N = 79889)</b>		
Excellent/Very good	51.6	69.0
Good	31.3	24.1
Fair/Poor	17.1	7.0
<b>Satisfaction with Life in General (Scale 1-10) (N = 79385)</b>		
0-3	11.8	2.1
4-6	25.4	11.8
7-10	66.7	86.2
<b>Perceived Life Stress (N = 81924)</b>		
Not at all stressful	16.9	17.0
Not very stressful	23.4	26.0
A bit stressful	36.0	38.2
Quite a bit/ extremely stressful	23.8	19.1
<b>Perceived Stress at Work (N = 43539)</b>		
Not at all stressful	13.1	10.7
Not very stressful	16.6	18.8
A bit stressful	37.7	42.1
Quite a bit/ extremely stressful	32.6	28.4

\*p<0.05 for all variables

There were notable differences among the ratings persons with COPD and those without COPD assigned to their perception of their overall health (Table 2). Persons with COPD were far less likely to rate their overall health as excellent or very good compared to those without COPD, 19% and 55%, respectively. About the same percentage (31-30%) rate their health as good, across

both groups. Persons with COPD were far more likely to rate their health as fair or poor compared to those without COPD, 49% compared to 15% of those who do not have COPD.

Differences were also noted among the ratings persons assigned to their mental health. Persons with COPD were less likely to rate their mental health as excellent or very good compared to those without COPD, 51.6% compared to 69.0%. Similar percentages were noted between those with COPD and those without COPD who rated their mental health as good, ranging from 23.7% to 34.2%. Persons living with COPD, were most likely to rate their mental health as fair or poor, 17% compared to only 7% of those living without COPD.

Persons were also asked to rate their overall satisfaction with life on a scale from 1 to 10, with 10 meaning the most satisfied. Those living with COPD were more likely to rate their overall satisfaction with life with a lower score (0-3) than those without COPD, 12% compared to only 2% of those persons who do not live with COPD. The percentage of persons who rank their satisfaction with life highly (score of 7-10) also varies between those living with COPD and those without COPD. About 66% of those living with COPD ranked their satisfaction high compared to about 86% of those who do not live with COPD.

Persons living with COPD and those without COPD ranked their perceived life stress similarly if they ranked their life stress was reported as not at all, not very or a bit stressful. Differences between those living with or without COPD were noted among those who ranked their life as quite a bit or extremely stressful. Those living with COPD were more likely to rank their life stress as quite a bit or extremely stressful, 24% compared to 19% of those without COPD.

Similar trends were noted among the rankings of perceived stress at work among those living with COPD compared to those not living with COPD. Persons living with COPD and those without COPD ranked their perceived work stress similarly if they ranked their work stress as not at all, not very or a bit stressful. Differences between those living with or without COPD were noted among those who ranked their work stress as quite a bit or extremely stressful. Those living with COPD were more likely to rank their work stress as quite a bit or extremely stressful, 33% compared to 28.4% of those without COPD.

Logistic regression analyses were performed to determine the association between age and self-reported health.

**Table 3. Impact of COPD on likelihood of having poor self-reported health by age**

	Age group (years)							
	35-49		50-69		70 or older		All ages	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Living with COPD	0.65*	0.61-0.69	0.37*	0.35-0.39	0.27*	0.25-0.29	4.96*	4.67-5.27

\*p<0.05 for all variables

Those with COPD were more likely to report poor self-reported health than those without COPD (OR = 4.96, CI = 4.67-5.27) (Table 3). Adults with COPD aged 35-49 (OR = 0.65, CI = 0.61-0.69) and aged 50-69 (OR = 0.37, CI = 0.35-0.39) were more likely to report being in poor health, compared to adults of the same age without COPD. Younger persons with COPD were most likely to report poor health than those without COPD.

**Table 4. Impact of COPD on likelihood of having poor self-reported mental health by age**

	Age group (years)							
	35-49		50-69		70 or older		All ages	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Living with COPD	1.21*	1.14-1.28	1.25*	1.20-1.32	0.98	0.92-1.03	2.54*	2.36-2.72

\*p<0.05 for all variables

Those with COPD were more likely to report poor self-reported mental health than those without COPD (OR =2.54, CI = 2.36-2.72) (Table 4). Adults with COPD aged 35-49 (OR = 1.21, CI = 1.14-1.28) and aged 50-69 (OR = 1.25, CI = 1.20-1.32) were more likely to report poor mental health, compared to adults of the same age without COPD.

