UNMET HEALTHCARE NEEDS DURING THE COVID-19 PANDEMIC

DESCRIBING UNMET HEALTHCARE NEEDS DURING THE COVID-19 PANDEMIC: AN ANALYSIS OF THE CANADIAN LONGITUDINAL STUDY ON AGING (CLSA) COVID-19 QUESTIONNAIRE STUDY

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TITLE: Describing Unmet Healthcare Needs During the COVID-19 Pandemic: An Analysis of the Canadian Longitudinal Study on Aging (CLSA) COVID-19 Questionnaire Study

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LAY ABSTRACT:

The COVID-19 pandemic in Canada affected how individuals were able to access healthcare services. To understand which groups experienced a greater level of difficulties, we examined the experience of unmet healthcare needs during the first year of the pandemic using a sample of 23,972 adults that had completed the Canadian Longitudinal Study on Aging (CLSA) COVID-19 Questionnaire Study (Sept. – Dec. 2020). We found evidence that the experience of unmet healthcare needs varied by several sociodemographic characteristics, such as sex, immigrant status, racial background, education and income. Younger adults were more likely to report unmet needs. Individuals with chronic conditions and those had reported unmet healthcare needs prior to the pandemic were also more likely to report unmet needs during the pandemic. Individuals with symptoms of depression and anxiety were also more likely to report unmet healthcare needs. These results can be used to inform interventions that improve access to healthcare services for vulnerable groups.

ABSTRACT:

BACKGROUND: The COVID-19 pandemic disrupted access to healthcare services in Canada, but little is known about the magnitude of unmet healthcare needs and characteristics associated with increased risk of unmet needs in the adult population.

OBJECTIVES: First, to describe unmet healthcare needs, including COVID-19 testing access, and to evaluate the association of the social determinants of health (SDOH) and chronic conditions with unmet healthcare needs. Secondly, to evaluate the association between symptoms of depression and anxiety with unmet healthcare needs, and test if the interaction was modified by sex.

METHODS: The data of 23,972 adults who completed the Canadian Longitudinal Study on Aging COVID-19 Questionnaire Study exit survey (Sept.–Dec. 2020) was analyzed. Three outcomes were evaluated: 1) challenges accessing healthcare, 2) not going to a hospital or seeing a doctor when needed, 3) experiencing barriers to COVID-19 testing. For objective 1, a prospective cohort study was conducted. For objective 2, a cross-sectional study was conducted.

RESULTS: Overall, 25% of adults in Canada reported challenges accessing healthcare, 8% did not go to a hospital or see a doctor when needed, and 4% experienced barriers to COVID-19 testing. Several SDOH, including sex, immigrant status, racial background, education and income, were associated with unmet needs. The odds of reporting all three

outcomes declined with age. Pre-pandemic unmet needs were strongly associated with higher odds of all three outcomes, while the presence of chronic conditions was associated with higher odds of the first two outcomes. Symptoms of depression and anxiety were strongly associated with all three outcomes. Interaction with sex was found for the first outcome, with stronger associations in females.

CONCLUSIONS: This thesis identified groups that experienced difficulties accessing healthcare services during the pandemic. Future research may assess consequences of unmet needs, evaluate mechanisms that cause unmet needs and determine ideal interventions.

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Lastly, I'd like to thank my family and friends for their provision of iced coffees and unwavering support.

PREFACE:

This thesis follows the format of a sandwich thesis. The introductory chapter is a literature review, which details the experience of unmet healthcare needs in Canada. The second chapter consists of manuscript #1 which was submitted to the Canadian Medical Association Journal (CMAJ) Open on December 6th, 2021 and revised based on reviewer comments on April 25, 2022. The third chapter also consists of manuscript #2, which was submitted to BMC Public Health on March 31st, 2022. The final, fourth chapter concludes the thesis by summarizing the results and discussing their significance.

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LIST OF ALL ABBREVIATIONS

aOR – Adjusted Odds Ratio

CCHS – Canadian Community Health Survey

CESD-10 – Center for Epidemiologic Studies Depression Scale 10

CI – Confidence Interval

CIS – Canada Income Study

CLSA – Canadian Longitudinal Study on Aging

COVID-19 – Coronavirus disease 2019

EU-SILC – European Union Statistics on Income and Living Conditions

GAD – Generalized Anxiety Disorder

GAD-7 – Generalized Anxiety Disorder Scale 7

MDE – Major Depressive Episode

NPHS – National Population Health Survey

OECD – Organisation for Economic Co-operation and Development

OR – Odds Ratio

SARS-CoV-2 – Severe acute respiratory syndrome coronavirus 2

SDOH – Social Determinants of Health

SHARE – Survey of Health, Ageing and Retirement in Europe

DECLARATION OF ACADEMIC ACHIEVEMENT

I, Jayati Khattar, declare that this thesis document is my original work. I conducted the background literature review, performed the data analyses, wrote the results and summarized the conclusions in this document. My supervisor, Dr. Laura N. Anderson, and committee members contributed to conceptualization of the research project, supervised the data analysis and provided feedback and comments for all pieces of this final document. Additional authors for the manuscripts have been credited below.

Chapter 2: This chapter consists of a manuscript that is currently under review with CMAJ Open. I conducted all data analysis and wrote the first draft of the manuscript. My supervisor and committee members assisted with the conceptualization and provided feedback through out the process. Vanessa De Rubeis provided assistance with the data cleaning and analysis. All authors, including Drs. Ying Jiang, Margaret de Groh, Nicole E. Basta, Susan Kirkland, Christina Wolfson and Parminder Raina provided feedback and comments on the manuscript and approved the manuscript before submission.

Chapter 3: This chapter consists of a manuscript that is currently under review at BMC Public Health. My supervisor and committee members assisted with the conceptualization and provided feedback through out the process. Vanessa De Rubeis provided assistance with the data cleaning and analysis. All authors, including Drs. Ying Jiang, Margaret de Groh,Nicole E. Basta, Susan Kirkland, Christina Wolfson and Parminder Raina provided feedback and comments on the manuscript and approved the manuscript before submission.

CHAPTER 1: LITERATURE REVIEW

1.1 What are Unmet Healthcare Needs?

1.1.1 An Introduction to the Measurement

Unmet healthcare needs can be defined simply as a perceived gap in the healthcare services required and the healthcare services received.(1,2) Unmet healthcare needs are a subjective measurement of the performance of a healthcare system, which are used to evaluate how accessible and acceptable services are in the opinion of the potential utilizers. They can be considered to be a counterpart to objective measurements of healthcare performance, such as utilization or expenditure statistics.(3) There may be multiple reasons for why unmet healthcare needs arise, ranging from personal preferences to systemic barriers. Unmet needs may differ by type of healthcare services, such as primary care, vision or dental. They may arise during any point in the process of seeking care, from the first recognition that care is needed to outpatient treatment.(4) The flexibility of the concept has allowed for examination of a diverse set of determinants that influence unmet needs. To prevent unmet needs, services must be available, accessible and acceptable.(5)

It has been recognized that there are limitations to the measurement. It has been considered to be too broad of a measurement. It is difficult to differentiate between the types of unmet needs, which can make it difficult to use them to mobilize policy change.(6) Additionally, unmet healthcare needs do not equate to actual services utilized, with some populations that use a greater amount of healthcare services more likely to report unmet needs and others less.(7)

Nevertheless, a strength of the measurement is that it is empowering to directly understand the perspective of individuals that use the healthcare services, rather than relying on the assessments of physicians or utilization statistics.(1) It is also easily incorporated into

questionnaires.(8) Furthermore, there is evidence to support that unmet healthcare needs can serve as a predictor of future deterioration in health. Without timely access to appropriate healthcare services, individuals can experience a worsening of symptoms that can have long term ramifications. Longitudinal studies have found that reporting unmet needs is associated with a greater risk of mortality.(9–11) For example, in a national study of Chinese older adults, those that expressed unmet needs had a 10% higher risk of 3 year mortality, even after controlling for sociodemographic characteristics.(12) Foregoing care can result in prolonging of pain and adverse consequences later in life.(13,14) Beyond the direct health impacts of unmet needs, delayed or missed care can also result in loss of future income and an overall lower quality of life.(15)

1.1.2 Unmet Healthcare Needs in Canada

In Canada, the principle of universal health coverage is enshrined in the 1984 Canada Health Act. The law affirms a responsibility to ensure "reasonable access to health services without financial or other barriers" for residents.(16) To receive the Canada Health Transfer, funding for the healthcare system, provinces and territories must outline a health insurance plan in accordance with the federal government's criteria. The criteria of the federal government relate to the public administration, comprehensiveness, universality, portability and accessibility of healthcare services. While the provincial and territorial governments are responsible for the administration and delivery of healthcare services, there is a cross-national commitment to the concept of universal health care. However, residents of Canada continue to report unmet healthcare needs.

Unmet healthcare needs in Canada have been routinely measured by Statistics Canada using the population-wide National Population Health Survey (NPHS) and the Canadian Community Health Survey (CCHS), which both asked respondents: "During the past 12 months, was there ever a time when you felt that you needed healthcare but didn't receive it?". Analysis of repeated cross-sectional NPHS and CCHS data found that unmet healthcare needs increased from the 1990s to early 2000s.(5,17) In the 1994/1995 NPHS cycle, 4% of the sample reported unmet needs, whereas in the 2000/2001 CCHS cycle, 13% of the sample reported unmet needs.(17) Longitudinal analysis of the 2000 to 2014 CCHS cycles found that the level of unmet needs stabilized to between 11.6% to 12% from 2003 to 2014.(18) Recently, Statistics Canada also began collecting information on unmet healthcare needs as part of the Canada Income Study (CIS). In the 2018 CIS cycle, only 5.1% of the sample reported unmet needs and in the 2019 cycle, only 6% of the sample reported unmet needs.(19)

The NPHS and CCHS have included questions related to the reasons for the unmet healthcare needs. Lengthy waiting times have been the most commonly cited reason in multiple iterations of the surveys.(3,17) Allan and Ammi (18) examined CCHS data from 2001 to 2014, finding that reasons related to systemic barriers (i.e., cost, transportation, unavailability of services) consistently represented the majority of reasons for unmet needs. In addition to population-wide surveys, research has examined numerous sub-groups and found unique barriers, such as disease-related stigma and precarious status in Canada, that result in unmet healthcare needs.(20,21)

Previous research that has directly examined the longitudinal relationship between unmet needs and long-term health consequences in Canada has been conflicting. Unmet needs were not associated with worsening in self-reported health in a study of Hamilton neighbourhoods.(22) In

a study of 2001-2003 CCHS data focusing on adults with chronic conditions, unmet needs were not associated with an elevated risk of hospital or mortality.(23) However, longitudinal analysis of larger samples of NPHS data found that unmet needs were associated with greater likelihood of reported chronic conditions, worsened self-reported health, and increases in activity restriction in later survey cycles.(6,24) A study of 9205 randomly-selected adults in Quebec also found that unmet needs resulted in enduring pain and restrictions in activities.(14) Several studies have estimated the impact of waiting times, finding that longer wait times were associated with greater risk of mortality.(25,26) Qualitative studies have also found that barriers to healthcare can cause frustration and deterioration in health.(27,28)

1.1.3 Unmet Healthcare Needs during the COVID-19 Pandemic

1.1.3.1 The COVID-19 pandemic in Canada

The first Canadian case of the novel virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes the coronavirus disease 2019 (COVID-19), was detected in January 2020 in the province of Ontario. Cases began to rapidly rise across the country by March 2020, due to community spread.(29) By March 11th, the World Health Organization declared COVID-19 a pandemic.(30) Starting at the end of March 2020, provincial and territorial public health authorities advised social distancing and placed gathering limits to limit spread.(31) The first wave is thought to have commenced in January 2020 and lasted until June.(32) The second wave began across the country in September 2020, peaked in mid-January and continued until the end of February 2021.(32) Throughout the first two waves, the provinces most affected were Ontario, Quebec, Alberta and British Columbia.(33) As of December 2020, 95% of all deaths related to COVID-19 in Canada occurred in the preceding four provinces.(33)

1.1.3.2. Response of the Canadian healthcare system to COVID-19

In response to COVID-19, medical systems shifted to virtual care and suspended non-essential services.(29) To maximize resources available for COVID-19 patients, elective surgeries and diagnostic test appointments were cancelled or postponed. It was estimated that 370,000 elective surgeries were postponed during the first wave alone.(34) MRI and CT scan volumes fell by one quarter and one fifth, respectively.(35) Home care services were also impacted, with declines in home assessments and visits observed.(36,37) Throughout the first and second wave of the pandemic, access to testing services for COVID-19 services was restricted due to limited testing capacity.(29) Therefore, the transition to virtual care and modifications in service availability changed how Canadians were able to access healthcare services.

From the start of the pandemic to May 2021, 49% of Canadians reported that they experienced difficulty accessing healthcare and 30% delayed seeking medical attention.(38) Additionally, 15% reported that that they did not receive all of the services needed, of which 80% stated that their lives had been negatively impacted due to the lost services causing anxiety and worsening of health status.(38) Given the enormity of unmet needs reported by Canadians during the pandemic, they must be examined to identify the groups at greatest risk of adverse consequences and plan for future health policies.

1.2 What are the Determinants of Unmet Healthcare Needs?

1.2.1. The Social Determinants of Health

The social determinants of health (SDOH) are the socioeconomic, political and environmental factors that influence the wellbeing of communities and populations.(39) Within

the SDOH framework, it is recognized that health is not merely a product of individual lifestyle choices, but it is shaped by broader, systemic determinants.(40) Differences in health are acknowledged to arise from inequities in power and resources.(40) There is a rich literature examining how a variety of factors, such as income, education and race, affect the wellbeing of populations. For example, analysis of life expectancies in Canada found that individuals residing in neighbourhoods with the top income quintile are expected to live 2.3 to 4.7 years longer than those residing in the lowest quintile.(41) The SDOH also influence the experience of unmet healthcare needs, as certain groups face greater barriers to care.

1.2.1.1. The Social Determinants of Health and Unmet Healthcare Needs

With respect to gender, women have repeatedly experienced higher levels of unmet need than men.(18) Some work has suggested that as women perform greater proportions of domestic labour and have lower financial freedom, preventing them from easily accessing healthcare services.(42,43) Studies have also found that women are referred to specialists and offered invasive procedures at lower rates than men.(44–46) Women also have higher levels of healthcare utilization, although some literature has found that gender differences are minimal after adjusting for morbidities and greater use of reproductive services.(47–49) Additionally, men typically express lower willingness to visit healthcare professionals, which may partly explain why they report less unmet needs.(50)

Research has found mixed results for the determinants of education and income. Individuals with higher levels of education have consistently reported higher levels of unmet need in Canada.(3,18,51,52) Longitudinal analysis of NPHS and CCHS cycles did not find that income was consistently associated with unmet needs in the country.(18,52) However, the

association has been seen to be significant in certain cycles individually, like the 2003 and 2014 CCHS, in which individuals with lower incomes were more likely to report unmet needs.(3) The 2002-2003 Joint Canada-United States survey found that unmet needs were highest in the lowest income quintile.(53) Results of the Tri-City Survey in British Columbia also found that individuals with lower incomes were more likely to report unmet need.(42) These conflicting conclusions may be due to several reasons. Data from Organisation for Economic Co-operation and Development (OECD) countries and the Survey of Health, Ageing and Retirement in Europe (SHARE) survey indicates that wealthier and more educated individuals are more likely to consult general practitioners and specialists.(54,55) Evaluation of Canadian data has also found that wealthier individuals are more likely to utilize specialist services.(56) Furthermore, individuals with higher levels of income and education tend to be less likely to forego care.(57,58) Therefore, they may have higher expectations for care received and be less amenable to disruptions. However, individuals with lower incomes or education levels may face greater difficulties navigating the healthcare system and advocating for their care.(59) They may also have to forego care due to financial constraints, especially for dental or optical services that are not covered in universal health coverage plans.(60) Additionally, longer wait times have been associated with lower income levels.(61,62) In countries with limited coverage of healthcare services, there appears to be a stronger association of income with unmet needs. Individuals with lower levels of income are more likely to report unmet needs.(63,64)

Racial and ethnic background have also been examined as risk factors for unmet needs.(65) Members of racialized groups ethnic may experience discrimination within the healthcare system, which can prevent them from seeking care again.(66) Longitudinal analysis of NPHS data from 1994 to 2007 did not find that immigrants had higher unmet needs than the

native-born population.(67) Nevertheless, language differences or unfamiliarity with the structure of the healthcare system are commonly cited by immigrants as barriers to healthcare services.(68)

Marital status has also been examined as a determinant on unmet needs. NPHS and CCHS data suggests that married/common-law individuals and those separated/divorced have higher unmet needs than those who are single.(18,52) Other literature contradicts this finding, with individuals that are single reporting more unmet needs than those with a partner.(43,69) It has been suggested that married individuals may have higher levels of healthcare utilization, which could contribute to their elevated unmet needs.(56) However, through marriage, individuals may be provided with social support, facilitating access to healthcare services.(70)

Unmet needs have also been associated with housing and employment type, which are seen as extensions of the determinant of income. In the Tri-City Survey, renters were more likely report unmet needs.(42) Residential stability was also associated with a decrease in unmet medical needs in a population of 1173 vulnerably housed adults.(71) Unemployed and precariously employed individuals have reported higher unmet needs, relative to those employed full time.(72,73)

Geographic differences have been noted in level of unmet needs.(3,74) Quebec residents have historically reported higher levels of unmet need.(3,18,74) Lengthier waiting times have also been reported by residents of Quebec in the CCHS.(61) Quebec residents were also the least likely have a regular medical doctor.(74) While minimal differences were found between the unmet needs of urban and rural residents in analysis of CCHS data, rural residents do have lower healthcare utilization rates.(18,75)

1.2.2. Mental Health (Depression and Anxiety)

Depression and anxiety are the two of the most common mental disorders, which can have debilitating consequences on daily functioning and overall wellbeing. Although these illnesses have complex manifestations, certain symptoms are regularly cited. Symptoms of depression include feelings of hopelessness, loss of energy and lack of self-efficacy. Anxiety is characterized by excessive worrying and tension. Analysis of CCHS data from 2000-2016 has estimated that 5.4% of employed adults experience a major depressive episode (MDE) on an annual basis.(76) The annual prevalence of anxiety disorders was estimated to be slightly lower, affecting 4.7% of employed adults.(76) It is estimated that 11.3% of Canadians will experience a MDE over the course of their lifetime, while 8.7% will experience symptoms of generalized anxiety disorder (GAD).(77)

