https://doi.org/10.24095/hpcdp.41.11.04

Original quantitative research

Symptoms of major depressive disorder during the COVID-19 pandemic: results from a representative sample of the Canadian population

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(Published online 27 September 2021)

This article has been peer reviewed.

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Abstract

Introduction: Since the outbreak of COVID-19, numerous studies from around the world have reported declines in mental health. However, most of these studies were of low-to-moderate quality and many were based on convenience samples or used mental health measures with low validity, or both. Consequently, it has been difficult to draw conclusions.

Methods: Both the 2020 Survey on COVID-19 and Mental Health (SCMH) and the Canadian Community Health Survey (CCHS) (2015–2019) used the Patient Health Questionnaire-9 to screen for major depressive disorder (MDD) in adults aged 18 or older. The prevalence of MDD was compared between the SCMH and the CCHS. Risk and protective factors for MDD in the SCMH were examined using bivariate and logistic regression analyses.

Results: Based on SCMH data, 15.2% (95% CI: 14.2–16.2) of Canadians screened positive for MDD. The prevalence of MDD was more than two times higher in the SCMH (during COVID-19) than in the CCHS (predating COVID-19). In bivariate analysis, Canadians reporting five or more COVID-19-related risk factors were close to 30 times more likely to have MDD than those reporting no risk factors. Mastery and a sense of community belonging were protective factors for MDD.

Conclusion: After remaining stable for two decades, the prevalence of depression among Canadians increased substantially with the onset of COVID-19. Ongoing monitoring of this common condition associated with major morbidity is vital to determine if elevated levels of MDD persist as we progress through and beyond future waves of COVID-19.

Keywords: *COVID-19, coping, coronavirus, depression, family violence, mastery, mental health, sense of community belonging*

Highlights

- During the second wave of COVID-19 in the fall of 2020, the prevalence of major depressive disorder (MDD) among Canadians aged 18 or older (defined as the proportion screening positive for MDD using the Patient Health Questionnaire-9) was 15% (13% for males and 18% for females).
- Based on data from eight Canadian provinces, the prevalence of MDD during the fall of 2020 was more than double what it had been in pre-COVID times (16% vs. 7%).
- A dose-response relationship was observed between MDD and COVID-19-related risk factors for poor mental health. Each increase in the number of COVID-19-related risk factors was associated with an increase in the prevalence of MDD, ranging from 2% among those reporting no risk factors to 62% among those reporting five or more risk factors.
- Mastery, the extent to which individuals perceive they have control over their life circumstances, was strongly associated with MDD. Those with low levels of mastery were 17 times more likely to screen positive for MDD than those with high mastery.
- Individuals reporting a very weak sense of community belonging were 10 times more likely to screen positive for MDD than those with a very strong sense of belonging.

Introduction

On March 11, 2020, the World Health Organization officially declared the COVID-19 outbreak to be a pandemic.[1] Since then, unprecedented public health measures have been implemented to contain the virus. In Canada, these have included closures of schools and childcare centres, physical distancing requirements, curfews, travel bans and the closure of many businesses.[2]

COVID-19 and the measures imposed to reduce its spread have resulted in stressors and other negative effects for

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Canadians, including worries about personal health and the health of loved ones, job loss, income insecurity, family tension stemming from confinement and feelings of fear, loneliness and isolation.[3,4] As well, unhealthy lifestyle behaviour changes have been reported, such as greater consumption of alcohol and cannabis,[4] and some reports have suggested an increase in family violence.[4,5] These negative changes are concerning since research has found that experiencing stressful life events is the most important risk factor for depression.[6-13] Furthermore, problematic use of alcohol[14] and cannabis[15] has been shown to be related to depression.

Canadian data collected starting in the mid-1990s indicate that the prevalence of depression had been stable for two decades.[16] However, since the outbreak of the pandemic, studies from Canada and other countries reveal increases in negative psychological outcomes, including depression.[17-24] However, based on assessment of the target populations, sample sizes, methods of sample selection and instruments used for measuring mental health, most of these studies were of low-to-moderate quality—many were based on convenience samples or used mental health measures of low validity, or both, which makes it difficult to draw conclusions.[17,19-22,24]

Psychosocial factors and resources such as mastery (the extent to which people perceive that they have control over their life circumstances),[25] coping mechanisms and a sense of community belonging have been shown to reduce the likelihood of depressive symptoms.[8,26-30] However, studies examining protective factors for depression during the pandemic are lacking. Identifying protective factors is essential for the development of intervention programs aimed at reducing depressive symptoms as Canadians live through multiple waves of COVID-19.