**Table 5. Patterns of Primary Health Care receipt and reasons why one does not have a Primary Health Care Provider**

	Self-reported COPD*	Doesn't report COPD*
<b>Is there a place you usually go for immediate care of a minor problem? (N = 112698)</b>		
Yes	93.1	89.1
No	6.9	10.9
<b>What kind of place? (N = 100216)</b>		
Doctor's Office	57.1	53.4
Hospital outpatient	4.3	4.1
Community health centre	7.0	6.3
Walk in Clinic	15.4	22.6
Hospital Emergency	14.2	11.4

Some other place	2.1	2.0
<b>Do you have a primary Health Care Provider? (N = 112726)</b>		
Yes	93.1	84.8
No	6.9	15.2
<b>Reasons why you do not have a primary Health Care Provider (N = 16505)</b>		
<b>No need</b>		
Yes	14.1	25.8
No	85.9	74.2
<b>No one available in the area</b>		
Yes	34.5	22.5
No	65.5	77.5
<b>No one is taking new patients</b>		
Yes	21.9	16.2
No	78.1	83.8
<b>Have not tried to find one</b>		
Yes	10.5	26.7
No	89.5	73.3
<b>Health Care Provider left or retired</b>		
Yes	38.7	16.8
No	61.3	77.1
<b>Other</b>		
Yes	22.8	16.8
No	77.2	83.2

\*p<0.05 for all variables

Nationally, the majority of persons, about 90%, living with COPD or not, have a place where they can go to for care if they have a health care problem (Table 5). The majority of persons identify that place as a doctor's office, 57%. Overall, the second most common place identified was a walk-in clinic and the third most common place identified was a hospital emergency department. Nationally, only 14.2% of those living with COPD, and 11.4% living without COPD, identify a hospital emergency room as a place they seek care for a minor problem. Hospital outpatient settings and other settings were the least common places persons sought care for a minor problem.

Those living with COPD were more likely to report having a primary health care provider than their counterparts living without COPD. For those who do not have a health care provider, the

most common reason identified was no one was available in the area. The second most common reason identified was that their health care provider retired or left the area.

**Table 6. Patterns of Primary Health Care Providers including Timing, other Health Care Providers and Coordination among Providers**

	<b>Self-reported COPD*</b>	<b>Doesn't report COPD*</b>
<b>Type of Primary Health Care Provider (N = 95757)</b>		
Family doctor/General Practitioner	95.3	96.3
Medical Specialist	1.4	1.1
Nurse Practitioner	2.8	1.9
Other	0.4	0.6
<b>Waiting time for care of a minor problem (N = 88930)</b>		
Same day	23.7	22.2
Next day	15.1	16.5
2-3 days	20.7	22.8
4-6 days	8.7	9.2
1-2 weeks	17.4	17.2
2 weeks to 1 month	8.2	7.8
1 month or more	6.2	5.6
<b>Other Health Care Provider (N = 95643)</b>		
<b>Another Family Doctor/General Practitioner</b>		
Yes	9.0	7.9
No	91.0	92.3
<b>Specialist</b>		
Yes	40.8	20.8
No	59.2	79.2
<b>Nurse/Nurse Practitioner</b>		
Yes	11.1	6.2
No	88.9	93.8
<b>Chiropractor</b>		
Yes	6.8	10.1
No	93.2	89.9

<b>Registered Dietician</b>		
Yes	4.1	1.7
No	95.9	98.3
<b>Pharmacist</b>		
Yes	27.8	15.8
No	72.2	84.2
<b>Physiotherapist</b>		
Yes	6.0	7.3
No	94.0	92.7
<b>Psychologist/Mental Health Provider</b>		
Yes	4.7	4.1
No	95.3	95.9
<b>Social Worker</b>		
Yes	2.9	1.5
No	97.1	98.5
<b>Other</b>		
Yes	6.4	7.6
No	93.6	92.4
<b>None (no other Health Care Provider)</b>		
Yes	33.4	48.6
No	66.6	51.4
<b>Level of Coordination between primary Health Care Providers (N = 48997)</b>		
Excellent/Very Good	60.2	52.2
Good	23.5	24.0
Fair/Poor	11.5	11.7
Not applicable	4.8	12.0

\*p<0.05 for all variables

The majority of those living with COPD report having a family doctor, 95.3%, as their primary health care provider (Table 6). In addition to receiving services from their primary health care provider, many persons also report receiving services from other health care providers. The most common type of other health care provider reported by those living with COPD was a specialist, 41%, followed by a pharmacist, 28%, a nurse or nurse practitioner, 11%, and another family physician, 9%. Relatively few persons living with COPD report receiving services from a physiotherapist, 6%. Among those living with COPD, over 80% reported the level of coordination

between their primary health care provider and other health care providers as good or higher, and only 12% reported the level of coordination as fair or poor.