1.2.2.1 Mental Health (Depression and Anxiety and Unmet Healthcare Needs

Individuals with depressive or anxiety symptoms are more likely to experience unmet healthcare needs.(78–81) Depressive or anxiety symptoms are also associated with higher rates of healthcare service utilization.(82–84) However, individuals with depression or anxiety symptoms have also been found to be more likely to avoid seeking healthcare services, which can result in inconsistent utilization.(85–87) It has been suggested that symptoms of depression, such as lack of self-care and decreased motivation, can prevent individuals from seeking healthcare.(88) The fear of being told about worsened health status or specific phobias related to needles or blood may deter individuals with anxiety from seeking care.(86) Individuals with depression or anxiety symptoms also have lower satisfaction with and greater distrust of healthcare professionals, contributing to their unmet needs.(89–91) Depression and anxiety are

also associated with financial insecurity, which suggests that individuals with the disorders may have limited resources available to seek care.(92,93)

1.2.3 Chronic Conditions

Chronic conditions can be defined as long term conditions, which affect an individual for at least 6 months.(94) Common chronic diseases include mental disorders, such as depression and anxiety (as discussed above), and other health disorders, including heart disease, cancer, diabetes, arthritis, autoimmune disorders, and chronic obstructive pulmonary disease. Physical disabilities may also be considered chronic illnesses. In Canada, 67% of all direct healthcare spending is for treatment of chronic diseases and chronic diseases are the leading cause of mortality.(95,96)

1.2.3.1 Chronic Conditions and Unmet Healthcare Needs

The presence of chronic conditions has consistently been associated with elevated unmet healthcare needs.(18,23,97,98) Individuals with chronic conditions have significantly higher levels of healthcare utilization, meaning they have greater opportunities to experience unmet needs.(99,100) Unmet needs may also arise due to failures within the healthcare system that prevent this vulnerable group from accessing services.(7) Physical barriers or lack of appropriate transportation can result in unmet needs.(7) Certain chronic conditions have had a more consistent relationship with unmet needs than others. While analysis of CCHS data does not find that diabetes and hypertension are consistently associated with unmet needs, arthritis and mood disorders do show a consistent relationship.(18,101) It has been suggested that unmet needs are even higher in individuals with multi-morbidity, relative to those with only one chronic condition.(3,23) Given their need for care across various departments, individuals with multi-

morbidity may experience frustration with fragmented healthcare services and experience multiple barriers simultaneously.(102,103)

1.2.4. Canada's Aging Population

In the upcoming decade, Canada is expected to undergo a substantial demographic transition. Individuals aged 65 or older, represented 15.6% of the population in 2014.(104) As of 2030, it is expected that individuals aged 65 or older will comprise 23% of the country's population.(104) With this cohort representing a growing proportion of the population, it is critical to explore how to meet the unique healthcare needs of this group. This is especially pertinent given that older adults are high healthcare users.(105)

1.2.4.1 Aging and Unmet Healthcare Needs

Although older adults use a greater amount of healthcare services, older adults report relatively less unmet needs than younger adults in Canada.(17,18) However, older adults have several barriers that prevent them from easily accessing healthcare services. Frailty, the state of mental and physical vulnerability due to aging, can prevent individuals from being able to advocate for their care.(106) Physical barriers, like poor vision or mobility, can prevent easy access to required services. Older adults may also lack adequate transportation.(107,108) They may find it difficult to navigate complicated healthcare networks.(109) If older adults lack social support systems or willing caregivers, this can place them at further risk of not having healthcare needs met.(110) Unmet healthcare needs may also be due to lack of assistance with daily activities.(111) The likelihood of chronic conditions increases with age, which may increase the

likelihood of reporting unmet needs.(112) Lastly, many older adults have co-morbidities, which can result in poor continuity of care.(23)

1.3 How did the COVID-19 pandemic affect the Determinants of Unmet Healthcare Needs?

1.3.1 The SDOH and the COVID-19 pandemic

During the COVID-19 pandemic in Canada, the disease and public health restrictions imposed a greater burden upon vulnerable groups. During the first wave, COVID-19 mortality rates across the country were higher in neighbourhoods with greater proportions of racialized groups.(113) Throughout the first and second waves, higher COVID-19 incidences were noted in census subdivisions with greater proportions of lower income residents.(114) In Ontario, higher incidences of COVID-19 were noted in neighbourhoods with higher proportions of recent immigrants, higher household densities and lower educational attainment during the first wave.(115) Deaths were also higher in Ontario neighbourhoods with higher proportions of racialized groups.(116) Across Canada, members of racialized groups were more likely to work in sectors that placed them at greater risk of COVID-19 contact, such as the long term care and food service industries.(116) They were also more likely to report experiencing financial insecurity during the first wave, due to job loss or reduced work hours.(116) This pattern has also been noted internationally, with higher COVID-19 incidence and mortality levels repeatedly linked to lower socioeconomic status.(117,118)

1.3.1.1. The SDOH and Unmet Healthcare Needs during the COVID-19 pandemic

There is limited work in Canada that examines how the SDOH affected unmet healthcare needs during the pandemic. A cross-sectional study of transit users in Toronto and Vancouver

found that deferring care during the pandemic was associated with being non-white, having a disability and low-income.(119) Analysis of Statistics Canada data found members of racialized groups and immigrants were less likely to report difficulties accessing non-emergency, dental or mental health services, but more likely to report difficulty accessing emergency services/urgent care.(120) During the initial wave of the pandemic, access to testing was associated with being a resident of Quebec but not education levels or gender.(121) In terms of direct utilization of services, access to virtual visits were similar across between neighbourhood income quintiles.(122)

There is a growing body of research internationally focusing on how the SDOH affected access to healthcare services during the pandemic. Cross-sectional studies from South Korea have suggested that women and individuals with lower education levels had greater unmet needs during the pandemic.(123,124) Evaluation of survey data from Switzerland also found that individuals with lower income and worse self-reported health were more likely to forego care.(125) Similarly, analysis of SHARE data found that females and those finding it difficult to make ends meet were more likely to report foregoing care.(126) Notably, SHARE data also found that individuals with higher levels of education and income were also more likely to report unmet needs.(126–128) This illustrates how the mixed association of the factors of income and education with unmet needs continues, even during the pandemic. A cross-sectional study suggested that individuals from lower income neighbourhoods were less likely to perceiving that they could access COVID-19 testing services.(129) Longitudinal studies have also noted that ethnic minorities and individuals from socioeconomic vulnerable neighbourhoods used disproportionately less emergency services during the first wave.(130,131) During the first wave in the United Kingdom, pro-rich inequities were observed for consultation of primary physicians

and use of medical helplines, although they were quickly diminished after the peak of the wave.(132) One study evaluating the use of hematology clinics found that individuals with lower levels of education were more likely to use telephone visits, rather than the video visits, possibly due to technology constraints.(133) Although access to healthcare services is only a component of unmet needs, these results speak to the disproportionate effect of the pandemic on vulnerable groups.

Unfortunately, it is difficult to distinguish the degree to which the pandemic worsened pre-existing inequities in unmet healthcare needs, as the majority of studies undertaken on this topic are cross-sectional. However, even after acknowledging that fact, it is reasonable to assume that the pandemic possibly exacerbated unmet healthcare needs among certain groups. Women have taken on a greater caregiving role during the pandemic, possibly further preventing from seeking healthcare services.(134,135) Deterioration in mental health was also more likely to be reported by females, possibly intensifying the experience of unmet needs.(136,137) The increases in domestic violence rates seen during the pandemic also disproportionately affect women and their freedom to seek services.(138) Financial insecurity has been experienced to a greater degree by racialized groups, immigrants, and individuals with lower levels of income, which may have prevented them from seeking care.(116,139)

1.3.2 Mental Health (Depression and Anxiety) and the COVID-19 pandemic

Throughout the COVID-19 pandemic, worsening symptoms of depression and anxiety have been noted across Canada. In a cross-sectional study of 1,803 adults across Canada, the proportion of the sample that reported symptoms of anxiety increased from 5% to 20%.(140) The proportion reporting symptoms of depression increased from 4% to 10%.(140) An increase in

depression and anxiety symptoms was also found in a cohort of 1301 mothers.(141) Data from the cohort study, the Canadian Longitudinal Study on Aging (CLSA), also found an increase in depressive symptoms from 2012 to 2020.(142) As noted earlier, when CCHS data from the falls of 2019 and 2020 were compared, Canadians were more significantly likely to report fair or poor mental health after the pandemic, particularly females.(136) Data from the Canadian Perspectives Survey Series conducted in March and May 2020 also found that mental health of the population deteriorated during the first wave.(143) Repeated cross-sectional data of 3000 randomly selected adults further supports this finding, with 38.5% of the sample reporting that their mental health had deteriorated during the pandemic.(137) Knowing that depression and anxiety symptoms are associated with unmet healthcare needs, it is necessary to evaluate the impact of these determinants during the pandemic.

1.3.2.1 Mental Health (Depression and Anxiety) and Unmet Healthcare Needs during the COVID-19 pandemic

Data from cross-sectional studies supports that unmet healthcare needs were higher in groups with depression or anxiety symptoms during the pandemic.(144–146) Individuals with poor mental health were also more likely to report foregoing care.(147) In a study in the United States, the odds of experiencing depression systems was 3.69 times higher in the group that experienced a delay in surgical care.(148)

It is difficult to isolate the effects of the pandemic on the association between mental health disorders and unmet healthcare needs, due to a lack of longitudinal studies on this topic. Use of healthcare services for mental health reasons increased during the pandemic, especially among individuals with depressive and anxiety symptoms.(149,150) However, it is still possible

that the rise in service use was not observed among those with severer forms of depression and anxiety or that access to general healthcare services remained difficult.(151) Numerous pandemic-specific factors could have contributed to the strong association between depression, anxiety and unmet healthcare needs. Social isolation may have resulted in worsening of depression symptoms, ultimately decreasing capacity to seek care.(152) Caregiving responsibilities for children and older adults increased during the pandemic, which has been associated with higher levels of depression, and may have impacted on ability to seek care.(153,154) Fear of being exposed to COVID-19 was higher in individuals with anxiety symptoms, suggesting that they might have been less likely to visit healthcare services out of fear of being exposed.(155,156) In a sample of patients with coronary artery disease in Germany, those with anxiety symptoms during the pandemic were more likely to cancel a scheduled appointment, in spite of typically having more serious symptoms.(157) Those with pre-existing mental health disorders were also more likely to report deterioration in mental health during the pandemic, suggesting this vulnerable group may have experienced even deeper barriers to care.(137)

1.3.3. Chronic Conditions and the COVID-19 pandemic

The presence of chronic conditions greatly elevates risk of severe COVID-19 outcomes, as has been found multiple systematic reviews.(158–160) In Canada, during the first wave of the pandemic, 90% of deaths due to COVID-19 occurred in an individual with a pre-existing co-morbidity.(161) In a survey of individuals with chronic conditions during the first wave, 48% of the sample reported that their health had worsened since the pandemic.(162) This finding

suggests the strong presence of unmet needs in this group, which already had elevated unmet needs prior to the pandemic.

1.3.3.1 Chronic Conditions and Unmet Healthcare Needs during the COVID-19 pandemic

Individuals with chronic conditions were significantly more likely to report experiencing unmet needs during the pandemic, as evidenced by multiple cross-sectional studies.(123,126) Individuals with chronic conditions were partly more likely to experience disruptions in care, due to the fact that they require more services.(163)

The impact of interruptions in care on individuals with chronic diseases is evident in the group's elevated mortality and morbidity levels during the pandemic. Evaluation of cardiac care in Ontario revealed that waitlist mortalities for cardiac surgeries rose during the pandemic, possibly due to delays in referrals.(164) Interruptions to cancer care from the beginning of the pandemic to June 2021 were modelled to result in a 2% increase in cancer deaths from 2020 to 2030 across Canada.(165) Individuals with chronic pain also reported higher levels of pain, due to limited access to healthcare services like rehab.(166,167) These changes in health status were direct consequences of cancelled or delayed appointments, which resulted in unmet needs. Other pandemic related changes may have caused higher levels of unmet needs in this population. Knowing that they were at greater risk of COVID-19 complications, individuals with chronic conditions may have decided to not seek in-person care.(168,169) Those with chronic conditions also reported greater fear of COVID-19, which may have caused them to be more likely to avoid seeking healthcare, even when needed.(157) Deterioration in mental health status was observed in this population, further diminishing their ability to seek care.(170)

1.3.4 Aging and the COVID-19 pandemic

The COVID-19 pandemic has had severe consequences for Canada's older adult population. From the onset of the pandemic to May 2021, individuals aged 65 and above have represented 93% of COVID-19 related deaths.(171) In September 2020, 24% of the group reported their mental health to be somewhat or much worse, than prior to the pandemic.(171) This proportion steadily increased to 33% in March/April 2021. Research from the CLSA also suggests that older adults across the country had worsening symptoms of depression during the first two waves of the pandemic.(142) It is critical to assess access to healthcare for this vulnerable group, given the impact the pandemic has had on their health.

1.3.4.1 Aging and Unmet Healthcare Needs during the COVID-19 pandemic

In spite of coping with the difficulties of the pandemic, older Canadians were still the least likely to report experiencing any difficulty accessing healthcare during the pandemic.(38) Similar results have been found internationally, with older adults the least likely to report unmet needs, even during the pandemic.(123,126) This may be due to older experiencing relatively smaller interruptions in care. In a study of Ontario physician billing data, visits to primary physicians declined the least in those aged 75 and above during the first wave of the pandemic.(172) Older adults were also the most likely to participate in virtual visits.(122,173) Testing was suggested to be more accessible for older adults, who were more likely to exhibit symptoms of the virus and thus qualify for symptomatic testing.(174) Nevertheless, 45% of individuals aged 65 and above reported that they experienced any difficulty accessing care.(38)

Certain sub-groups of the population were at greater risk of losing access to healthcare services during the pandemic. Although virtual care appointments were implemented, older

adults with fragility or without a caregiver were less likely to use telehealth visits.(175) Older adults with dementia and Parkinson's had lower admission rates to nursing homes and hospitals, contributing to the excess mortality of the group.(176) Routine home care appointments decreased in frequency, in addition to home care assessments.(36,37) Misinformation regarding COVID-19 or the availability of healthcare services may have instilled greater fear in the older adult population, particularly those with lower digital literacy.(177) Furthermore, abiding by physical distancing guidelines may caused older adults to experience social isolation, preventing easy access to care networks and limiting connection with caregivers. Social isolation during the pandemic has been associated with cognitive decline, which may have caused further difficulties accessing care.(178–180) It has been estimated that elder abuse also increased during the pandemic, which may have also limited freedom to seek care.(181,182) Older adults with symptoms of depression were also more likely to report unmet needs during the pandemic.(183,184) Lastly, while financial insecurity due to the pandemic was lower in older adults, 14% of the group did report that they had difficulty meeting their financial obligations.(171)

1.4 Thesis Objectives

Research during the COVID-19 pandemic shows that the SDOH, mental health, and aging continue to be associated with the experience of unmet healthcare needs. Despite of a lack of longitudinal studies in this field, there is clear evidence of the pandemic limiting access to healthcare services for vulnerable groups. Therefore, the objectives of this thesis were:

1.1 To describe the experience of unmet healthcare needs, including COVID-19 testing access, among adults in Canada during the first year of the COVID-19 pandemic.

1.2 To evaluate the association between the SDOH and other predictors (pre-pandemic unmet healthcare needs and chronic conditions) with unmet healthcare needs among adults in Canada during the first year of the COVID-19 pandemic.

2.1 To evaluate the association between symptoms of depression and anxiety with unmet healthcare needs among adults in Canada during the first year of the COVID-19 pandemic.

2.2 To evaluate the interaction between depression, anxiety and sex to assess if the association between mental health and unmet needs is modified by sex.

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CHAPTER 2: MANUSCRIPT 1

Title: Unmet healthcare needs during the COVID-19 pandemic among adults: a prospective cohort study in the Canadian Longitudinal Study on Aging

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2.1 Abstract

Background: The COVID-19 pandemic impacted access to healthcare services in Canada. However, limited research examines the influence of the social determinants of health (SDOH) on unmet healthcare needs during the pandemic.

Methods: We conducted a prospective cohort study of 23,972 adults in the Canadian Longitudinal Study on Aging (CLSA) COVID-19 Study (April-Dec. 2020) to identify the SDOH associated with unmet healthcare needs during the pandemic. Using logistic regression, we assessed the association between several SDOH on the following three outcomes (separately): experiencing any challenges in accessing healthcare services, not going to a hospital or seeing a doctor when needed and experiencing barriers to accessing testing for COVID-19.

Results: From Sept.-Dec. 2020, 25% of Canadian adults experienced any challenges accessing healthcare services and 8% did not go to a hospital or see a doctor, when needed and 4% faced barriers accessing COVID-19 testing. The prevalence of all three unmet need outcomes was lower among older age groups. Differences were observed by sex, region, education, income and racial background. Immigrants (OR=1.18; 95% CI=1.09-1.27) or individuals with chronic conditions (OR=1.35; 95% CI=1.27-1.43) had significantly higher odds of experiencing challenges accessing healthcare services and also had higher odds of not going to a hospital or seeing a doctor (Immigrants: OR=1.26; 95% CI=1.11-1.43; Chronic conditions: OR=1.45; 95% CI=1.31-1.61). Pre-pandemic unmet healthcare needs were strongly associated with all three outcomes.

Interpretation: Substantial unmet healthcare needs were reported by Canadian adults during the pandemic. The results of this study have important implications for health equity.