In this study, we examined depression in relation to COVID-19 using data from the nationally representative Canadian Survey on COVID-19 and Mental Health (SCMH) conducted during the second wave of the COVID-19 pandemic in the fall of 2020, and the Canadian Community Health Survey (CCHS)—Annual Component from 2015 to 2019 (conducted before the onset of COVID-19). In both surveys, symptoms of depression during the previous two weeks were measured using the Patient Health Questionnaire-9 (PHQ-9), a nine-item instrument used as a screening tool for identifying probable cases of major depressive disorder, henceforth referred to as MDD for convenience.[31-33]

The research questions addressed were:

1. Did the prevalence of MDD change between the pre-COVID period and the administration of the SCMH (during the second wave)? Did changes differ by sociodemographic characteristics?
2. What was the prevalence of COVID-19-related risk and protective factors during the second wave of COVID-19? The COVID-19-related risk factors include changes related to COVID-19 that have the potential to negatively impact mental health.
3. During the second wave of COVID-19, what were the risk factors (COVID-19-related and sociodemographic) and protective factors associated with MDD?

The unparalleled nature of the COVID-19 pandemic offers a unique opportunity to examine the mental health of Canadians during a public health emergency to understand the health consequences.

Methods

Data sources

Data are from the SCMH-2020[34] and the 2015 to 2019 CCHS—Annual Component.[35]

The SCMH collected cross-sectional data from 11 September 2020 to 4 December 2020. The target population was individuals aged 18 years or older living in the 10 provinces or in the three territorial capital cities. Individuals living on reserves, in institutions and outside capital cities in the territories were excluded. These exclusions represented less than 2% of the Canadian population. In each province and in each territorial capital, a simple random sample of dwellings was selected from the Dwelling Universe File (a list of dwelling addresses based on various administrative data files created by Statistics Canada). One person aged 18 or older was randomly chosen from each occupied sampled dwelling to participate in the SCMH. Respondents completed the survey online or by telephone. The response rate was 53.3%—14 689 respondents in total. SCMH respondents were asked for permission to share the information they provided with the Public Health Agency of Canada (PHAC); 12 344 agreed to share. This study was based on records from the share file.

The target population of the CCHS was individuals aged 12 years or older living in the 10 provinces or three territories.[35] Residents of reserves and other Indigenous settlements in the provinces, full-time members of the Canadian Forces, the institutionalized population and individuals living in some remote regions were excluded. These exclusions represented less than 3% of the Canadian population. In the CCHS, the Labour Force Survey area frame was used for the sampling of the adult population. The CCHS was completed by telephone or in person using a computer-assisted questionnaire.

In the annual CCHS, the PHQ-9 module is optional content; each year, the province or territory decides if this module will be administered. The years in which the CCHS depression module was most recently administered were: 2019 in Ontario and Manitoba; 2018 in Prince Edward Island; 2016 in Newfoundland and Labrador, Nova Scotia, New Brunswick and Saskatchewan; and 2015 in British Columbia. The PHQ-9 module has not been administered in Quebec and Alberta. The territories are excluded from the CCHS annual files because territorial data become representative of the population only after two years of data have been collected.

From 2015 to 2019, response rates to the CCHS ranged from a low of 54.4% in 2019 to a high of 62.8% in 2017. Similar to the SCMH, the CCHS asked respondents for permission to share their information with PHAC; each year, more than 90% agreed to share. For the eight provinces for which comparisons with the SCMH were made, the combined CCHS sample size of those aged 18 years or older on the share files was 31 920.

Measures

MDD

Both surveys measured symptoms of MDD using the PHQ-9.[31-33] The PHQ-9 is not a diagnostic instrument, but a PHQ-9 score of 10 or higher suggests depressive symptoms of sufficient severity and persistence that additional assessment or treatment is required clinically.[31-33] Table 1 provides details on the items and scoring.