**Table 7. Impact of COPD on likelihood of reporting poor coordination between health care providers health by age**

	Age group (years)							
	35-49		50-69		70 or older		All ages	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Living with COPD	1.44*	1.33-1.55	1.09*	1.02-1.07	0.72*	0.65-0.78	0.63*	0.56-0.71

\*p<0.05 for all variables

Those with COPD were less likely to report poor coordination than those without COPD (OR = 0.63, CI = 0.56-0.71) (Table 7). The odds for reporting poor coordination were higher for those aged 35 to 49 (OR = 1.44, CI = 1.33-1.55) than those aged 70 or greater (OR = 0.72, CI = 0.65-0.78). When examining the interaction between poor coordination, self-reported health and COPD, persons that were older, aged 70 or greater, and who reported poor health, who did not have COPD, were more likely to report poor coordination.

In the CCHS, persons were asked if, in addition to their primary health care provider, they saw any other health care providers. A series of possible provider types was provided. We consider both these individual provider types and the total number of services accessed as proxies for the capacity to access health services as needed. Because a substantial proportion of respondents did not access any additional services, the number of total services was modelled using a poisson regression for this analysis.

Overall, persons with COPD reported using fewer medical services beyond primary health care (0.84) than those persons without COPD. Use of medical services did vary by age, such that respondents aged 35 to 49 tended to use more (1.21) times more likely to access services than younger respondents (less than 35 years), this increased for those 50-69 (1.42) and again for those 70 or older (1.64). Female respondents tended to use more services (1.31) than males. There was also an effect of income such that those with higher incomes, \$80 000 or higher, reported using the greatest number of services, and those with incomes from \$40 000 to \$79 000 used more services (1.14) than those reporting lower incomes of less than \$39 000.

#### **IV. DISCUSSION**

Using data from the CCHS 2017-2018, we explored self reports of health and health service use. Findings indicate that there were notable differences between the self-reported health of persons with COPD and those without COPD as persons with COPD were far less likely to rate their overall health as excellent or very good compared to those without COPD, 19% and 55%, respectively. Persons with COPD were far more likely to rate their health as fair or poor compared to those without COPD, 49% compared to 15% of those who do not have COPD. These findings are similar to those found in another study which examine self-rated health in persons living with COPD in the United States. Putcha and colleagues (2013) also found that those with COPD more commonly reported their health as fair or poor compared to those without COPD.

In this study, those with COPD were more likely to report poor self-reported health than those without COPD. The odds for reporting poor health were higher for persons who were younger with COPD (aged 35-49 and 50-69) than persons who were older living with COPD (aged 70 or older). Therefore, having COPD is an important determinant of self-rated health.

Differences were also noted among the ratings of self-reported mental health, although these differences were generally smaller than those seen with general health. Persons with COPD were less likely to rate their mental health as excellent or very good compared to those without COPD, 51.6% compared to 69.0%. Persons living with COPD, were most likely to rate their mental health as fair or poor, 17% compared to only 7% of those living without COPD. Those with COPD were more likely to report poor self-reported mental health than those without COPD. The odds for reporting poor mental health were higher for persons who were younger with COPD (aged 35-49 and 50-69).

These findings are consistent with other studies that also found that health is poor for those living with COPD compared to those without the disease (Janson et al., 2013; Putcha et al., 2013). This is important for health care providers to recognize as the individual burden of living with COPD is high. As symptoms can greatly interfere with the daily lives and activities of persons with this condition, interventions need to be targeted to help manage symptoms and to help individuals continue to be independent as possible for as long as possible. Further, as this study found those who are younger living with this condition were more likely to report poorer self-rated health and mental health than those who were older, further emphasizes the burden COPD places on persons during their productive years.

The impact of COPD is probably being underestimated in this and other studies. The diagnosis of COPD often takes time and many people only receive their diagnosis when they are in more advanced stages of the disease (Bourbeau et al., 2019). As such, many people in this data base are likely living with COPD, and have stated that they do not have COPD when in fact they likely do have the condition. This number likely greatly exceeds the number of people incorrectly diagnosed with this condition. Since there are people with COPD mixed into the 'those without

COPD' population, it can be expected that we are underestimating the impact of COPD on health. As the incidence of COPD rises with age, it can be imagined that the age effect may be accordingly overestimated.