Key Words: Unmet Healthcare Needs, COVID-19, CLSA

2.2 Introduction

The first Canadian case of COVID-19 was detected in January 2020. By March 2020, all provinces and territories adopted public health restrictions, such as school and business closures and limits on gatherings, to mitigate its spread.(1) Public health restrictions have continued to varying degrees across Canada.(1) The spread of SARS-CoV-2 and adoption of public health restrictions in Canada affected access to healthcare services. To adapt to the strain of COVID-19 patients, healthcare systems cancelled elective surgeries and in-person appointments, and reliance on virtual visits increased.(2,3) Nationally, emergency room visits and inpatient admission levels declined by 24% and 10%, respectively, in 2020.(4,5) Home care and primary care services were disrupted.(6,7)

Self-perceived unmet needs are a reflection of access to and performance of a healthcare system.(8) Unmet needs are dependent not only on the use of services but also their accessibility and acceptability. Unmet healthcare needs during the COVID-19 pandemic may have serious implications on patient care and potentially enduring consequences.(9) Patients have reported limitations of virtual visits.(10–13) Independent of the COVID-19 pandemic, it is well known that the social determinants of health (SDOH) impact unmet healthcare needs.(14,15) However, the impacts of the SDOH on unmet healthcare needs during the pandemic are not yet understood in Canada. Disruptions to services may have deepened access concerns for vulnerable groups, potentially having implications for health equity. The objectives of this study were to describe unmet healthcare needs, including COVID-19 testing access, and to evaluate the association between the SDOH and other predictors (pre-pandemic unmet healthcare needs and chronic conditions) with unmet healthcare needs among adults in Canada throughout the first year of the COVID-19 pandemic.

2.3 Methods

2.3.1 Study Design, Data Source and Setting

We conducted a prospective cohort study using participants in the Canadian Longitudinal Study on Aging (CLSA). The CLSA is a national long-term study of community-dwelling adults aged 45-85 years at the time of recruitment (2010-2015).(16,17) Participants were recruited across the 10 provinces and are followed-up every 3 years for at least 20 years or until death or loss-to-follow-up. Residents of the three territories or First Nations reserves, members of the Armed Forces, and institutionalized persons were excluded. Participants were required to participate in English or French and complete the survey independently. At baseline, 51,338 individuals participated in the CLSA (2011-2015) and 44,817 went on to complete follow up one (FUP1) (2015-18).

In response to the COVID-19 pandemic, the CLSA COVID-19 Questionnaire Study was developed by the CLSA COVID-19 team and launched to collect longitudinal data over a 9-month period with participants completing a 30-minute baseline survey (April 15th-May 30th, 2020), 10-minute weekly/biweekly/monthly surveys, and a 30-minute exit survey (September 29th-December 29th, 2020). The surveys are available on the CLSA website: https://www.clsa-elcv.ca/researchers/data-collection. All eligible members of the CLSA cohort (i.e., alive, with known contact information and able to independently complete the survey) were invited to participate (N=42,511) via email (N=34,428) or telephone (N=8,083), if email information was not available. From the invited members, 28,559 completed the baseline survey (response=67%), with 23,832 completing by web and 4,727 by telephone.

2.3.2 Measurement of Unmet Healthcare Needs

Unmet healthcare needs were measured using three questions in the COVID-19 exit survey: 1) "Since the beginning of the COVID-19 pandemic have you experienced any challenges in accessing healthcare?", 2) "Since March 1st, 2020 were there times when you did not go to the hospital or to see a doctor even though you needed to?" , and 3) "Since the beginning of the COVID-19 pandemic have you experienced barriers to accessing testing for COVID-19?". The response options for each question were "Yes," "No," "Don't know/No answer," and "Prefer not to answer". Less than 2% of participants responded "Don't know/No answer" for the first two outcomes and these responses were grouped together with the "No" responses. Nearly 12% of the respondents answered "Don't know/No Answer" to the third question, thus a sensitivity analysis was conducted to determine if the categorization of the outcomes as "No" compared to missing affected the results, and no differences were observed so the "Don't know/No Answer" were also combined with "No" for the third outcome. These questions were not formally validated but are similar to questions asked in the Canadian Community Health Survey (CCHS), European Union Statistics on Income and Living Conditions, and the Survey of Health, Ageing and Retirement in Europe (SHARE).(18–20) The questions did not differentiate between virtual and in-person care.

Participants who answered "Yes" to the three unmet healthcare questions were asked follow-up questions clarifying the healthcare services they had challenges accessing, the reasons they did not visit the hospital or see a doctor and the barriers they faced when accessing COVID-19 testing. The frequency of the follow up questions will be reported, stratified by age and province.

2.3.3 Measurement of the Social Determinants of Health and Other Predictors

Information on the SDOH were extracted from the CLSA surveys, across different timepoints. Sex, racial background, education and immigrant status were extracted from CLSA baseline (2011-2015). Household income, dwelling type and marital status were extracted from FUP1 (2015-2018). Age, region (Atlantic: Newfoundland, Nova Scotia, P.E.I., New Brunswick; Quebec; Ontario; Prairies: Alberta, Saskatchewan, Manitoba; British Columbia), urban/rural status and work status were extracted from the COVID-19 baseline survey. Urban/rural status was measured by linking the participants' postal codes to the Statistics Canada Postal Code Conversion file.(21) Work status was determined by asking participants if they usually worked outside of their residence, regardless if they were an essential worker or not. Dwelling type was measured by asking if they lived in a house, apartment/condominium, or other residence type (senior's housing, institution or mobile home). In addition to the SDOH, pre-pandemic unmet needs was extracted from FUP1 when participants were asked, "During the past 12 months, was there ever a time when you felt that you needed healthcare but you didn't receive it?". The presence of chronic conditions was measured in the COVID-19 baseline survey, by inquiring about the lifetime occurrence of asthma, chronic obstructive pulmonary disease, other chronic lung diseases, diabetes, high blood pressure, heart disease, cancer, heart/lung/kidney/liver/pancreas failure, autoimmune disorder, pneumonia and human immunodeficiency virus.

2.3.4 Statistical Analysis

We described the characteristics of the study's participants. We also compared the characteristics of the participants completed FUP1 and then did or did not complete the COVID-

19 exit survey to consider how results of our study might differ if all participants from FUP1 had completed the COVID-19 exit survey. Participants had a unique study identifier, which allowed for linkage of their data across time. Sampling weights for the COVID-19 survey were not available and so were not applied. Proportions of participants who reported the unmet healthcare needs outcomes along with 95% confidence intervals (CI) were computed overall and by the SDOH.

The magnitude of the association between each of SDOH and the three unmet healthcare outcomes was estimated using logistic regression. Odds ratios and 95% CIs were estimated for unadjusted models with each predictor variable individually. Then, an adjusted model that included the following variables was estimated: sex, age, province, urban/rural, racial background, immigrant status, household income, education, marital status, dwelling type, work status, chronic condition status and pre-pandemic unmet needs. The adjusted risk differences were estimated. Variance inflation factors (VIF) for the adjusted models were estimated in a linear regression model to assess multi-collinearity.(22)

2.4 Results

Of the 28,559 individuals who completed the COVID-19 baseline survey, information on 23,975 individuals was available at CLSA baseline, FUP1 and the CLSA COVID-19 study (at both baseline and exit). Three individuals were excluded as they resided in the territories in 2020, resulting in a sample size of 23,972 (response=56%; Figure 1). The sociodemographic characteristics of the participants are presented in Table 1. Supplementary Table 1 describes how the characteristics of individuals at FUP1 and then did or did not complete the COVID-19 exit survey are fairly similar, as has been previously demonstrated.(22) Notably, pre-pandemic unmet

needs are slightly higher in the group that did not complete the COVID-19 exit survey. Overall, 25% of the participants indicated facing any challenges accessing healthcare and 8% of the participants indicated they did not go to a hospital or see a doctor even though they needed to. Additionally, 4% of participants indicated facing barriers accessing testing for COVID-19.

Table 2 reports the logistic regression results examining the associations between each of the SDOH, other predictors and the unmet need outcomes. Notably, older age was associated with lower odds of reporting all three outcomes. Immigrants had higher odds of reporting challenges accessing healthcare (OR=1.18; 95% CI=1.09-1.27), as well as not visiting a hospital or seeing a doctor when needed (OR=1.26; 95% CI=1.11-1.43). Higher education levels were associated with higher odds of indicating challenges accessing healthcare and barriers to COVID-19 testing. While lower income was associated with increased odds of not visiting the hospital or seeing a doctor when needed, higher income was associated with increased odds of challenges accessing healthcare and barriers to COVID-19 testing. Females (OR=1.20; 95% CI=1.09-1.32) and non-white participants (OR=1.37; 95% CI=1.06-1.78) had higher odds of reporting not visiting the hospital or seeing a doctor when needed, relative to males and white participants, respectively. Ontario residents had the highest odds of reporting challenges accessing healthcare and barriers to COVID-19 testing. Quebec residents were most likely to not visit a hospital or doctor, while being the least likely to indicate the other two outcomes. Pre-pandemic unmet needs were strongly associated with higher odds of all three outcomes. Chronic conditions were associated with the first two outcomes, but not the COVID-19 testing outcome. The results of fully adjusted models, adjusted for all variables simultaneously, revealed similar associations, with few exceptions (e.g., the association between racial background and barriers to

testing changes direction but is not statistically significant in the adjusted or unadjusted models) (Supplementary Table 2). The adjusted risk differences are reported (Supplementary Table 3).

Participants were most likely to report difficulties accessing primary care and specialist care (Supplementary Table 4). The most common reasons for not visiting the hospital or doctor were redirection of services to priority groups and fear of COVID-19 contact (Supplementary Table 5). Redirection of services was greater concern to adults aged 50-54, than those aged 85-96 (Figure 5). The most common barrier to COVID-19 testing was not being eligible, which was most commonly reported by adults aged 50-54 (Figure 6).

2.5 Interpretation

A quarter of adults surveyed (25%) faced challenges accessing healthcare services and 8% did not go to the hospital or to see a doctor even though they needed to during the first 9 months of the pandemic in Canada. About 4% of adults experienced barriers accessing COVID-19 testing. Regional differences in the level of unmet healthcare needs were noted.

Reporting of all three outcomes decreased with older age. This is consistent with analysis of CCHS data on unmet healthcare needs of Canadians from 2001-2014, as well as pandemic data from Europe and Korea.(19,24,25) Older adults may have experienced relatively smaller interruption to care. We found that services being redirected to priority groups was a primary concern for adults aged 50-54 but not adults aged 85-96. In Ontario, the lowest decline in primary care visits was observed in older adults, who were also more likely to use virtual visits.(6,26) Furthermore, we found that not being eligible for COVID-19 testing was of greater concern to adults aged 50-54 than those aged 85-96, which may be consistent with provincial testing restrictions that may have prioritized older symptomatic adults.(27) Statistics Canada

reported that younger adults (aged 25-44) were more likely to indicate that they would seek testing than older adults (aged 65+).(28) Thus, they may be more likely to report barriers attaining the service. Additionally, older participants may have experienced a smaller decline in mental health, relative to younger participants, possibly enabling them to continue to seek services.(29)

Immigrants were significantly more likely to indicate challenges accessing healthcare services and not visiting a hospital or doctor. The literature has established that immigrants face unique difficulties accessing healthcare.(15,30–32) Non-white participants were more likely to report not visiting a hospital or seeing a doctor than white participants. Non-white Canadians are less likely to have a regular physician.(33) Consistent with other national data for this time period, we found minimal evidence of differences in COVID-19 testing access by racial background but it is a major limitation that only 3% of the participants sampled were non-white.(34) Females were 13% more likely to indicate not seeking hospital or doctor attention, as has been found in previous studies.(24)

Participants with higher education levels had higher odds of indicating challenges accessing healthcare, consistent with pre-pandemic CCHS research, possibly due to perceiving greater disruption as they typically had higher levels of healthcare utilization before the pandemic.(24,35) Individuals with higher education levels also had higher odds of reporting barriers accessing COVID-19 testing, expected given that they were more likely to report seeking testing according to Statistics Canada.(28) While participants with higher levels of income were more likely to report challenges accessing healthcare and barriers to COVID-19 testing, they were less likely to report not visiting a hospital or seeing a doctor. Individuals with

higher levels of income tend to be less likely to forego care, as has been noted even during the pandemic, meaning they may have greater expectations for accessibility of services.(36–38)

Regional differences in unmet healthcare needs were not uniform across outcomes. While Quebec residents had higher odds of not visiting a hospital or doctor, Ontario residents had higher odds of facing challenges accessing healthcare and barriers to COVID-19 testing. We explored whether these differences were due to the language of survey administration (French vs English). It was difficult to distinguish language and region effects because most French surveys were completed in Quebec. Quebec residents are more likely to lack access to a family physician.(39) Residents of the Prairies did not report higher levels of unmet need, in spite of high case incidence.(40)

Pre-pandemic unmet needs were strongly associated with all three outcomes. Participants with chronic conditions had higher odds of reporting challenges accessing services and not going to a hospital or doctor when needed. These findings suggest that those with health conditions faced difficulties accessing healthcare during the pandemic, raising concern about future consequences.

Limitations: Despite a low response rate, our study described the unmet healthcare needs of nearly 24,000 adults in Canada in the first year of the pandemic. Data from later in the pandemic was not available but given the use of a cohort with ongoing data collection, future work may be possible. Although we examined several predictors, including pre-pandemic unmet healthcare needs, some of the data had been collected in FUP1 and may not reflect the participants' current situation. We could not quantify the change in unmet needs due to slightly different measures used in FUP1 and the pandemic. While formally validated measures of unmet healthcare needs

were not used, we described how participants perceived the availability of services. The fluctuations in case counts, public health restrictions and testing guidelines across time and regions made it difficult to describe the reasons behind unmet needs. Lastly, recruitment for the CLSA at baseline only included community-living adults aged 45 to 85 years of age and excluded institutionalized persons, residents of three territories or First Nations reserves, individuals not able to participate in English or French, which has the potential to limit the generalizability of the results.(16)

2.6 Conclusion

We examined how the perception of access to healthcare services among Canadians was affected by COVID-19 early in the pandemic. The findings suggest that unmet need was lower in older ager groups and varied by education, income, immigrant status, racial background and region. Given that the presence of chronic conditions and pre-pandemic unmet needs were also associated with higher odds of reporting unmet healthcare needs, there is evidence that individuals with pre-existing vulnerabilities experience difficulties when trying to access healthcare services. Efforts must continue to ensure accessible care for Canadians.

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2.8 Tables and Figures

Table 1: Descriptive characteristics of study participants who completed the COVID-19 exit survey (Sept. to Dec. 2020)

	CLSA participants who completed the COVID-19 Exit Survey (N=23972)
	N (%)
Measured at Baseline (2011-2015)	
Sex	
Female	12743 (53.2)
Male	11229 (46.8)
Racial background	
White	23273 (97.2)
Non-white	673 (2.8)
Missing	26
Immigrant status	
Immigrant	3789 (15.8)
Non-immigrant	20173 (84.2)
Missing	10
Education	
Less than secondary school	1101 (4.6)
Secondary school	2349 (9.8)
Some post-secondary	1719 (7.2)
Post-secondary degree/diploma	18756 (78.4)
Missing	47
Measured at FUP1 (2015-2018)	
Household income	
Less than $20,000	861 (3.8)
$20,000 to <$50,000	4855 (21.4)
$50,000 to <$100,000	8569 (37.9)
$100,000 to <$150,000	4589 (20.3)
$150,000 or more	3758 (16.6)
Missing	1340
Marital status	

Single, never married or never lived with a partner	2007 (8.4)
Married or living with a partner	16833 (70.3)
Widowed	2332 (9.7)
Divorced or separated	2785 (11.6)
Missing	15
Unmet needs (pre-pandemic)	
Yes	1874 (7.8)
No	22060 (92.2)
Missing	38
Measured at COVID-19 Baseline (Apr. – May 2020)	
Age	
<50	0 (0.0)
50-54	1097 (4.6)
55-64	7250 (30.2)
65-74	8759 (36.5)
75-84	5145 (21.5)
85-96	1721 (7.2)
Region[1]	
Atlantic	4334 (18.0)
Prairies	5130 (21.4)
Ontario	5554 (23.2)
Quebec	4336 (18.1)
British Columbia	4618 (19.3)
Urban/Rural	
Rural area	4245 (17.8)
Urban area	19602 (82.2)
Missing	125
Dwelling type	
House	18625 (77.8)
Apartment or condominium	4410 (18.4)
Other	907 (3.8)
Missing	30

Chronic conditions	
Present	14235 (59.7)
Absent	9594 (40.3)
Missing	143
Work status	
Usually work outside the home	6273 (26.6)
Do not work outside the home	17357 (73.4)
Missing	342
Measured at COVID exit survey (Sept. – Dec. 2020)	
Any challenges in accessing healthcare	
Yes	5992 (25.3)
No	17759 (74.7)
Missing	221
Did not go to the hospital or to see a doctor even though they needed to	
Yes	1776 (7.5)
No	21989 (92.5)
Missing	207
Experienced barriers to accessing testing for COVID-19	
Yes	917 (3.9)
No	22828 (96.1)
Missing	227

[1] Atlantic: Newfoundland, Nova Scotia, P.E.I., New Brunswick; Prairies: Alberta, Saskatchewan, Manitoba

Table 2: Logistic regression models assessing the association between sociodemographic characteristics and unmet healthcare needs during the COVID-19 pandemic as reported by participants during the CLSA COVID-19 exit survey (Sept. to Dec. 2020)