As it has been reported that those living with COPD use many health services, especially acute care services, and have high rates of hospitalization and emergency room visits compared to those not living with COPD (Gershon et al., 2013), it was useful to see what were some of the health services that community dwelling individuals reported using in this data sample. The self-reported data in this survey focuses on primary health care and reports the type of providers and the number of health care providers one may receive care from. This survey data also captures services that may not necessarily be captured in other available administrative databases. It was found that the majority of those living with COPD report having a family doctor, 95.3%, as their primary health care provider. In addition to receiving services from their primary health care provider, persons with COPD were less likely to also report receiving health services from other health care providers than their counterparts without COPD. This finding is somewhat unexpected as compared to those persons without COPD, persons with COPD self-report their health to be poorer. As they self-report poorer health, one would expect that persons with COPD may seek additional service to help mitigate the symptomatic burden COPD places on their daily functioning. Findings also indicated those most likely to seek additional services beyond their primary care provider were older, female respondents, with higher incomes, health care providers may anticipate that such persons have unmet health care needs and/or are experiencing distressing symptoms related to their COPD. As coverage for some of these services identified in the CCHS may not be covered through respective provincial health care coverage and may require persons to pay out of pocket for services or have these services covered through additional health plans, the finding of those with higher incomes are more likely to seek additional health care services is noteworthy as this population may be more likely to have the financial ability to seek additional services. In this case, the ability to personally pay out of pocket for services may also be driving those with COPD to seek health service.

Lastly, although we have identified who is most likely to seek and receive additional health services, many persons in this study population do not access additional health services beyond their health care provider. One may hypothesize several reasons why this may be the case, first, persons may be satisfied with the management and care provided by their primary care provider or persons may not have access to other services based on geographical location or the financial means to access services in other areas or ones that may not be covered through provincial health care plans.

The most common type of other health care provider reported by those living with COPD was a specialist. In this study, although 41% of the cohort saw a specialist, data particular to the type of specialist were not available. COPD best practice guidelines identifies the specialist is a respirologist for disease management. Canadian respirologists often work in large urban academic

centres (Tranmer et al. 2022). As such, demand for their lung health expertise is substantial as indicated by patient, family, and health care providers' concerns about timely access to service. In addition, many persons living with COPD also has other comorbidities such as cardiac disease or diabetes (Corsonello et al., 2011; Putcha et al., 2013), and may see other, or more than one specialist to manage other chronic illnesses they may also have.

Among those living with COPD, over 80% reported that the level of coordination between their primary health care provider and other health care providers was good or better than good, and only 12% reported the level of coordination as fair or poor. Those with COPD were more likely to report higher levels of coordination than those without COPD. The odds for reporting poor coordination were higher for those aged 35 to 49 than those aged 70 or greater. The interaction between poor coordination, COPD, and self-rated health was examined and it was found that those with lower ratings of self-health were more likely to report lower levels of coordination among providers. These findings are interesting as overall, those with COPD report high levels of coordination among their health care providers, but some persons living with COPD report lower levels of coordination, specifically those who are younger and who report poor self-health. Those who report poor self-health may not be satisfied with the level of health service they are receiving and/or seeking as evidenced by their reports of poor coordination among health care providers. For older adults living with COPD, the understanding of coordination among health care providers may be different. It is possible that some persons living with COPD may not have any expectation for coordination among health care providers. It is also possible that they may not see other health care providers to manage their condition, as for many living with COPD, it is a long-standing condition that they have learned to manage.

Existing literature supports the notion that comprehensive, coordinated care is best and enhanced when providers work together (Mandi et al., 2014). Poor coordination has been associated with worse outcome, often a higher likelihood of hospital admissions, emergency room visits, and readmissions (Tranmer et al., 2022), yet overall, in this data set, persons with COPD were not more likely to report poor coordination among their health care providers, and those who were more likely to report poor coordination were younger and also reported poor self-rated health.

While any number or combination of health care providers may be involved in the management of COPD, the combination of a primary care provider and a specialist is common. Tranmer and colleagues (2022) further highlight the concern often raised regarding specialist care, specific to respirologists, as most work within academic centres located in larger urban areas of Canada. Further, not all respirologists focus on providing care to those with COPD. However, a large proportion of the total sample report not seeing any other health care providers other than their main provider (56%). In some cases, persons with COPD may be receiving adequate support from their primary care provider to manage their chronic condition and therefore do not feel the need to seek additional services from other providers. However, another scenario may also be the

case, where persons living with COPD would like to see additional health care providers to manage their condition but they are unable to do so, as perhaps other health care providers are not available in their geographic area and this may be why they indicated that they do not see any other providers. The number of available health care service providers is also an issue to be considered as perhaps only a few of the other health care providers are available to deliver service where those with COPD are residing. As such, persons with COPD may indicate that they sought service from a certain number of health care providers, but in reality, they would have liked to see more and/or different health care providers than what is available in their geographic region.

About one-quarter of those living with COPD reported receiving health service from a pharmacist, 28%. This finding is not surprising as a major component of the daily management of COPD is pharmacological in nature and the majority of those diagnosed would receive prescriptions for medications to manage their condition. However, one would expect the reported percentage of those who report receiving service from a pharmacist to be much higher than 28% as the majority of those living with COPD would have their prescriptions filled by and interact with a pharmacist. Yet three-quarters of those persons did not identify them as a member of their health care team.

Relatively few persons living with COPD report receiving services from a physiotherapist, only 6%. The service provided by physiotherapists, among other health services, are a core element in a pulmonary rehabilitation program; participation in a pulmonary rehabilitation program is a major component of the recommended management for COPD (Bourbeau et al., 2019, GOLD, 2023). Unfortunately, this finding is not surprising. Only 1.2% of the Canadian population of those living with COPD participate in or have access to pulmonary rehabilitation services (Bowen et al., 2015; Brooks et al., 2007; Brooks et al., 1999; Camp et al., 2015). However, the reason one may see a physiotherapist, or any of the other health care providers, is not collected in the CCHS, so although 6% report receiving services, they may be seeing them for reasons other than for their COPD management. Regardless of the reason why someone living with COPD chooses to receive care from a physiotherapist, or any other health care provider, it still indicates that they have the resources and the capacity to manage their COPD and improve their overall health and functioning.

As most persons with COPD identify having a primary health care provider (93.1%), very few persons are managing their COPD without a primary care provider, only 6.9%. The two most common reasons identified for not having a primary health care provider were that, the health care provider left or retired or no one is available in the area. This suggests that geography and equity of health care access are relevant to this group.

Findings from this study should be interpreted in light of the following limitations. First, the CCHS is cross-sectional, thus providing a description of a phenomenon at one point in time. In addition, the CCHS is comprised of self-reported data and may be subject to misclassification and recall bias. Specific to COPD, information was not collected about the severity of COPD, the

symptoms experienced by individuals, nor information regarding the overall management of their condition. As such, comparisons among those with similar stages of COPD could not be made. Lastly, the CCHS excludes individuals living in the Territories, members of the Canadian Forces, or those living on First Nations Reserves, so these populations are not included in the analyses.

## **V. CONCLUSION**

This study has added is a clear reflection of COPD on self-rated health. Similar to previous work (Jansen et al., 2013; Putcha et al., 2013), this study adds to the evidence that those who live with COPD have poorer self-rated health and mental health when compared to their counterparts without this condition. They were less likely to seek health services beyond their primary care provider and from other service providers than those persons without COPD. However, those who did seek additional services were more likely to be older with higher incomes. This includes a substantial number of services which may not be fully captured through clinical administrative databases, as, for example, pharmacists and physiotherapists, working in a community setting, are generally covered through private insurance in the Canadian context. Since COPD is progressive, these findings underscore the importance of identifying, diagnosing, and managing this condition earlier to optimize well-being for those living with this condition. At the population level, the Canadian population is aging fairly rapidly and the impact will become even more salient over the years to come. Since management of this condition is critical and optimal management rests on an entire team of health professionals, there should be a further exploration of self-reported health and health service use among those living with COPD. Further studies should continue to examine possible differences among self-reported health and health service use for those who live in different geographic areas and further examine potential differences among those living within an urban versus rural environment.

This information is helpful to health care providers and health care administrators as they plan for and deliver health care services to those living with COPD. It is hoped that a better understanding of the health, and the impact COPD has on self-reported health, and health care services accessed by those living with COPD, can be used by health care providers to strategically engage with those living with COPD as they interact with different health care services and providers.

The authors report that there is no conflict of interest. The results and views expressed are those of the authors and are not those of Statistics Canada.