	Any challenges in accessing healthcare **OR (95% CI)**	Did not go to the hospital or to see a doctor even though they needed to **OR (95% CI)**	Experienced barriers to accessing testing for COVID-19 **OR (95% CI)**
Sex			
Male	Reference	Reference	Reference
Female	1.01 (0.95, 1.07)	1.20 (1.09, 1.32)	0.92 (0.80, 1.05)
Age			
50-55	Reference	Reference	Reference
55-64	0.88 (0.77, 1.02)	0.78 (0.63, 0.97)	0.72 (0.55, 0.94)
65-74	0.88 (0.77, 1.02)	0.74 (0.60, 0.91)	0.59 (0.45, 0.77)
75-84	0.73 (0.63, 0.85)	0.59 (0.47, 0.74)	0.45 (0.34, 0.60)
85-96	0.52 (0.43, 0.62)	0.51 (0.36, 0.68)	0.37 (0.25, 0.55)
Region			
Atlantic	Reference	Reference	Reference
Quebec	0.48 (0.43, 0.54)	1.38 (1.19, 1.61)	0.80 (0.58, 1.10)
Ontario	1.22 (1.11, 1.33)	0.97 (0.83, 1.13)	3.40 (2.68, 4.32)
Prairies	0.73 (0.67, 0.80)	0.74 (0.63, 0.87)	1.92 (1.48, 2.48)
British Columbia	1.03 (0.94, 1.13)	0.92 (0.79, 1.08)	2.37 (1.84, 3.06)
Urban/Rural			
Urban	Reference	Reference	Reference
Rural	0.93 (0.86, 1.00)	1.06 (0.93, 1.20)	0.79 (0.65, 0.95)
Racial background			
White	Reference	Reference	Reference
Non-white	0.91 (0.76, 1.10)	1.37 (1.06, 1.78)	1.09 (0.74, 1.60)
Immigrant status			
Non-immigrant	Reference	Reference	Reference
Immigrant	1.18 (1.09, 1.27)	1.26 (1.11, 1.43)	1.15 (0.97, 1.37)
Household income			

Less than $20,000	0.81 (0.68, 0.97)	1.52 (1.18, 1.97)	0.66 (0.46, 0.97)
$20,000 to <$50,000	0.80 (0.73, 0.89)	1.19 (1.01, 1.40)	0.56 (0.45, 0.69)
$50,000 to <$100,000	0.89 (0.82, 0.98)	1.03 (0.89, 1.20)	0.56 (0.47, 0.68)
$100,000 to <$150,000	1.03 (0.93, 1.13)	1.05 (0.89, 1.24)	0.68 (0.56, 0.83)
$150,000 or more	Reference	Reference	Reference
Education			
Less than secondary school	0.58 (0.50, 0.69)	1.02 (0.81, 1.29)	0.54 (0.36, 0.81)
Secondary school	0.74 (0.66, 0.82)	0.96 (0.81, 1.14)	0.52 (0.39, 0.67)
Some post-secondary	1.02 (0.91, 1.14)	1.09 (0.90, 1.30)	0.90 (0.70, 1.16)
Post-secondary diploma or more	Reference	Reference	Reference
Marital status			
Married or living with a partner	Reference	Reference	Reference
Single, never married or never lived with a partner	1.02 (0.92, 1.14)	1.16 (0.98, 1.38)	1.15 (0.92, 1.45)
Widowed	0.76 (0.70, 0.84)	1.02 (0.87, 1.21)	0.72 (0.56, 0.94)
Divorced or separated	1.03 (0.94, 1.13)	1.40 (1.21, 1.61)	1.13 (0.92, 1.38)
Chronic conditions			
Absent	Reference	Reference	Reference
Present	1.35 (1.27, 1.43)	1.45 (1.31, 1.61)	0.97 (0.85, 1.11)
Dwelling type			
House	Reference	Reference	Reference
Apartment	0.90 (0.83, 0.97)	1.09 (0.97, 1.23)	1.01 (0.85, 1.19)
Other	0.74 (0.63, 0.88)	1.08 (0.84, 1.38)	0.59 (0.38, 0.92)
Work status			
Do not work outside the home	Reference	Reference	Reference
Usually work outside the home	1.07 (1.01, 1.15)	1.05 (0.94, 1.17)	1.43 (1.24, 1.65)
Unmet needs (Pre-pandemic)			
Yes	2.21 (2.00, 2.44)	2.91 (2.55, 3.33)	1.77 (1.45, 2.16)
No	Reference	Reference	Reference

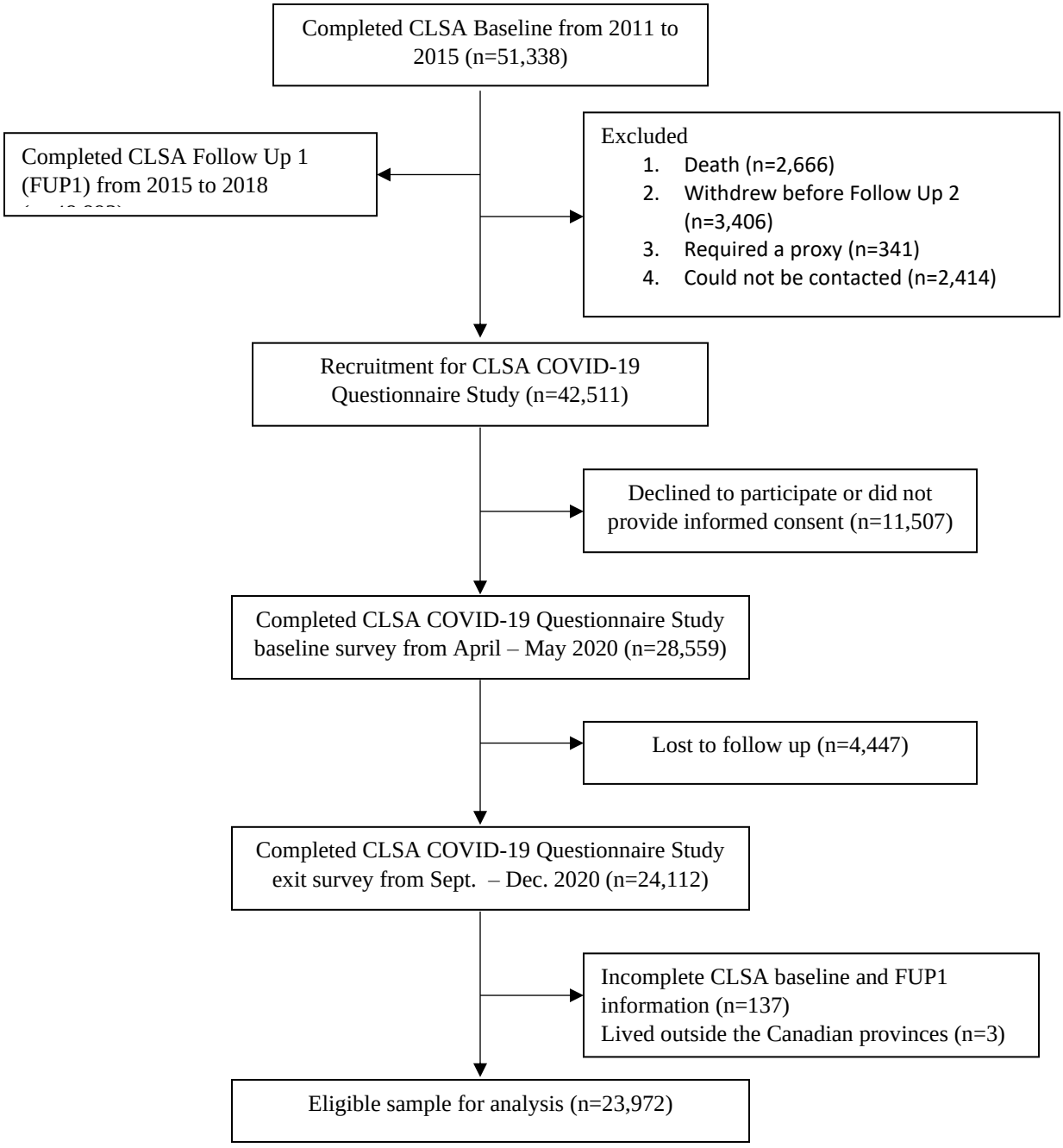


Figure 1: CLSA participant flow throughout baseline (2011-2015), follow up one (2015-2018) and COVID-19 (2020) data collection

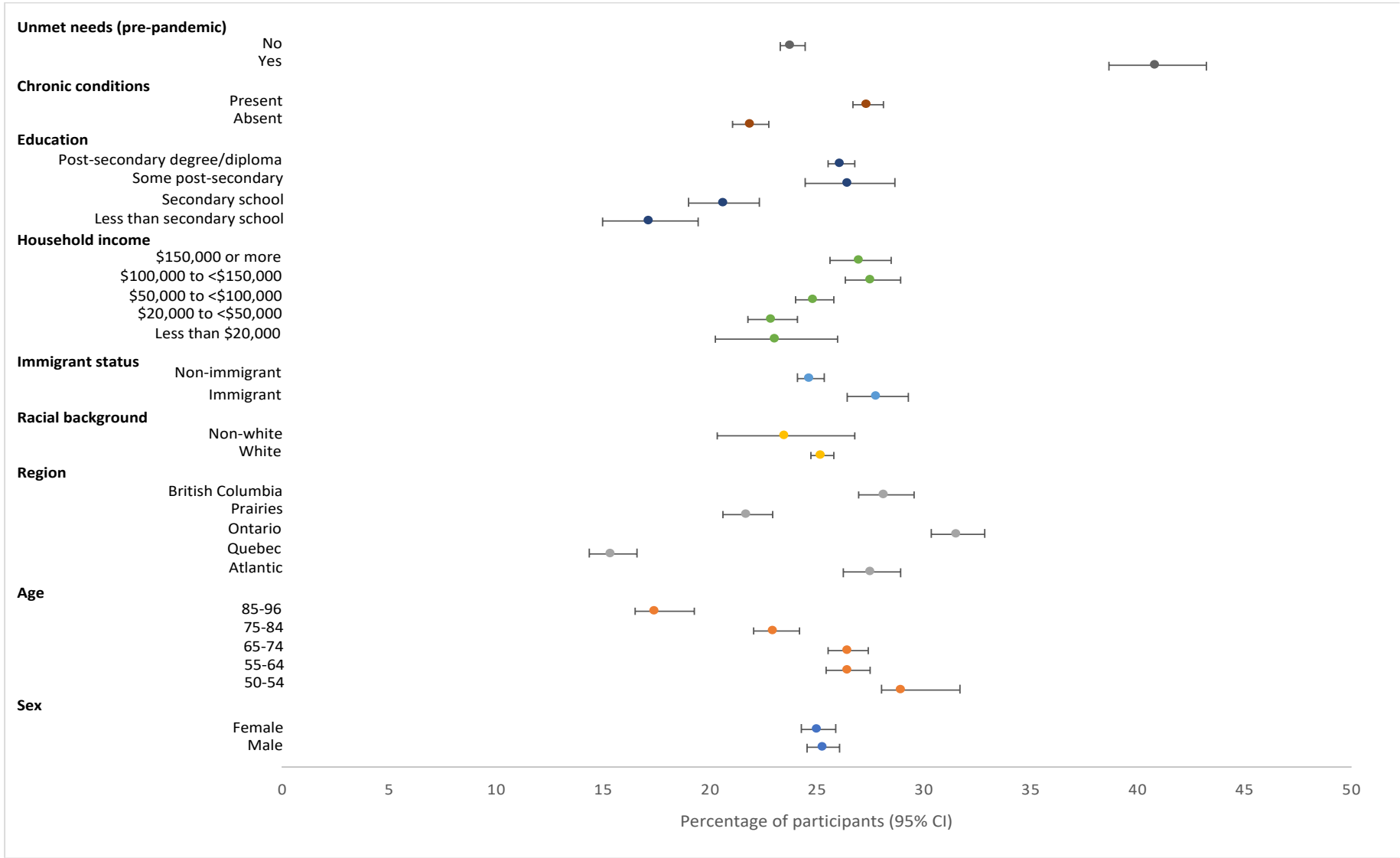


Figure 2: Prevalence of any challenges in accessing healthcare during the COVID-19 pandemic as reported by participants during the CLSA COVID-19 exit survey (Sept. to Dec. 2020), according to select sociodemographic characteristics

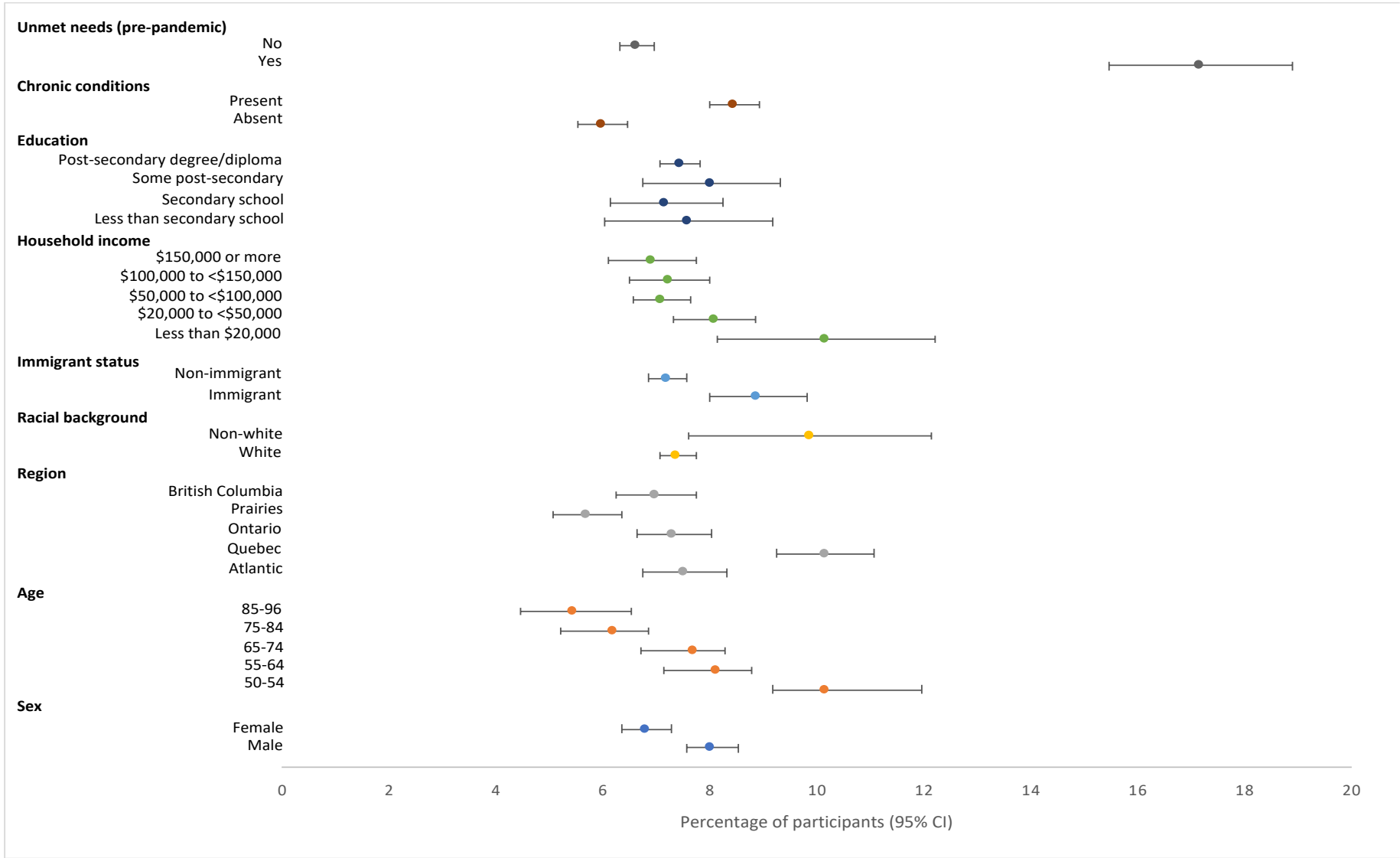


Figure 3: Prevalence of not visiting the hospital or seeing a doctor while needing to during the COVID-19 pandemic as reported by participants during the CLSA COVID-19 exit survey (Sept. to Dec. 2020), according to select sociodemographic characteristics

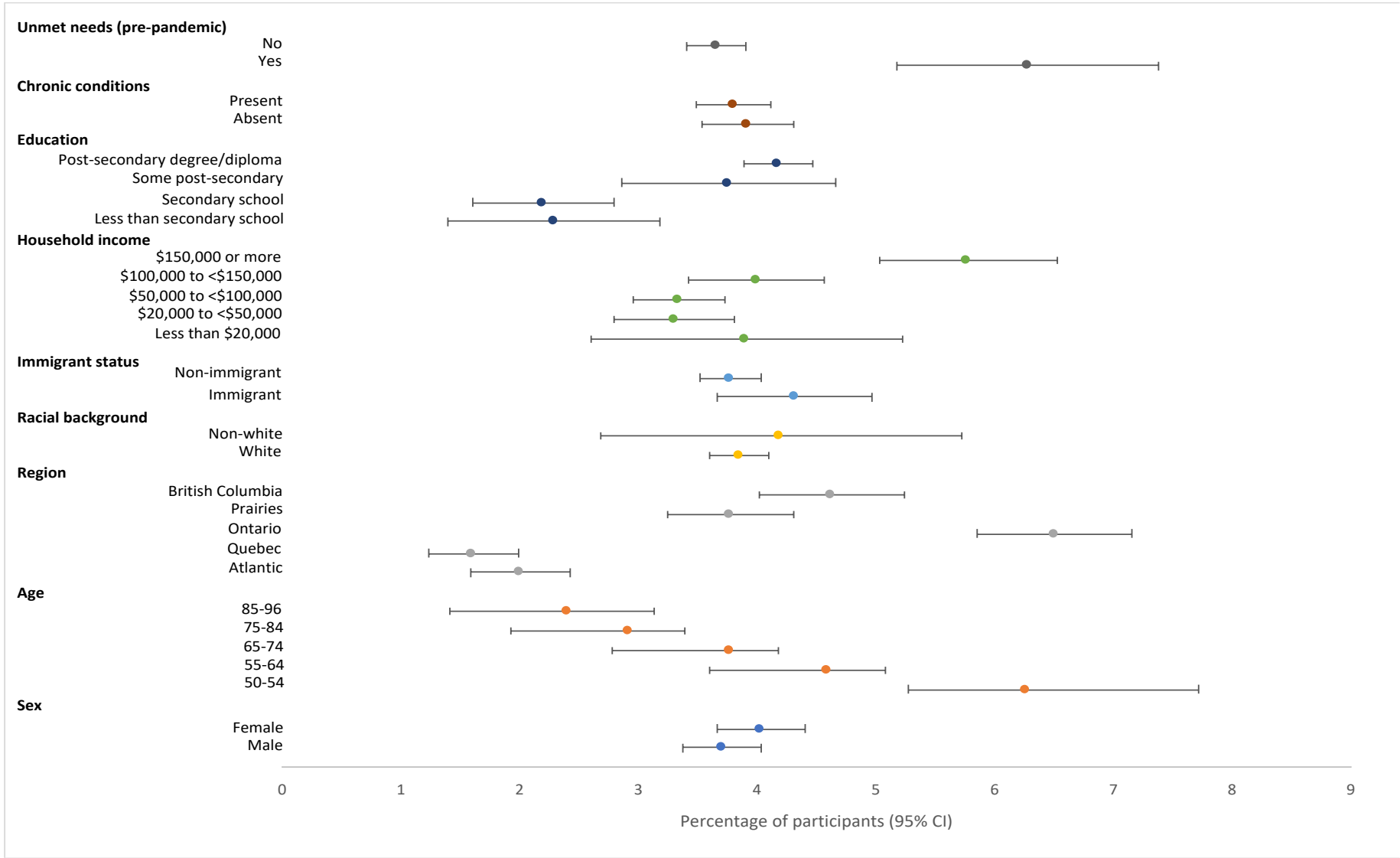


Figure 4: Prevalence of barriers to accessing testing for COVID-19 during the COVID-19 pandemic as reported by participants during the CLSA COVID-19 exit survey (Sept. to Dec. 2020), according to select sociodemographic characteristics