**REFERENCES**

- Arne, M., Lisspers, K., Stallberg, B., Boman, G., Hedenstrom, H., Janson, C., & Emtner, M. (2010). How often is diagnosis of COPD confirmed with spirometry? *Respiratory Medicine*, *104*(4), 550-556.
- Bailey, P.H. (2004). The dyspnea-anxiety-cycle – COPD patients’ stories of breathlessness: “It’s scary/when you can’t breathe. *Qualitative Health Research*, *14*(6), 760-778.
- Bailey, P.H., McMillan Boyles, C., Duff Cloutier, J., Bartlett, A., Goodridge, D., Manji, M., & Dusek, B. (2013). Best practice in nursing care of dyspnea: The 6<sup>th</sup> vital sign in individuals with COPD. *Journal of Nursing Education and Practice*, *3*(10), <http://dx.doi.org.10.5430/jnep.v3n1p108>.
- Bakthavatsalu, B., Walshe, C., & Simpson, J. (2021). A systematic review of thematic synthesis of the experience of hospitalization in people with advanced chronic obstructive pulmonary disease. *COPD: Journal of Chronic Obstructive Pulmonary Disease*, *18*(5), 576-584. <https://doi.org/10.1080/15412555.2021.1971186>.
- Barnes, P.J., & Celli, B.R. (2009). Systemic manifestations and comorbidities of COPD. *European Respiratory Journal*, *33*, 1165-1185. <https://doi.10.1183/09031936.00128008>.
- Bourbeau, J., Bhutani, B., Hernandez, P., Aaron, S.D., Balter, M., Beauchesne, M., D’Urzo, A., Goldstein, R., Kaplan, A., Maltais, F., Sin, D.D., & Marciniuk, D.D., (2019): Canadian thoracic society clinical Practice guideline on pharmacotherapy in patients with COPD – 2019 update of evidence, *Canadian Journal of Respiratory, Critical Care, and Sleep Medicine*, *3*(4), 210-232. <https://doi:10.1080/24745332.2019.1668652>.
- Bowen, J.M., Campbell, K., Sutherland, S., Bartlett, A., Brooks, D., Qureshi, R., Goldstein, R., Gershon, A.S., Prevost, S., Samis, L., Kaplan, A.G., Hopkins, R.B., MacDougald, C., Nunes, E., O’Reilly, D.J., & Goeree, R. (2015). Pulmonary rehabilitation in ontario: a cross-sectional survey. *Ontario Health Technology Assessment Services*. *15*(8):1-67.
- Boyles, C.M., Bailey, P.H., & Mossey, S. D. (2011). Chronic obstructive pulmonary disease as disability: Dilemma stories. *Qualitative Health Research*, *23*, 3-13.
- Brooks, D., Lacasse, Y., & Goldstein, R.S. (1999). Pulmonary rehabilitation programs in Canada: National survey. *Canadian Respiratory Journal*, *6*(1), 55-63.
- Brooks, D., Sottana, R., Bell, B., Hanna, M., Laframboise, L., Selvanayagarajah, S., & Goldstein, R. (2007). Characterization of pulmonary rehabilitation programs in Canada in 2005. *Canadian Respiratory Journal*, *14*(2), 87-92. <https://doi:10.1155/2007/951498>.

- Camp, P.G., Hernandez, P., Bourbeau, J., Kirkham, A., Debigare, R., Stickland, M.K., Goodridge, D., Marciniuk, D.D., Road, J.D., Bhutani, M., & Dechman, G. (2015). Pulmonary rehabilitation in Canada: A report from the Canadian thoracic society COPD clinical assembly. *Canadian Respiratory Journal*, 22(3),147-52. [https://doi: 10.1155/2015/369851](https://doi.org/10.1155/2015/369851).
- Celli, B., Blesi, F., Gaga, M., Singh, D., Vogelmeier, C., Pegorato, V., Caputo, N., & Agusti, A. (2017). Perception of symptoms and quality of life: Comparison of patients and physicians; views in the COPD mirror study. *International Journal of Chronic Obstructive Pulmonary Disease*, 12, 2189-2196. [https://doi: 10.2147/COPD.S136711](https://doi.org/10.2147/COPD.S136711).
- Chen, W., FitzGerald, M., Sin, D.D. & Sadatsafavi, M. (2017). Excess economic burden of comorbidities in COPD: A 15-year population-based study. *European Respiratory Journal*, 50(1), [https://doi.10.1183/14993003.00393-2017](https://doi.org/10.1183/14993003.00393-2017).
- Corsonello, A., Antonelli, I.R., Pistelli, R., Pedone, C., Bustacchini, S., & Lattansio, F. (2011). Comorbidities of chronic obstructive pulmonary disease. *Current Opinions in Pulmonary Medicine*, 17, S21-S28.
- Evans, J., Chen Y., Camp, P.G., Bowie, D.M., & McRae, L. (2014). Estimating the prevalence of COPD in Canada: Reported diagnosis versus measured airflow obstruction. *Health Reports*, 25(3), 3-11. <http://www.statcan.gc.ca/pub/82-003-x/2014003/article/11908-eng.htm>.
- Gershon, A.S., Guan, C.G., Victor, J.C., Goldstein, R., & To, T., (2013). Quantifying health services use for chronic obstructive pulmonary disease. *American Journal of Respiratory and Critical Care Medicine*, 187(6), 596-60. [https://doi: 10.1164/rccm.201211-2044OC](https://doi.org/10.1164/rccm.201211-2044OC).
- Gershon, A.S., Hwee, J., Croxford, R., Aaron, S.D., & To, T. (2014). Patient and physician factors associated with pulmonary function testing for COPD: A population study. *Chest*, 145(2), 272-281.
- Gershon, A.S., Hwee, J., Victor, J.C., Wilton, A., Wu, R., Day, A., & To, T. (2015). Mortality trends in women and men with COPD in Ontario, Canada, 1996-2012, *Thorax*, 70, 121-126. [https://doi: 10.1136/thoraxjnl-2014-205956](https://doi.org/10.1136/thoraxjnl-2014-205956).
- Gershon, A.S., Mecredy, G., Croxford, R., To, T., Stanbrook, M.B., & Aaron, S.D. (2017). Outcomes of patients with chronic obstructive pulmonary disease diagnosed with or without pulmonary function testing. *Canadian Medical Association Journal*, 189(14), E530-8. [https://doi:10.1503/cmaj.151420](https://doi.org/10.1503/cmaj.151420).
- Gershon A. S., Wang, C., Wilton, A. S., Raut, R., & To, T. (2010). Trends in chronic obstructive pulmonary disease prevalence, incidence, and mortality in Ontario, Canada, 1996-2007:

- A population-based study. *Archives of Internal Medicine*, 170(6), 560-565. <https://doi:10.1001/archinternmed>.
- Gershon, A.S., Warner, L., Cascagnette, P., Victor, J.C. & To, T. (2011). Lifetime risk of developing chronic obstructive pulmonary disease: A longitudinal population study. *Lancet*, 378, 991-996.
- Global burden of disease chronic respiratory disease collaborators (2020). Prevalence and attributable health burden of chronic respiratory diseases, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet Respiratory Medicine*, 8(6), 585-596.
- Goodridge, D., Hutchinson, S., Wilson, D., & Ross, C. (2011). Living in a rural area with advanced chronic respiratory illness: A qualitative study. *Primary Care Respiratory Journal*, 20(1), 54-8. [https://doi: 10.4104/pcrj.2010.00062](https://doi:10.4104/pcrj.2010.00062).
- Halding, A., & Grov, E.K. (2017). Self-rated health aspects among persons living with chronic obstructive pulmonary disease. *International Journal of COPD*, 12, 1163-1172.
- Halpin, D.M.G., Celli, B., Criner, G., (2019a). The GOLD Summit on chronic obstructive pulmonary disease in low- and middle-income countries. *International Journal of Tuberculosis and Lung Disease*, 23(11), 1131-1141.
- Halpin, D.M.G., Celli, B., Crinder, G., Frith, P., Varela, V., Salvio, S., Vogelmeier, C., Chen, R., Mortimer, K., de Oca, M., Obaseki, A., Decker, R., & Agusti, A. (2019b). It is time for the world to take COPD seriously: A statement from the GOLD board of directors. *European Respiratory Journal*, 54(1), 1900914.
- Hillas, G., Perlikos, F., Tsiligianni, I., & Tzanakis, N. (2015). Managing comorbidities in COPD. *International Journal of Chronic Obstructive Pulmonary Disease*, 10, 95-109. [https://doi: 10.2147/COPD.S54473](https://doi:10.2147/COPD.S54473).
- Janson, C., Marks, G., Buist, S., Gnatiuc, L., Gislason, T., McBurnie, M., Nielson, R., Studnicka, M., Toelle, B., Benediktsdotir, B., & Burney, P. (2013). The impact of COPD on health status: Findings from the BOLD study. *European Respiratory Journal*, 42, 1472-1483. <https://doi:10.1183/09031936.00153712>.
- Kuwornu, J.P., Teare, G.F., Quail, J.M., Forget, E., Muthukumarana, S., Wang, X.E., Osman, M., Lix, L.M. (2017). Comparison of the accuracy of classification models to estimate healthcare use and costs associated with COPD exacerbations in Saskatchewan, Canada: A retrospective cohort study. *Canadian Journal of Respiratory Therapy*. 53(3), 37-44.
- Lee, H., Jhun, B.W., Cho, J., Yoo, K.H., Lee, J.H., Kim, D.K., Lee, J.D., Jung, K.S., Lee, J.Y., Park, H.Y. (2017). Different impacts of respiratory symptoms and comorbidities on