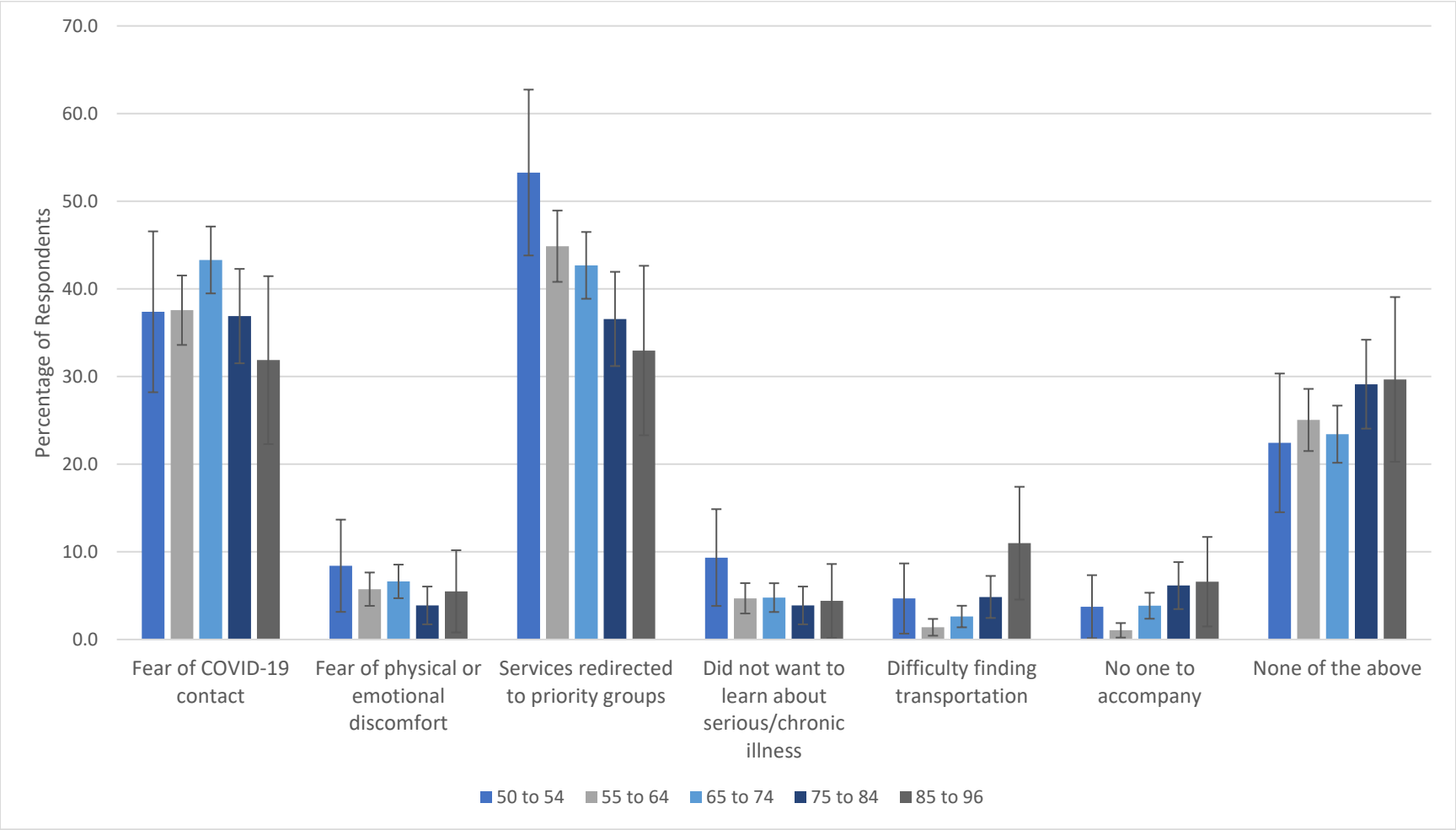


Figure 5: Reasons for not visiting the hospital or seeing a doctor while needing to as reported by participants in the CLSA COVID-19 exit survey (Sept. to Dec. 2020), stratified by age (N=1731)

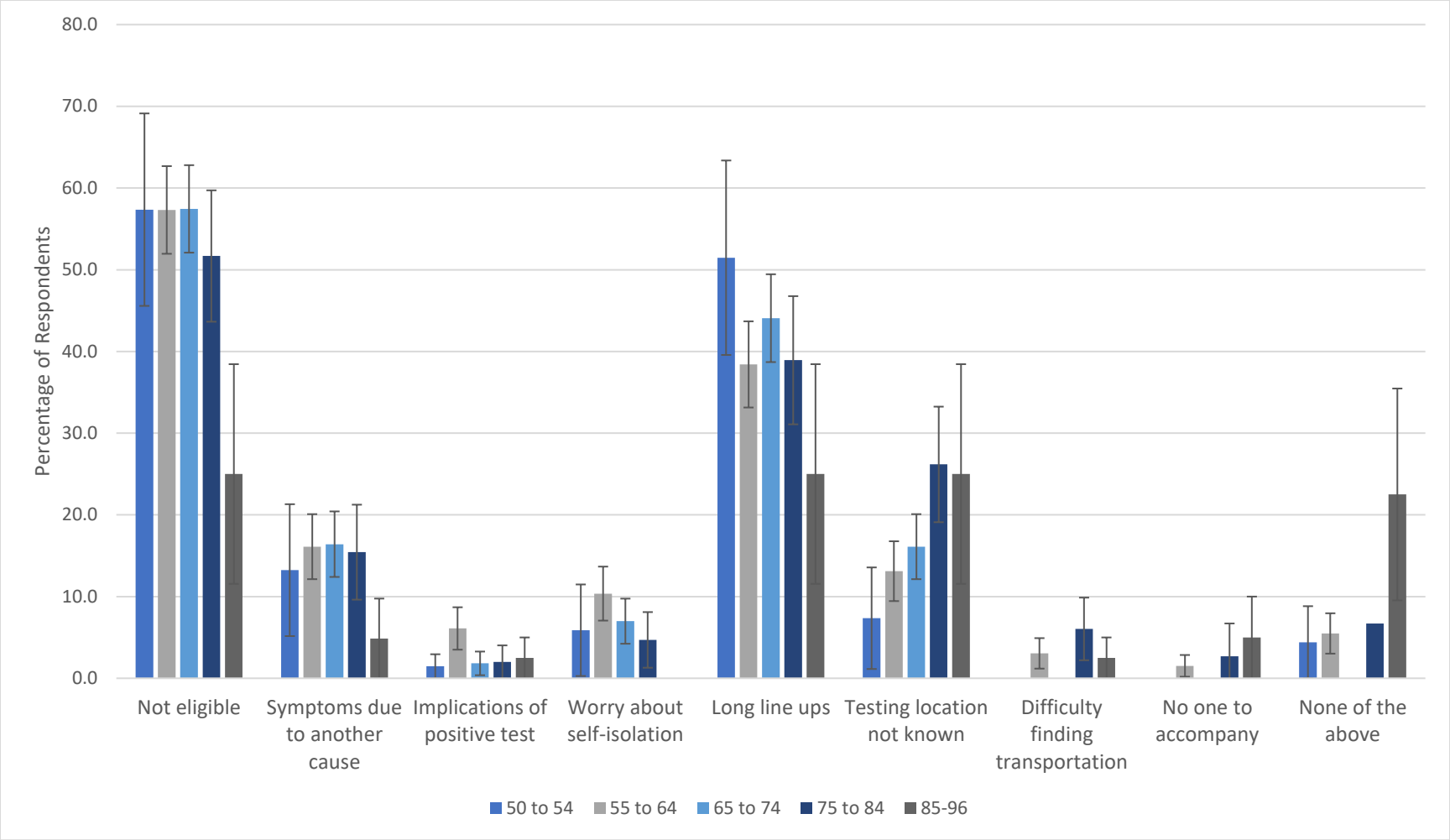


Figure 6: Barriers to accessing testing for COVID-19 as reported by participants in the CLSA COVID-19 exit survey (Sept. to Dec. 2020), stratified by age (N=914)

2.9 Supplementary Material

Supplementary Table 1: Descriptive characteristics of participants completed FUP1 (2015-2018) and then did or did not complete the COVID-19 exit survey

	CLSA Participants who completed the COVID-19 Exit Survey (N=23972)	**CLSA Participants who did not complete the COVID-19 Exit Survey (N=20840)**
	N (%)	N (%)
Measured at Baseline (2011-2015)		
Sex		
Female	12743 (53.2)	10200 (48.9)
Male	11229 (46.8)	10640 (51.1)
Racial background[1]		
White	23273 (97.2)	19893 (95.5)
Non-white	673 (2.8)	927 (4.5)
Missing	26	20
Immigrant status[1]		
Immigrant	3789 (15.8)	3381 (16.2)
Non-immigrant	20173 (84.2)	17453 (83.8)
Missing	10	6
Education[1]		
Less than secondary school	1101 (4.6)	1568 (7.5)
Secondary school	2349 (9.8)	2385 (11.5)
Some post-secondary	1719 (7.2)	1592 (7.7)
Post-secondary degree/diploma	18756 (78.4)	15235 (73.3)
Missing	47	60
Measured at FUP1 (2015-2018)		
Age		
<50	432 (1.8)	511 (2.45)
50-54	2723 (11.4)	2932 (14.07)
55-64	8312 (34.7)	6437 (30.9)
65-74	7804 (32.6)	5497 (26.4)

75-84	4092 (17.1)	4273 (20.5)
85-96	609 (2.5)	1190 (5.7)
Region		
Atlantic	4355 (18.1)	4476 (21.5)
Prairies	5171 (21.6)	4213 (20.2)
Ontario	5535 (23.1)	4296 (20.6)
Quebec	4333 (18.1)	4360 (20.9)
British Columbia	4578 (19.1)	3495 (16.8)
Urban/Rural		
Rural area	3308 (13.8)	3350 (16.1)
Urban area	20648 (86.2)	17475 (83.9)
Missing	16	15
Household income		
Less than $20,000	861 (3.8)	1222 (6.5)
$20,000 to <$50,000	4855 (21.4)	5074 (26.8)
$50,000 to <$100,000	8569 (37.9)	6553 (34.6)
$100,000 to <$150,000	4589 (20.3)	3218 (17.0)
$150,000 or more	3758 (16.6)	2858 (15.1)
Missing	1340	1918
Marital status		
Single, never married or never lived with a partner	2007 (8.4)	1875 (9.0)
Married or living with a partner	16833 (70.3)	13705 (65.8)
Widowed	2332 (9.7)	2589 (12.4)
Divorced or separated	2785 (11.6)	2664 (12.8)
Missing	15	7
Dwelling type		
House	19354 (80.7)	16190 (77.7)
Apartment or condominium	4137 (17.3)	3869 (18.6)
Other	479 (2.0)	780 (3.7)
Missing	2	1

Supplementary Table 2: Logistic regression models assessing the association between sociodemographic characteristics and unmet healthcare needs during the COVID-19 pandemic as reported by participants during the CLSA COVID-19 exit survey (Sept. to Dec. 2020), adjusted for all covariates

	Any challenges in accessing healthcare **aOR (95% CI)**	Did not go to the hospital or to see a doctor even though they needed to **aOR (95% CI)**	Experienced barriers to accessing testing for COVID-19 **aOR (95% CI)**
Sex			
Male	Reference	Reference	Reference
Female	1.03 (0.96, 1.10)	1.13 (1.01, 1.25)	0.89 (0.77, 1.03)
Age			
50-54	Reference	Reference	Reference
55-64	0.86 (0.74, 1.00)	0.74 (0.59, 0.92)	0.74 (0.56, 0.99)
65-74	0.85 (0.72, 0.99)	0.62 (0.48, 0.78)	0.66 (0.48, 0.89)
75-84	0.69 (0.58, 0.82)	0.45 (0.35, 0.59)	0.50 (0.35, 0.70)
85-96	0.52 (0.42, 0.64)	0.39 (0.28, 0.54)	0.40 (0.25, 0.64)
Region			
Atlantic	Reference	Reference	Reference
Quebec	0.47 (0.42, 0.53)	1.43 (1.22, 1.68)	0.68 (0.49, 0.95)
Ontario	1.19 (1.09, 1.31)	1.00 (0.85, 1.18)	3.30 (2.57, 4.22)
Prairies	0.72 (0.65, 0.79)	0.78 (0.65, 0.93)	1.84 (1.41, 2.40)
British Columbia	0.98 (0.89, 1.08)	0.90 (0.76, 1.07)	2.19 (1.69, 2.85)
Urban/Rural			
Urban	Reference	Reference	Reference
Rural	0.94 (0.87, 1.03)	1.04 (0.91, 1.20)	0.93 (0.76, 1.13)
Racial background			
White	Reference	Reference	Reference
Non-white	0.74 (0.60, 0.90)	1.09 (0.81, 1.46)	0.91 (0.61, 1.38)
Immigrant status			
Non-immigrant	Reference	Reference	Reference
Immigrant	1.12 (1.03, 1.22)	1.37 (1.19, 1.58)	0.98 (0.81, 1.19)
Household income			

Less than $20,000	0.93 (0.76, 1.14)	1.16 (0.86, 1.57)	0.95 (0.62, 1.46)
$20,000 to <$50,000	0.93 (0.82, 1.04)	1.10 (0.91, 1.34)	0.84 (0.65, 1.08)
$50,000 to <$100,000	0.98 (0.89, 1.08)	1.02 (0.87, 1.20)	0.72 (0.59, 0.89)
$100,000 to <$150,000	1.05 (0.95, 1.16)	1.04 (0.87, 1.24)	0.76 (0.62, 0.94)
$150,000 or more	Reference	Reference	Reference
Education			
Less than secondary school	0.72 (0.60, 0.86)	1.05 (0.81, 1.35)	0.67 (0.43, 1.06)
Secondary school	0.77 (0.69, 0.86)	0.95 (0.80, 1.14)	0.51 (0.37, 0.70)
Some post-secondary	0.96 (0.86, 1.09)	1.09 (0.89, 1.32)	0.85 (0.65, 1.11)
Post-secondary diploma or more	Reference	Reference	Reference
Marital status			
Married or living with a partner	Reference	Reference	Reference
Single, never married or never lived with a partner	1.15 (1.02, 1.30)	0.94 (0.77, 1.14)	1.21 (0.92, 1.58)
Widowed	0.94 (0.83, 1.07)	1.09 (0.90, 1.33)	1.02 (0.75, 1.37)
Divorced or separated	1.12 (1.00, 1.25)	1.17 (0.99, 1.38)	1.20 (0.95, 1.52)
Chronic conditions			
Absent	Reference	Reference	Reference
Present	1.46 (1.36, 1.56)	1.53 (1.37, 1.71)	1.11 (0.96, 1.28)
Dwelling type			
House	Reference	Reference	Reference
Apartment	0.96 (0.88, 1.05)	1.04 (0.91, 1.20)	1.15 (0.95, 1.40)
Other	0.98 (0.81, 1.19)	1.14 (0.86, 1.51)	1.00 (0.63, 1.60)
Work status			
Do not work outside the home	Reference	Reference	Reference
Usually work outside the home	0.97 (0.89, 1.05)	0.92 (0.80, 1.05)	1.09 (0.92, 1.30)
Unmet needs (pre-pandemic)			
Yes	2.23 (2.00, 2.47)	2.55 (2.21, 2.94)	1.70 (1.37, 2.12)
No	Reference	Reference	Reference

Supplementary Table 3: Adjusted risk differences for all of the sociodemographic characteristics and unmet healthcare needs during the COVID-19 pandemic as reported by participants during the CLSA COVID-19 exit survey (Sept. to Dec. 2020), adjusted for all covariates*

	Any challenges in accessing healthcare **% (95% CI)**	Did not go to the hospital or to see a doctor even though they needed to **% (95% CI)**	Experienced barriers to accessing testing for COVID-19 **% (95% CI)**
Sex			
Male	Reference	Reference	Reference
Female	0.50 (-0.69, 1.69)	0.75 (0.08, 1.43)	-0.35 (-0.80, 0.09)
Age			
50-55	Reference	Reference	Reference
55-64	-2.98 (-6.05, 0.09)	-2.62 (-4.75, -0.49)	-1.22 (-2.52, 0.08)
65-74	-3.28 (-6.51, -0.04)	-3.87 (-6.11, -1.64)	-1.64 (-3.02, -0.26)
75-84	-7.05 (-10.45, -3.64)	-5.61 (-7.90, -3.34)	-2.43 (-3.86, -1.00)
85-96	-11.42 (-15.20, -7.63)	-6.37 (-8.80, -3.94)	-2.89 (-4.43, -1.36)
Region			
Atlantic	Reference	Reference	Reference
Quebec	-12.37 (-14.18, -10.56)	2.68 (1.48, 3.88)	-0.63 (-1.12, -0.08)
Ontario	3.64 (1.69, 5.58)	0.01 (-1.05, -3.00)	4.28 (3.48, 5.08)
Prairies	-6.12 (-7.98, -4.25)	-1.45 (-2.48, -0.43)	1.61 (0.92, 2.29)
British Columbia	-0.05 (-2.44, 1.51)	-0.65 (-1.71, 0.41)	2.27 (1.54, 3.00)
Urban/Rural			
Urban	Reference	Reference	Reference
Rural	-1.06 (-2.58, 0.47)	0.28 (-0.61, 1.16)	-0.23 (-0.82, 0.36)
Racial background			
White	Reference	Reference	Reference
Non-white	-5.19 (-8.34, -2.04)	0.56 (-1.44, 2.55)	-0.27 (-1.44, 0.90)
Immigrant status			
Non-immigrant	Reference	Reference	Reference
Immigrant	2.12 (0.44, 3.81)	2.23 (1.14, 3.31)	-0.06 (-0.65, 0.52)
Household income			
Less than $20,000	-1.33 (-5.02, 2.35)	0.97 (-1.09, 3.04)	-0.20 (-1.78, 1.37)

$20,000 to <$50,000	-1.42 (-3.58, 0.75)	0.61 (-0.64, 1.86)	-0.62 (-1.51, 0.26)
$50,000 to <$100,000	-0.43 (-2.22, 1.36)	0.12 (-0.89, 1.14)	-1.06 (-1.76, -0.36)
$100,000 to <$150,000	0.95 (-0.95, 2.86)	0.23 (-0.85, 1.32)	-0.92 (-1.63, -0.21)
$150,000 or more	Reference	Reference	Reference
Education			
Less than secondary school	-5.62 (-8.45, -2.80)	0.30 (-1.39, 1.99)	-1.12 (-2.20, -0.04)
Secondary school	-4.61 (-6.50, -2.71)	-0.31 (-1.41, 0.80)	-1.70 (-2.31, -1.09)
Some post-secondary	-0.68 (-2.90, 1.54)	0.56 (-0.78, 1.89)	-0.52 (-1.31, 0.27)
Post-secondary diploma or more	Reference	Reference	Reference
Marital status			
Married or living with a partner	Reference	Reference	Reference
Single, never married or never lived with a partner	2.62 (0.23, 5.02)	-0.41 (-1.60, 0.78)	0.61 (-0.32, 1.54)
Widowed	-1.07 (-3.30, 1.16)	0.58 (-0.76, 1.92)	0.04 (-0.86, 0.96)
Divorced or separated	2.11 (0.04, 4.18)	1.06 (-0.12, 2.23)	0.60 (-0.21, 1.41)
Chronic conditions			
Absent	Reference	Reference	Reference
Present	6.81 (5.63, 7.98)	2.63 (1.96, 3.29)	0.32 (-0.12, 0.76)
Dwelling type			
House	Reference	Reference	Reference
Apartment	-0.81 (-2.42, 0.80)	0.27 (-0.65, 1.19)	0.46 (-0.19, 1.11)
Other	-0.33 (-3.77, 3.12)	0.87 (-1.09, 2.84)	-0.01 (-1.42, 1.41)
Work status			
Do not work outside the home	Reference	Reference	Reference
Usually work outside the home	-0.61 (-2.13, 0.91)	-0.52 (-1.36, 0.32)	0.28 (-0.29, 0.84)
Unmet needs (Pre-pandemic)			
Yes	17.00 (14.54, 19.47)	8.44 (6.75, 10.13)	2.05 (1.04, 3.06)
No	Reference	Reference	Reference

*Calculated using the differences between marginal means

Supplementary Table 4: Frequency of types of challenges experienced accessing healthcare reported by CLSA COVID-19 exit survey (Sept. to Dec. 2020) participants (N=5960)

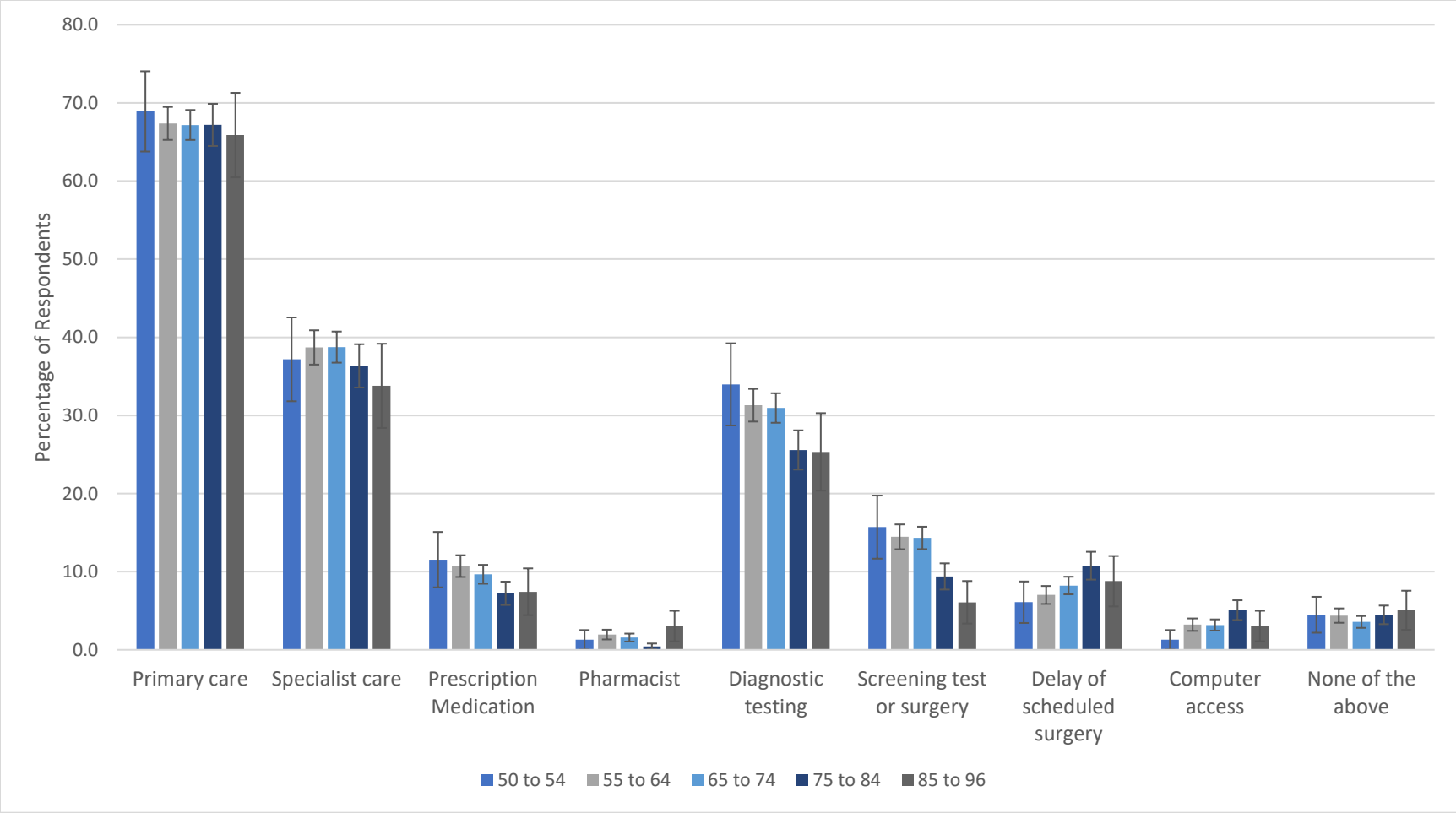
Service	**N (%)**
Primary care	4009 (67.3)
Specialist care	2261 (37.9)
Prescription medication	567 (9.5)
Pharmacist	91 (1.5)
Diagnostic testing	1782 (29.9)
Screening test/surgery	779 (13.1)
Delay of scheduled surgery	492 (8.3)
Unable to use zoom/no access to a computer	206 (3.5)
None of the above	246 (4.1)

Supplementary Table 5: Frequency of reasons for not visiting the hospital or seeing a doctor while needing to reported by CLSA COVID-19 exit survey (Sept. to Dec. 2020) participants (N=1731)

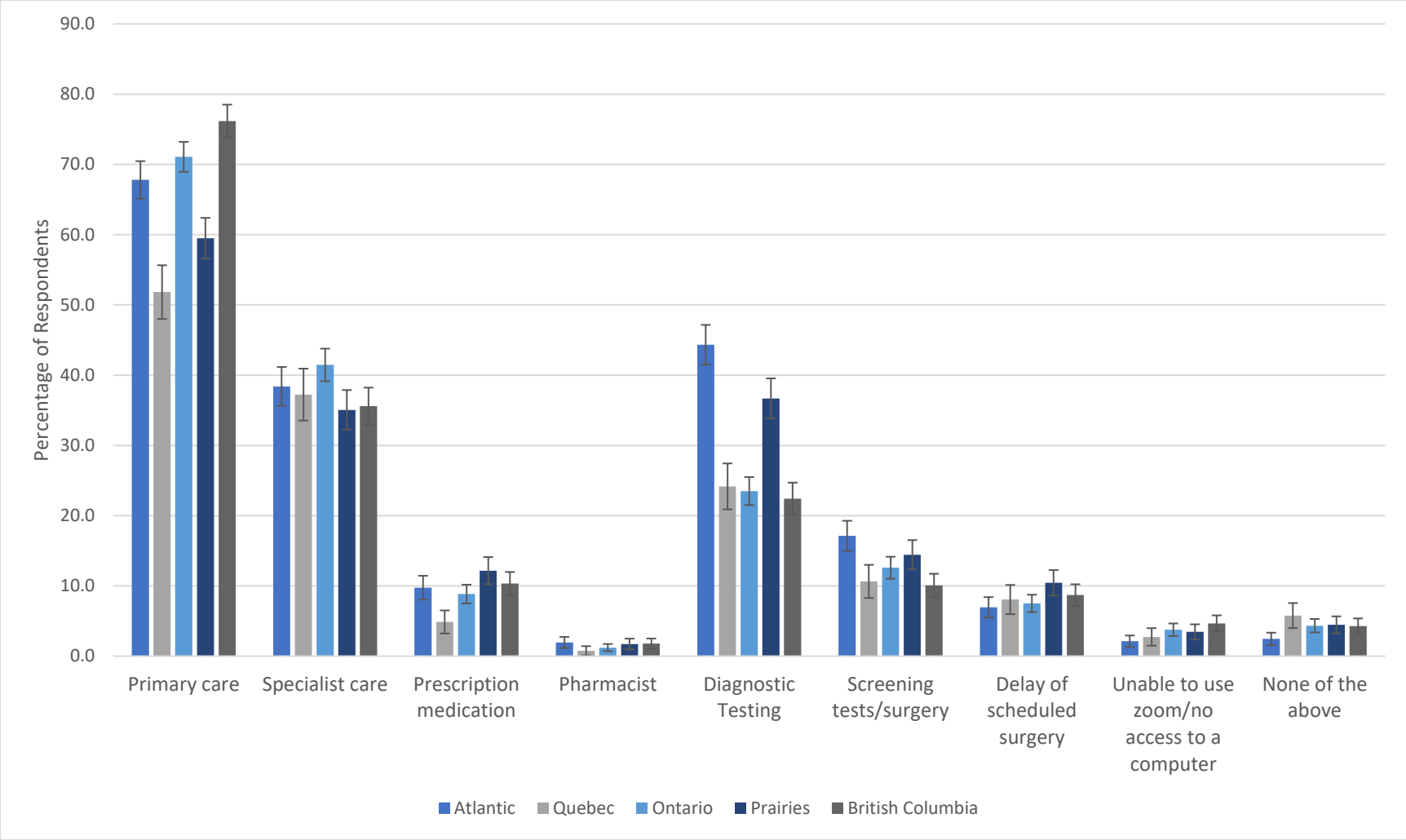
Service	**N (%)**
Fear of COVID-19 contact	680 (39.3)
Fear of physical or emotional discomfort	102 (5.9)
Services redirected to priority groups	735 (42.5)
Did not want to learn about chronic/serious illness	84 (4.8)
Difficulty finding transportation	55 (3.2)
No one to accompany	60 (3.5)
None of the above	437 (25.2)

Supplementary Table 6: Frequency of barriers to accessing testing for COVID-19 reported by CLSA COVID-19 exit survey (Sept. to Dec. 2020) participants (N=914)

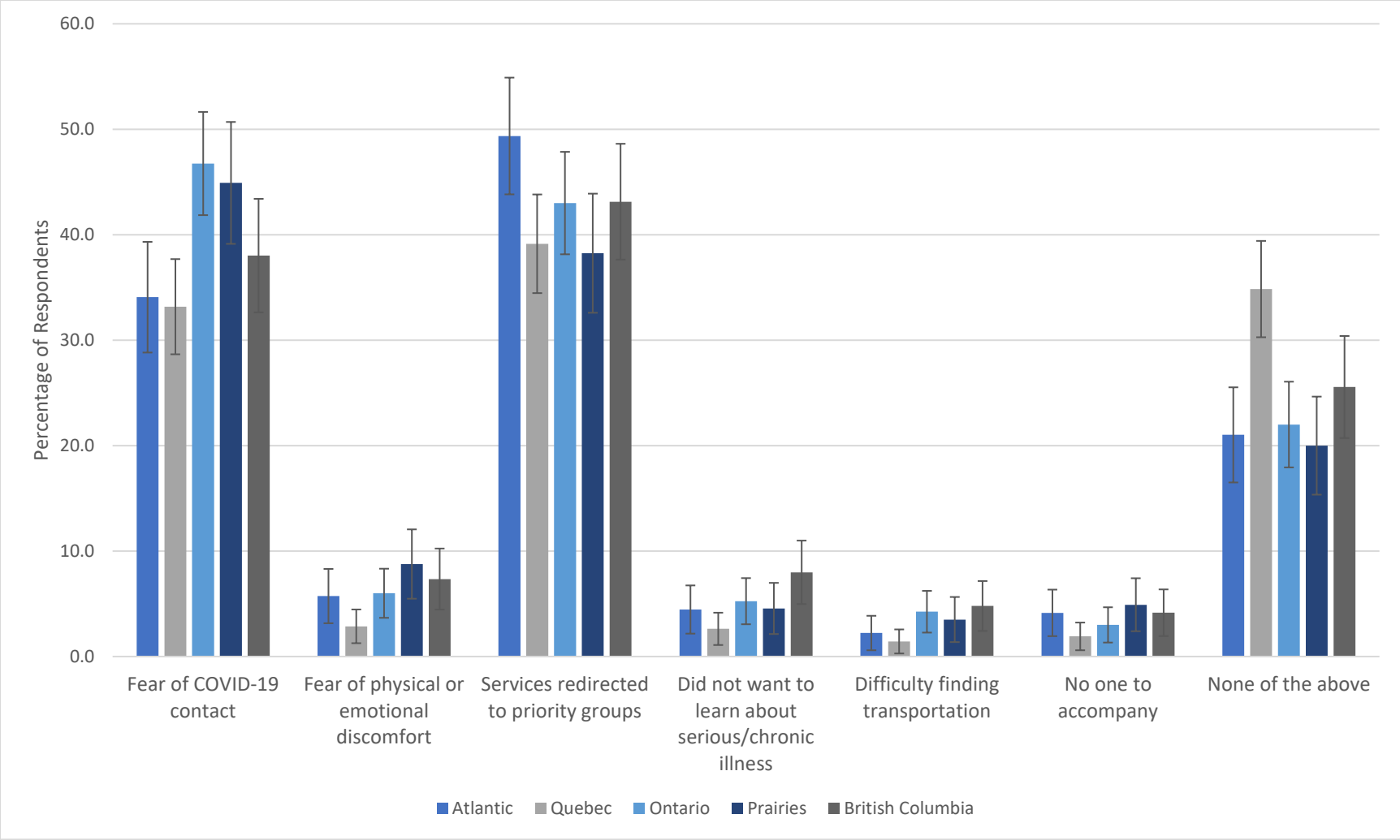
Service	**N (%)**
Not eligible	503 (55.0)
Symptoms due to another cause	141 (15.4)
Implications of positive test	31 (3.4)
Worry about self-isolation	68 (7.4)
Long line ups	374 (40.9)
Testing location not known	150 (16.4)
Difficulty finding transportation	37 (4.0)
No one to accompany	20 (2.2)
None of the above	73 (8.0)