- COPD-specific health-related quality of life by COPD severity. *International Journal of Chronic Obstructive Pulmonary Disease*, 12, 3301-3310. <https://doi:10.2147/COPD.S145910>.
- Mandi, K.D., Olson, K.I., Mines, D., Li, C., & Tian, F. (2014). Provider collaboration: Cohesion, constellations, and shared patients. *Journal of Gerontological Internal Medicine*, 29, 1499-1505. <https://doi.org/10.1007/s11606-014-2964-0>.
- Mannino, D.M., & Buist, A.S. (2007). Global burden of COPD: risk factors, prevalence, and future trends. *Lancet*, 370(9589), 765-73. [https://doi:10.1016/S0140-6736\(07\)61380-4](https://doi:10.1016/S0140-6736(07)61380-4).
- Mannino, D.M., & Holguin, F. (2006). Epidemiology and global impact of chronic obstructive pulmonary disease. *Respiratory Medicine*, 1, 114-120. <https://doi:10.1016/j.rmedu.2006.02.001>.
- Mannino, D.M., Higuchi, K., Yu, T., Zhou, H., Li, Y., Tian, H., & Suh, K. (2015). Economic burden of COPD in the presence of comorbidities. *Chest*, 148(1). <https://doi.org/10.1378/chest.14-2434>.
- Mather, C.D. & Loncar, D. (2006). Projections of global mortality and burden of disease from 2022 to 2030. *PLoS Med*. 3(11), e442.
- May, S. M., & Li, J.T. (2015). Burden of chronic obstructive pulmonary disease: Healthcare costs and beyond. *Allergy Asthma Proceedings*, 36(1), 4-10. <https://doi:10.2500/aap.2015.36.3812>.
- Murray, C.J., Atkinson, C., Bhalla, K. et al. (2013). The state of US health, 1990-2010: Burden of diseases, injuries, and risk factors. *Journal of the American Medical Association*, 310(6), 591-608.
- Najafzadeh, M., Marra, C.A., Lynd, L.D., Sadatsafavi, M., FitzGerald, J.M., McManus, B., & Sin, D. (2012). Future impact of various interventions on the burden of COPD in Canada: A dynamic population model. *PLoS One*, 7(10), <https://doi:10.1371/journal.pone.0046746>.
- Public Health Agency of Canada. (2018). *Asthma and chronic obstructive pulmonary disease (COPD) in Canada, 2018*. <https://www.canada.ca/en/public-health/services/publications/diseases-conditions/asthma-chronic-obstructive-pulmonary-disease-canada-2018.html>.
- Putcha, N., Puhan, M.A., Hansel, N.N., Drummond, B., & Boyd, C.M. (2013). Impact of comorbidities on self-rated health in self-reported COPD: An analysis of NHANES 2001-2008. *Journal of Chronic Obstructive Pulmonary Disease*, 10, 324-322. <https://doi:10.3109/15412555.2012.744963>.

- Smetanin, P., Stiff, D., Briante, C., Ahmad, S., Wong, L., & Ler, A. (2011). Life and economic impact of lung disease in Ontario 2011 to 2041. *Risk Analytica on behalf of the Ontario Lung Association*.
- StataCorp. (2019). *Stata Statistical Software: Release 16*. College Station, TX: StataCorp LLC.
- Statistics Canada. (2017). Chronic obstructive pulmonary disease under-diagnosed in Canadian adults: Results from cycles 3 and 4 (2012 to 2015) of the Canadian Health Measures Survey. *Health Fact Sheets*.
- Statistics Canada. (2020). *Canadian Community Health Survey (CCHS), 2017-2018*. <https://abacus.library.ubc.ca/dataset.xhtml?persistentId=hdl:11272.1/AB2/SEB16A>.
- Stridsman, C., Zingmark, K., Lindberg, A., & Skar, L. (2015). Creating a balance between breathing and viability: Experiences of well-being when living with chronic obstructive pulmonary disease. *Primary Health Care Research & Development*, 16, 42-52. <https://doi:10.1017/S1463423614000048>.
- Tranmer, J., Rotter, T., O'Donnell, D., Marciniuk, D., Green, M., Kinsman, K., & Li, W. (2022). BMC Health Services Research, 22, 1210. <https://doi.org/10.1186/s12913-022-08588-w>.
- Verma, J.Y., Amar, C., Sibbald, S., & Rocker, G.M. (2018). Improving care for advanced COPD through practice change: Experiences of participation in a Canadian spread collaborative. *Chronic Respiratory Disease*, 15(1), 1-14. <https://doi:10.1177/1479972317712720> [journals.sagepub.com/home/crd](https://journals.sagepub.com/home/crd).

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