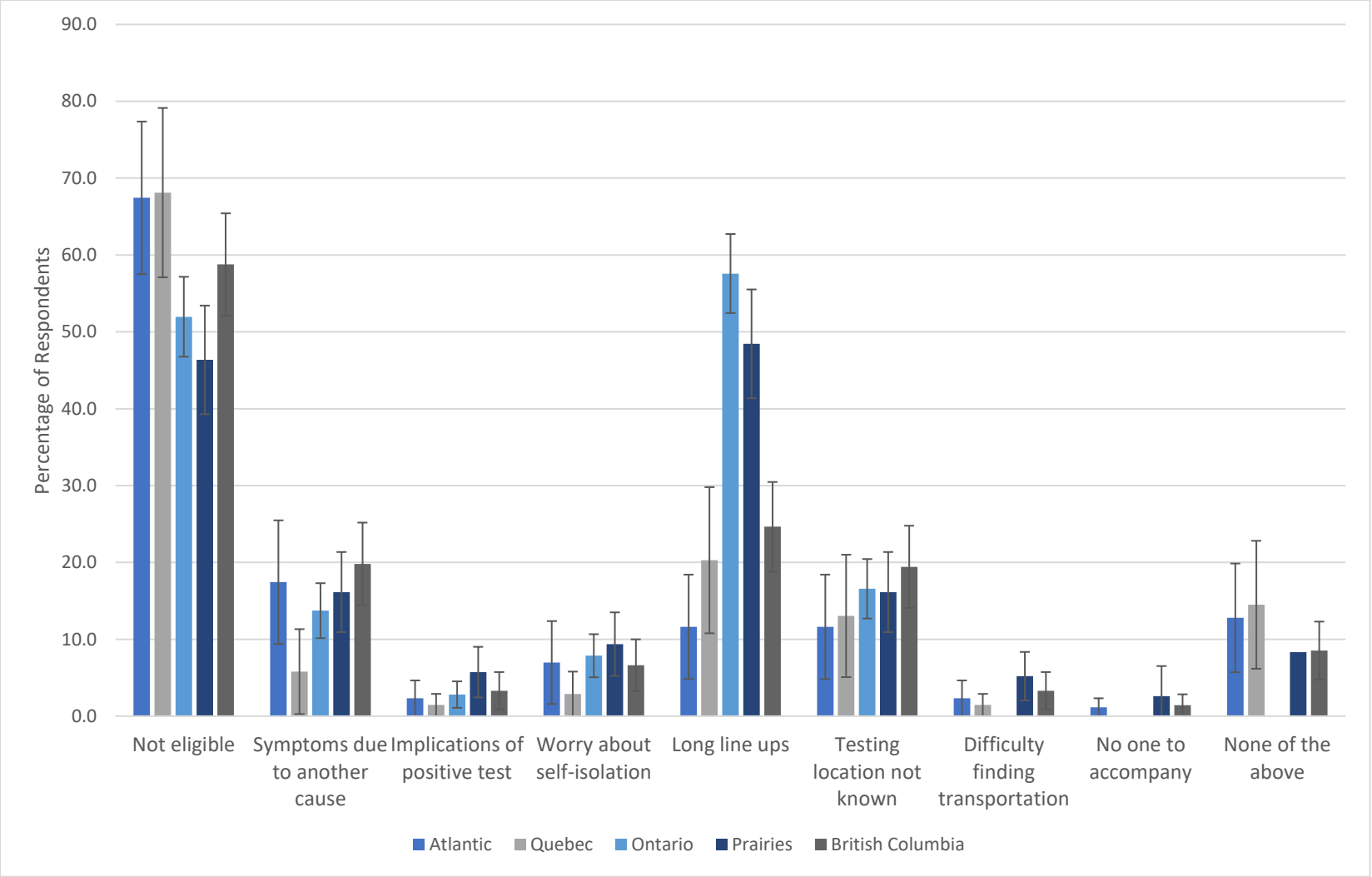
Supplementary Figure 1: Frequency of types of challenges experienced accessing healthcare, as reported by participants in the CLSA COVID-19 exit survey (Sept. to Dec. 2020), stratified by age (N=5960)



Supplementary Figure 2: Frequency of types of challenges experienced accessing healthcare as reported by participants in the CLSA COVID-19 exit survey (Sept. to Dec. 2020), stratified by province (N=5960)



Supplementary Figure 3: Reasons for not visiting the hospital or seeing a doctor while needing to as reported by participants in the CLSA COVID-19 exit survey (Sept. to Dec. 2020), stratified by province (N=1731)



Supplementary Figure 4: Barriers to accessing COVID-19 testing as reported by participants in the CLSA COVID-19 exit survey (Sept. to Dec. 2020), stratified by province (N=914)

CHAPTER 3: MANUSCRIPT 2

Title: Symptoms of depression and anxiety, and unmet healthcare needs in older adults during the COVID-19 pandemic: a cross-sectional study from the Canadian Longitudinal Study on Aging

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3.1 Abstract

Background: The COVID-19 pandemic disrupted access to healthcare services in Canada. Research prior to the pandemic has found that depression and anxiety symptoms were associated with increased unmet healthcare needs.

Methods: To examine if mental health was associated with perceived access to healthcare during the pandemic, a cross-sectional study was conducted using data from 23,972 participants (aged 50-96) in the Canadian Longitudinal Study on Aging COVID-19 Exit survey (Sept–Dec 2020). We used logistic regression to estimate how the presence of depression and anxiety symptoms, defined using scores of ≥10 on the Center for Epidemiologic Studies Depression Scale and ≥10 on the Generalized Anxiety Disorder Scale, were associated with the odds of reporting: 1) challenges accessing healthcare, 2) not going to a hospital or seeing a doctor when needed, 3) experiencing barriers to COVID-19 testing. Models were adjusted for sex, age, region, urban/rural residence, racial background, immigrant status, income, marital status, work status, chronic conditions, and pre-pandemic unmet needs.

Results: The presence of depressive (aOR=1.96; 95% CI=1.82, 2.11) and anxiety symptoms (aOR=2.33; 95% CI=2.04, 2.66) compared to the absence of these symptoms were independently associated with higher odds of challenges accessing healthcare. A statistically significant interaction with sex suggested stronger associations in females. Symptoms of depression (aOR=2.88; 95% CI=2.58, 3.21) and anxiety (aOR=3.05; 95% CI=2.58, 3.60) were also associated with increased odds of not going to a hospital or seeing a doctor when needed. Lastly, depressive (aOR=1.99; 95% CI=1.71, 2.31) and anxiety symptoms (aOR=2.01; 95% CI=1.58,

2.56) were associated with higher odds of reporting barriers to COVID-19 testing. There was no significantly significant interaction with sex for the latter two outcomes.

Conclusion: The presence of depression and anxiety symptoms were strongly associated with perceived unmet healthcare needs during the COVID-19 pandemic. Interventions to improve healthcare access for adults with depression and anxiety during the pandemic may be necessary.

Key Words: Depression, Anxiety, Unmet Healthcare Needs, CLSA

3.2 Introduction

Due to the onset of the COVID-19 pandemic in March 2020, various public health restrictions were implemented in all Canadian provinces and territories.(1) As part of the public health response, many healthcare system resources were re-directed to caring for COVID-19 patients and several services switched to virtual delivery.(2) This led to a disruption in the delivery of primary care, hospital and home-based services.(3)(4)(5) Fear of COVID-19 and cancellation or delay of appointments also led to challenges accessing services.(6–8) From March 2020 to May 2021, 49% of Canadians reported difficulty accessing healthcare services, and 15% did not receive required healthcare services.(9) Similarly, in the Canadian Longitudinal Study on Aging (CLSA), we found that 25% of older adults reported challenges accessing healthcare, while 8% reported that when they did not visit a hospital or doctor, while needing to during the second wave (Sept. – Dec. 2020).(6)

Prior to the pandemic, research has found interconnections between depression, anxiety and experiencing unmet healthcare needs. Multiple studies have found that experiencing symptoms of depression is associated with elevated unmet needs, including a cross-sectional study of 845 older adults in Germany which found that the odds of experiencing depressive symptoms were 82% higher in the group that had unmet needs.(10–14) People with symptoms of anxiety are also more likely to report unmet needs, with one study of HIV patients finding that those with anxiety were two times more likely to miss a follow-up appointment.(15–17) Depression and anxiety have both also been associated with lower levels of satisfaction with the healthcare system and overall trust in healthcare providers.(18–21) Concerningly, women have reported greater levels of unmet need, and are more likely to report symptoms of depression and anxiety, relative to men.(22,23)

Although symptoms of depression and anxiety have been found to be associated with unmet healthcare needs prior to the pandemic, this research question has not yet been evaluated during the COVID-19 pandemic in Canada. Therefore, the primary objective of this study was to evaluate the association between symptoms of depression and anxiety and unmet healthcare needs among adults. As a secondary objective, the interaction between depression, anxiety and sex will be evaluated to assess if the association between mental health and unmet needs is modified by sex.

3.3 Methods

3.3.1 Study Design & Data Source

A cross sectional study was conducted using data from the CLSA COVID-19 exit survey (Sept. – Dec. 2020). The CLSA is a national cohort study that recruited 51,338 adults from across the ten provinces.(24) Recruitment and baseline data collection occurred between 2011 to 2015 and follow-up one (FUP1) occurred from 2015 to 2018 (n=44,817). Participants will be followed up every three years until at least 2033. At recruitment, participants were required to be between the ages of 45 to 85, able to complete interviews in French or English. The study excluded residents of the three territories, First Nations Reserves or settlements, any institutions (e.g., long term care homes) and full-time members of the Armed Forces. The study also excluded individuals with signs of cognitive impairment.(25) The CLSA has been extensively described by Raina et al. and information on the study is also available online (https://www.clsa-elcv.ca/).(25–27) Ethics approval was granted by the Hamilton Integrated Research Ethics Board and from each data collection site across Canada.

In response to the COVID-19 pandemic, the CLSA COVID-19 Questionnaire Study was launched. Participants who could be contacted were invited to participate in the study via web or telephone surveys. There were 42,511 participants invited and 28,559 (response rate=67%) completed the baseline survey, which was administered between April 15th, 2020 and May 30th, 2020. Participants then completed weekly/bi-weekly/monthly surveys until the final COVID-19 exit survey was administered between September 29th, 2020 and December 29th, 2020. While 24,114 participants completed the CLSA COVID-19 exit survey, 23,975 participants had data available from the CLSA baseline, FUP1 and COVID-19 surveys. Three participants were excluded from the sample as they lived in one of the three territories in 2020, resulting in a final sample of 23,972 adults for this analysis.

3.3.2. Measurement of Depression and Anxiety

The main independent variables of interest were self-reported symptoms of depression and anxiety assessed at the time of the CLSA COVID-19 exit survey (Sept. – Dec. 2020).(26) Depressive symptoms were evaluated using the 10-item version of the Center for Epidemiologic Studies Depression Scale (CESD-10). Participants are asked to report the frequency of experiencing certain feelings or behaviours within the past week on a four-point Likert scale, ranging from "All of the time" to "Rarely or never". CESD-10 composite scores can range from 0 to 30. In this study, we have categorized scores ≥10 as indicative of depression symptoms based on the scale's guidelines.(28) The CESD-10 has shown good validity and reliability among older adults.(29–31) Symptoms of anxiety were assessed using the Generalized Anxiety Disorder 7 (GAD-7) scale. The GAD-7 consists of seven items, with participants asked to rank how frequently in the past two weeks they felt bothered by given concerns on a four-point Likert scale

from "Not at all" to "Nearly every day". GAD-7 composite scores range from 0 to 21. We used a cut off score of ≥10 to indicate the presence of anxiety symptoms, as has been suggested by the scale's developers and supported by subsequent validation studies.(32,33) The GAD-7 scale has also shown a high level of reliability.(34,35)

3.3.3. Measurement of Unmet Healthcare Needs

Our primary outcome of interest, the self-reported experience of unmet healthcare needs, was assessed using three questions that were included in the CLSA COVID-19 exit survey: 1) "Since the beginning of the COVID-19 pandemic have you experienced any challenges accessing healthcare?" 2) "Since March 1st, 2020 were there times when you did not go to the hospital or to see a doctor even though you needed to?", and 3) "Since the beginning of the COVID-19 pandemic, have you experienced barriers to accessing testing for COVID-19?".(6) For each question, participants could respond by saying "Yes", "No", "Don't know / No answer" or "Prefer not to answer".

3.3.4 Confounding variables

Potential confounding variables were selected *a priori* and defined as variables that were a potential risk factor of the outcome, associated with the exposures, and not on the causal pathway between the exposure and the outcome. These included: sex, age, geographic region, urban/rural, racial background, immigrant status, household income, marital status, work status, chronic conditions and pre-pandemic unmet needs. Sex, racial background and immigrant status were assessed at CLSA baseline (2011-2015). Participants were classified as immigrants if they were not born in Canada. Household income, marital status and pre-pandemic unmet needs were

measured at CLSA FUP1 (2015-2018). At FUP1, pre-pandemic unmet needs were assessed by asking participants if "During the past 12 months, was there ever a time when you felt that you needed healthcare but you didn't receive it?". Age, geographic region (Atlantic: Prince Edward Island, Nova Scotia, New Brunswick, Newfoundland; Quebec; Ontario; Prairies: Manitoba, Saskatchewan, Alberta; British Columbia), urban/rural residence, work status and presence of chronic conditions were measured from the COVID-19 baseline survey. Participants were classified as living in urban or rural areas, by linking their postal code to the Statistics Canada Postal Code Conversion file. Work status was classified as not working outside of their residence or working outside of their residence, whether as an essential worker or a non-essential worker. Participants were categorized as having a chronic condition if they reported that over the course of their lifetime a doctor had ever diagnosed them with of the following conditions: chronic obstructive pulmonary disease, other chronic lung diseases, diabetes, high blood pressure, heart disease, cancer, heart/lung/kidney/liver/pancreas failure, autoimmune disorder, pneumonia and human immunodeficiency virus. If they reported having any of the illnesses, they were considered to have a chronic condition. During development of the COVID-19 baseline survey, these conditions were chosen as they represented an elevated COVID-19 mortality risk.

3.3.5 Statistical Analyses

Descriptive statistics, including the frequency and distribution of all variables, were first calculated for the overall sample of 23,972 participants. Descriptive statistics are also provided for the sample stratified by the presence or absence of symptoms of depression and anxiety. Odds ratios and 95% confidence intervals (CI) were estimated from logistic regression models. Models were constructed to assess the association between symptoms of depression and anxiety

and each of the three unmet healthcare need outcomes, separately. Unadjusted estimates were first obtained and then fully adjusted logistic regression models were run to obtain adjusted odds ratios (aORs) and 95% CIs. The fully adjusted models included all potential confounders identified *a priori*: sex, age, region, urban/rural, racial background, immigrant status, household income, marital status, work status, chronic conditions, and pre-pandemic unmet needs. To fulfill the secondary objective, the models were tested for the interaction of depression and anxiety with sex. The p-values for the interaction coefficients are reported, with stratified analyses presented by sex. Sensitivity analyses were conducted to test the interaction between depression, anxiety and pre-pandemic unmet needs. This was done to assess if the associations between the mental health exposures and unmet need outcomes differed between those who already expressed unmet need prior to the pandemic, compared to those who did not. To evaluate if the co-occurrence of depression and anxiety affected the results, depression and anxiety were also included simultaneously in the models. The co-occurrence of the outcomes of challenges accessing healthcare and not going to a hospital or seeing a doctor when needed was also evaluated.

The software SAS v9.4 was used to perform the statistical calculations. There was relatively minimal missing data (i.e., less than 10% for any variable), and only cases with complete data on all variables were included in the regression models and therefore no imputation was performed.

3.4 Results

The descriptive characteristics of the 23,972 adults eligible for this analysis are summarized in Table 1. The majority of the sample is aged 65 or above (65.2%). We found that 22% (N=5179)

of participants screened positive for symptoms of depression and 5% (N=1176) of participants screened positive for symptoms of anxiety in the COVID-19 exit survey (Sept. – Dec. 2020). Regarding unmet healthcare needs, 25% (N=5992) of participants reported challenges accessing healthcare, 8% (N=1776) reported not visiting the hospital or seeing the doctor while needing to and 4% (N=917) reported barriers to accessing testing for COVID-19.

Descriptive characteristics of the sample with symptoms of depression and anxiety can be found in Table 1. Females represented a greater proportion of those with depression and anxiety symptoms. Individuals with chronic conditions and pre-pandemic unmet needs also represented a substantially greater proportion of those with symptoms, relative to those without. Participants that reported working outside of the home, whether as an essential or non-essential worker, comprised a greater proportion of those that had anxiety symptoms, compared to those that did not work outside of the home.

As shown in Table 2, the presence of both depressive and anxiety symptoms were strongly associated with all three unmet healthcare outcomes. The fully adjusted results were similar to the unadjusted results, with aORs only slightly attenuated. Depressive symptoms (aOR=1.96; 95% CI=1.82, 2.11) and anxiety (aOR=2.33; 95% CI=2.04, 2.66) were strongly associated with increased odds of reporting challenges accessing the healthcare system. Similarly, symptoms of depression (aOR=2.88; 95%CI=2.58, 3.21) and anxiety (aOR=3.05; 95% CI=2.58, 3.60) were associated with increased odds of not going to a hospital or seeing a doctor when needed. Lastly, both depression (aOR=1.99; 95% CI=1.71, 2.31) and anxiety (aOR=2.01; 95% CI=1.58, 2.56) were associated with increased odds of reporting experiencing barriers to accessing testing for COVID-19.

3.4.1 Sex stratification

A statistically significant interaction was observed between sex and both depression and anxiety for the outcome of reported challenges accessing the healthcare system. Although the results were elevated and significant for both males and females, the association of reported access challenges and symptoms of both depression and anxiety symptoms was stronger for females. Results were also elevated and significant for depression and anxiety in both males and females for the other two questions on unmet needs, but no statistically significant interactions with sex were observed. The sex-stratified results for all of the outcomes are shown in Table 3.

3.4.2 Sensitivity analyses

Testing for interaction between pre-pandemic unmet needs and the mental health exposures did not result in any statistically significant outcomes (Supplementary Table 1). Therefore, the association between depression, anxiety and unmet healthcare needs during the pandemic did not differ between those with and without pre-pandemic unmet needs. Notably, of those with anxiety symptoms, 90.2% of the participants also had depressive symptoms. (Supplementary Table 2). When including both depression and anxiety in the fully adjusted logistic regression models, the ORs for anxiety were attenuated but the ORs for depression changed minimally (Supplementary Table 3). Notably, 19.8% of those who reported challenges accessing healthcare also reported that they did not go to a hospital or see a doctor when needed (Supplementary Table 4).

3.5 Discussion

The results of our study suggest that the presence of depression and anxiety symptoms were strongly associated with increased unmet health care needs among adults in Canada early in the second wave of the COVID-19 pandemic. A statistically significant interaction was found for sex with depression and anxiety for the outcome of experiencing challenges accessing healthcare, such that the association was stronger in females. Nonetheless, the association between mental health challenges and challenges accessing healthcare services was also strong in males. No significant interaction by sex was observed for the other outcomes.

Our results are consistent with other studies conducted prior to the pandemic, as depression and anxiety symptoms have been repeatedly associated with elevated levels of unmet healthcare needs.(36,37) While some pre-pandemic studies have noted that individuals with depression and anxiety have higher levels of healthcare utilization, access to services is only one aspect of unmet needs.(15,36–38) People with depression and anxiety are more likely to report barriers to care, lower levels of satisfaction with care and mistrust in medical professionals.(18,21,39) These factors help justify the greater level of unmet needs in this vulnerable population, in spite of their higher healthcare utilization levels.

Cross-sectional studies conducted in the United States and Singapore during the pandemic have also found that individuals with depression or anxiety symptoms were less likely to access healthcare services.(40–42) The association between depression, anxiety and unmet healthcare needs may have been exacerbated by the pandemic, given the observed rise in depression and anxiety symptoms.(26,43,44) In our cross-sectional study, we cannot determine temporality but symptoms of depression include self-neglect and lack of self-efficacy and this may have decreased capacity to seek care.(45,46) Individuals with anxiety symptoms also

reported greater fear of being infected with COVID-19 and lower confidence in the adaptability of healthcare systems.(47,48) These factors may have resulted in individuals with depressive or anxiety symptoms being more likely to avoid seeking healthcare services. It is also possible that lack of healthcare access, i.e., unmet healthcare needs, contributed to a rise in depression and anxiety symptoms during the pandemic.

The high prevalence of depressive symptoms in the sample speaks to the negative consequences the pandemic has had on older adults.(26) In order to contain spread of the virus, public health authorities advised physical distancing and restricted public gatherings. The guidelines were strongly recommended for older age groups, who were noted to have higher COVID-19 mortality rates.(49) Isolation, due to public health guidance advice against gatherings, may have contributed to the symptoms of depression manifesting or worsening in older adults. Longitudinal analysis of depressive symptoms in participants of the CLSA COVID-19 Questionnaire Study found that the prevalence of depressive symptoms in the sample was higher during the pandemic (Sept.-Dec. 2020).(26) Other cohort studies have also found evidence for worsening of depressive symptoms in older adults, due to the pandemic.(50,51) While the prevalence of anxiety in this sample is lower than other estimates of anxiety in the Canadian population, studies have found that symptoms of anxiety seemed to have worsened in the pandemic.(43,52–54) Given the established association between depression, anxiety and unmet healthcare needs, mental health interventions for older adults may be required to help individuals overcome access hesitancy and service barriers to ensure access to healthcare services is uninterrupted.

While this study only found a significant interaction by sex for one of the outcomes, challenges accessing healthcare, differences in unmet healthcare needs by sex have been noted in

the literature. Women have reported higher levels of unmet needs due to greater caregiving responsibilities and lower financial freedom.(55–57)

Strengths of this study include the large sample size with a wide variety of information, validated measures of depression and anxiety symptoms and measurement of unmet healthcare needs during the pandemic.(29,30,32,35) However, there are some potential limitations. The sample includes a very low proportion of racialized Canadians, which means that selection bias limits the representativeness of the results. Additionally, while strong statistically significant associations were observed, a causal relationship or directionality cannot be established due to the cross-sectional nature of the study. Further research is needed to give insight into the mechanisms of how depressive and anxiety symptoms affect healthcare seeking and to evaluate changes over time, which in turn can better inform future public health strategies or interventions.

3.6 Conclusion

Given the significant association found between symptoms of depression, anxiety and unmet healthcare needs, there is strong justification for interventions tailored for individuals with depression and anxiety to anxiety to help them overcome access hesitancy and/or external barriers to healthcare. Additional research is needed to evaluate the mechanisms of the relationship of depression and anxiety with unmet needs to determine the ideal methods of intervention. This will help ensure equitable access to the healthcare system for a vulnerable population. Lastly, as the pandemic has had severe mental health consequences for older adults, attention is needed to understand how to best serve the healthcare needs of this population.

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3.8 Tables and Figures

Table 1: Descriptive characteristics of the sample at CLSA COVID-19 exit (Sept. – Dec. 2020)

	COVID-19 Exit Survey (N=23972) N (%)	**CES-D 10 Score ≥10 (N=5179)** N (%)	**GAD-7 Score ≥10 (N=1176)** N (%)
Sex			
Female	12743 (53.2)	3295 (63.6)	778 (66.2)
Male	11229 (46.8)	1884 (36.4)	398 (33.8)
Age			
50-54	1097 (4.6)	312 (6.0)	111 (9.4)
55-64	7250 (30.2)	1664 (32.2)	486 (41.3)
65-74	8759 (36.5)	1777 (34.3)	365 (31.1)
75-84	5145 (21.5)	1042 (20.1)	169 (14.4)
85-96	1721 (7.2)	384 (7.4)	45 (3.8)
Geographic region			
Atlantic	4334 (18.1)	855 (16.5)	194 (16.5)
Prairies	5130 (21.4)	1151 (22.2)	268 (22.8)
Ontario	5554 (23.2)	1264 (24.4)	288 (24.5)
Quebec	4336 (18.1)	823 (15.9)	180 (15.3)
British Columbia	4618 (19.3)	1086 (21.0)	246 (20.9)
Urban/Rural			
Rural area	4245 (17.8)	790 (15.3)	197 (16.8)
Urban area	19602 (82.2)	4368 (84.7)	975 (83.2)
Missing	125	21	4
Racial background			
White	23273 (97.2)	5033 (97.3)	1133 (96.5)
Non-white	673 (2.8)	140 (2.7)	41 (3.5)
Missing	26	6	2
Immigrant status			

Immigrant	3789 (15.8)	822 (15.9)	176 (15.0)
Non-immigrant	20173 (84.2)	4356 (84.1)	1000 (85.0)
Missing	10	1	0
Household income			
Less than $20,000	861 (3.8)	264 (5.5)	66 (6.0)
$20,000 to <$50,000	4855 (21.5)	1242 (25.6)	265 (24.1)
$50,000 to <$100,000	8569 (37.9)	1803 (37.2)	384 (34.9)
$100,000 to <$150,000	4589 (20.3)	878 (18.1)	226 (20.6)
$150,000 or more	3758 (16.5)	660 (13.6)	158 (14.4)
Missing	1340	332	77
Marital status			
Single, never married or never lived with a partner	2007 (8.4)	562 (10.9)	112 (9.5)
Married or living with a partner	16833 (70.3)	3256 (62.9)	808 (68.8)
Widowed	2332 (9.7)	555 (10.7)	88 (7.5)
Divorced or separated	2785 (11.6)	802 (15.5)	167 (14.2)
Missing	15	4	1
Chronic conditions			
Present	14235 (59.7)	3304 (64.3)	740 (63.3)
Absent	9594 (40.3)	1837 (35.7)	429 (36.7)
Missing	143	38	7
Work status			
Does not work outside the house	17357 (74.6)	3679 (73.7)	743 (66.1)
Essential worker	2495 (10.7)	510 (10.2)	149 (13.3)
Non-essential worker	3426 (14.7)	801 (16.1)	232 (20.6)
Missing	694	189	52
Unmet needs (pre-pandemic)			
Yes	1874 (7.8)	685 (13.3)	199 (16.9)
No	22060 (92.2)	4485 (86.7)	976 (83.1)
Missing	38	9	1
Challenges in accessing healthcare (pandemic)			

Yes	5992 (25.3)	1898 (36.8)	519 (44.3)
No	17759 (74.7)	3261 (63.2)	652 (55.7)
Missing	221	20	5
Not going to a hospital or seeing a doctor when needed (pandemic)			
Yes	1776 (7.5)	763 (14.8)	239 (20.4)
No	21989 (92.5)	4401 (85.2)	933 (79.6)
Missing	207	15	4
Experienced barriers to accessing testing for COVID-19 (pandemic)			
Yes	917 (3.9)	331 (6.4)	94 (8.0)
No	22828 (96.1)	4830 (93.6)	1077 (92.0)
Missing	227	18	5

Table 2: Logistic regression models examining depression and anxiety with unmet healthcare needs (Sept.–Dec. 2020)

	Unadjusted OR (95% CI)	**Adjusted OR (95% CI)***
Challenges in accessing healthcare		
Depression		
Negative	Reference	Reference
Positive	2.07 (1.93, 2.21)	1.96 (1.82, 2.11)
Anxiety		
Negative	Reference	Reference
Positive	2.49 (2.21, 2.81)	2.33 (2.04, 2.66)
Not going to a hospital or seeing a doctor when needed		
Depression		
Negative	Reference	Reference
Positive	3.03 (2.74, 3.35)	2.88 (2.58, 3.21)
Anxiety		
Negative	Reference	Reference
Positive	3.54 (3.04, 4.12)	3.05 (2.58, 3.60)
Experiencing barriers to accessing testing for COVID-19		
Depression		
Negative	Reference	Reference
Positive	2.10 (1.83, 2.41)	1.99 (1.71, 2.31)
Anxiety		
Negative	Reference	Reference
Positive	2.32 (1.86, 2.90)	2.01 (1.58, 2.56)

* Adjusted for sex, age, region, urban/rural, racial background, immigrant status, income, marital status, work status, chronic conditions, unmet needs (pre-pandemic)

Table 3: Adjusted logistic regression models for experiencing unmet healthcare needs, stratified by sex (Sept. – Dec. 2020)

	Males aOR (95% CI)*	**Females** aOR (95% CI)*	**Interaction term** p-value
Challenges in accessing healthcare			
Depression			
Negative	Reference	Reference	0.075
Positive	1.84 (1.64, 2.06)	2.05 (1.87, 2.56)	
Anxiety			
Negative	Reference	Reference	0.016
Positive	1.91 (1.53, 2.39)	2.59 (2.20, 3.05)	
Not going to a hospital or seeing a doctor when needed			
Depression			
Negative	Reference	Reference	0.718
Positive	2.82 (2.37, 3.35)	2.92 (2.53, 3.37)	
Anxiety			
Negative	Reference	Reference	0.568
Positive	3.22 (2.42, 4.27)	2.99 (2.43, 3.68)	
Experiencing barriers to accessing testing for COVID-19			
Depression			
Negative	Reference	Reference	0.124
Positive	1.74 (1.39, 2.19)	2.21 (1.80, 2.71)	
Anxiety			
Negative	Reference	Reference	0.272
Positive	1.70 (1.13, 2.59)	2.19 (1.62, 2.96)	

*Adjusted for age, region, urban/rural, racial background, immigrant status, income, marital status, work status, chronic conditions, unmet needs (pre-pandemic)

3.9 Supplementary Material

Supplementary Table 1: Adjusted logistic regression models for unmet healthcare needs, stratified by pre-pandemic unmet needs (Sept.-Dec. 2020)

	Absence of Pre-pandemic Unmet Needs aOR (95% CI)*	**Presence of Pre-pandemic Unmet Needs** aOR (95% CI)*	**Interaction term** p-value
Challenges in accessing healthcare			
Depression			
Negative	Reference	Reference	0.898
Positive	2.04 (1.90, 2.20)	2.04 (1.65, 2.53)	
Anxiety			
Negative	Reference	Reference	0.524
Positive	2.30 (1.99, 2.65)	2.56 (1.82, 3.61)	
Not going to a hospital or seeing a doctor when needed			
Depression			
Negative	Reference	Reference	0.412
Positive	3.03 (2.72, 3.38)	2.63 (1.99, 3.48)	
Anxiety			
Negative	Reference	Reference	0.637
Positive	3.14 (2.60, 3.79)	2.75 (1.90, 3.99)	
Experiencing barriers to accessing testing for COVID-19			
Depression			
Negative	Reference	Reference	0.544
Positive	2.05 (1.77, 2.38)	1.83 (1.20, 2.78)	
Anxiety			
Negative	Reference	Reference	0.326
Positive	2.12 (1.62, 2.77)	1.64 (0.92, 2.91)	

*Adjusted for age, region, urban/rural, racial background, immigrant status, income, marital status, work status, chronic conditions, unmet needs (pre-pandemic)

Supplementary Table 2: Frequency of anxiety symptoms reported, with co-occurrence of depression symptoms (Sept.-Dec. 2020) (N=22992)

	GAD-7 Score ≥10 (N=1172) N (%)	**GAD-7 Score <10 (N=21820)** N (%)
CESD-10 Score ≥10	1058 (90.3)	114 (17.9)
CESD-10 Score <10	3903 (9.7)	17917 (82.1)

Supplementary Table 3: Adjusted logistic regression models for unmet healthcare needs, including depression and anxiety Sept.-Dec. 2020)

	Adjusted OR (95% CI)*	**Adjusted OR (95% CI)****
Challenges in accessing healthcare		
Depression		
Negative	Reference	Reference
Positive	1.96 (1.82, 2.11)	1.80 (1.66, 1.95)
Anxiety		
Negative	Reference	Reference
Positive	2.33 (2.04, 2.66)	1.56 (1.36, 1.80)
Not going to a hospital or seeing a doctor when needed		
Depression		
Negative	Reference	Reference
Positive	2.88 (2.58, 3.21)	2.58 (2.29, 2.92)
Anxiety		
Negative	Reference	Reference
Positive	3.05 (2.58, 3.60)	1.66 (1.38, 1.99)
Experiencing barriers to accessing testing for COVID-19		
Depression		
Negative	Reference	Reference
Positive	1.99 (1.71, 2.31)	1.89 (1.60, 2.24)
Anxiety		
Negative	Reference	Reference
Positive	2.01 (1.58, 2.56)	1.32 (1.02, 1.73)

* Adjusted for sex, age, region, urban/rural, racial background, immigrant status, income, marital status, work status, chronic conditions, unmet needs (pre-pandemic)

** Adjusted for sex, age, region, urban/rural, racial background, immigrant status, income, marital status, work status, chronic conditions, unmet needs (pre-pandemic), depression and anxiety

Supplementary Table 4: Cross-tabulation of challenges accessing healthcare with not going to a hospital or seeing a doctor when needed (Sept.-Dec. 2020) (N=23738)

	Reported challenges accessing healthcare (N=5988) N (%)	Did not report challenges accessing healthcare (N=17750) N (%)
Reported not going to a hospital or seeing a doctor when needed	1186 (19.8)	587 (3.3)
Did not report not going to a hospital or seeing a doctor when needed	4802 (80.2)	17163 (96.7)

CHAPTER 4: CONCLUSION

4.1 Overview of Findings

This thesis evaluated the association of the SDOH, chronic conditions and mental health (depression and anxiety) with unmet healthcare needs in adults residing in Canada during the first year of the COVID-19 pandemic. The sample used was members of the Canadian Longitudinal Study on Aging (CLSA), particularly the older adults (aged 50+) that participated in the CLSA's COVID-19 Questionnaire Study exit survey (September – December 2020). Overall, 25% of Canadian adults reported challenges accessing healthcare and 8% reported not going to a hospital or seeing doctor when they needed to early in the pandemic. Additionally, 4% reported barriers to accessing testing for COVID-19. It was found that the odds of reporting unmet healthcare needs were lower in the older age groups. Unmet healthcare needs also varied by sex, region, immigrant status, racial background and income. Individuals with higher levels of education were more likely to report challenges accessing healthcare and barriers to COVID-19 testing. The health-related determinant of pre-pandemic unmet healthcare needs was strongly associated with unmet needs. The presence of chronic conditions was strongly associated with the higher odds of challenges accessing healthcare and not going to a hospital or seeing a doctor, but not barriers to testing for COVID-19. Symptoms of depression and anxiety were strongly associated with all three of the unmet healthcare need outcomes, even after adjusting for confounding variables.

4.2 Implications for Public Health and Future Ares of Research

This thesis contributes to the public health literature by describing the burden of unmet health care needs during the pandemic and identifying certain vulnerable groups, who had higher

odds of reporting unmet healthcare needs during the COVID-19 pandemic in Canada. From a public health surveillance perspective, these results are useful as they were able to describe the groups that experienced challenges accessing healthcare services. There has been limited characterization of the burden of the pandemic on unmet healthcare needs in Canada, meaning this work contributes towards addressing this research gap. Additionally, the results demonstrate where resources may need to be directed, which is necessary for planning future interventions. For example, those with chronic health conditions were significantly more likely to report unmet needs during the pandemic, suggesting that unmet needs have persisted for this group and that further attention towards this group is warranted. In order to prevent long-term consequences from unmet healthcare needs, additional resources may be needed to address the challenges accessing healthcare that occurred during the pandemic. Given the mental health consequences of the pandemic and the association of depression and anxiety with unmet healthcare needs, there may be justification for mental-health related interventions.

This thesis highlights some challenges that are present when working with the measurement of unmet healthcare needs, particularly reconciling unmet needs with healthcare utilization or outcomes. While participants with higher levels of education reported greater unmet needs, greater levels of COVID-19 mortality and morbidity were noted in neighbourhoods with lower levels of education and income.(1–3) Similarly, while older adults comprised the greatest proportion of deaths in Canada, older groups of adults were less likely to report unmet needs.(4) Although these findings aligned with pre-pandemic literature, there was limited research during the pandemic that directly examined this disconnect. However, it must be recognized that unmet healthcare needs are only one measurement tool, which cannot account for all differences in health outcomes. Future qualitative work may help better understand the

motivations behind reporting unmet needs. Future research should also consider whether improvements can be made to the measurement of self-perceived unmet healthcare needs. For example, it may be more meaningful to separate the survey question into two components: one that asks about the need for healthcare and another that asks if the care was received. Although several questionnaires like the European Union Statistics on Income and Living Conditions and the Commonwealth Fund International Health Policy Survey do not differentiate between individuals that did or did not need healthcare, the European Health Interview Survey does have two separate components.(5) Different healthcare services may be asked about separately. Future pandemic research may also conduct regression analysis by treating the reasons for not seeking healthcare as outcomes.

While this thesis was able to incorporate a longitudinal aspect by adjusting for pre-pandemic unmet needs, longitudinal research is still needed to quantify how the COVID-19 pandemic affected the prevalence of unmet healthcare needs. Longitudinal research is also needed to assess which groups experienced greater changes in unmet needs and examine the future consequences of unmet needs during the pandemic. This work is necessary to plan for appropriate mitigation efforts. Additionally, there is limited work examining the pathways in which depression and anxiety symptoms can affect unmet healthcare needs, and vice versa. While some inferences can be made about the effects of the illnesses, qualitative work may give insight into the reasoning of how these mental health conditions affect the experience of unmet needs. Furthermore, research may examine how the subjective measurement of unmet healthcare needs was associated with the objective measurement of healthcare utilization during the pandemic. Although it is recognized that the two measurements have different purposes, it would be of interest to see how they may have converged or diverged during the pandemic.

4.3 Final Remarks

This thesis examined the determinants of unmet healthcare needs of adults during the first year of the pandemic using data from the Canadian Longitudinal Study on Aging COVID-19 Questionnaire Study. Through this work, the experience of unmet healthcare needs during a time of crisis have been captured. These findings are significant to the field of health equity and contribute to the growing body of research exploring the consequences of the pandemic.

4.4 References

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