Covariates

MDD was examined in relation to sociodemographic variables, COVID-19-related risk factors and protective factors.

The sociodemographic variables included were gender (female, male); age group (18–24, 25–34, 35–49, 50–64 and 65 years or older); racialized group member (non-White, White); immigrant status (yes, no ["non-immigrants" include those born in Canada and those who are Canadian citizens by birth]); place of residence (urban centre, rural); educational attainment (less than high school, high school, post-secondary certificate/degree/diploma, and university certificate, diploma or degree above the bachelor's level); household income (divided into quintiles); and frontline worker (yes, no). In the SCMH questionnaire, a frontline worker was defined as "an individual who has the potential to come in direct contact with COVID-19 by assisting those who have been diagnosed

TABLE 1
Measures for depression, COVID-19-related risk factors and protective factors

Variable	Measure
Depression	To measure depression, respondents to the SCMH and the CCHS were asked the following questions from the Patient Health Questionnaire-9 (PHQ-9) to identify probable cases of major depressive disorder (MDD):[31-33] **Over the last 2 weeks, how often have you been bothered by any of the following problems?** 1. Had little interest or pleasure in doing things 2. Felt down, depressed, or hopeless 3. Had trouble falling or staying asleep, or sleeping too much 4. Felt tired or having little energy 5. Had poor appetite or overate 6. Felt bad about yourself—or that you are a failure or have let yourself or your family down 7. Had trouble concentrating on things, such as reading the newspaper or watching television 8. Been moving or speaking so slowly that other people could have noticed? Or the opposite, being so fidgety or restless that you have been moving around a lot more than usual 9. Had thoughts that you would be better off dead or of hurting yourself in some way The answer categories were: Not at all; Several days; More than half the days; Nearly every day. A score was assigned to each item, from 0 (Not at all) to 3 (Nearly every day). An overall score was derived by summing the scores for the 9 items. A cut-off score of 10 identifies probable cases of MDD.[31-33] The PHQ-9 has also been found to be a reliable and valid measure of depression severity.[31]
COVID-19-related risk factors	Nine COVID-19-related risk factors were examined in the study. Six risk factors came from the following "mark all that apply" checklist: **Have you experienced any of the following impacts due to the COVID-19 pandemic?** • Loss of job or income • Difficulty meeting financial obligations or essential needs • Death of a family member, friend or colleague • Feelings of loneliness or isolation • Physical health problems • Challenges in personal relationships with members of your household The other three risk factors (increased consumption of alcohol and cannabis since the onset of COVID-19, and concerns about family violence) were derived from the following items: **On average, over the course of the COVID-19 pandemic, how has your alcohol consumption changed when comparing to before the pandemic?** • Increased • Decreased • No change **On average, over the course of the COVID-19 pandemic, how has your use of cannabis changed when comparing to before the pandemic?** • Increased • Decreased • No change

Continued on the following page

TABLE 1 (continued)
Measures for depression, COVID-19-related risk factors and protective factors

Variable	Measure
COVID-19-related risk factors	**The next questions concern the serious problem of violence in the home. Your responses are important whether or not you have had any of these experiences. Remember that all information provided is strictly confidential. How concerned are you about violence in your home?** • Not at all • Somewhat • Very • Extremely All three risk factors were dichotomized: increased use (Yes/No) for alcohol and cannabis, and concern for violence in your home as "Yes" (response = "Somewhat", "Very" or "Extremely") or "No" (response = "Not at all").
Protective factors	**Sense of community belonging** The following item was used to measure sense of community belonging: **How would you describe your sense of belonging to your local community?** • Very strong • Somewhat strong • Somewhat weak • Very weak
	Mastery Mastery is a psychological resource referring to the extent to which people perceive that they have control over their life circumstances. Mastery is not considered to be a fixed personal resource, but rather, it can evolve with the experiences (good and bad) that individuals face across the lifespan.[29] SCMH respondents were administered the 7-item scale developed by Pearlin & Schooler 1978:[25] 1. You have little control over the things that happen to you. 2. There is really no way you can solve some of the problems you have. 3. There is little you can do to change many of the important things in your life. 4. You often feel helpless in dealing with the problems of life. 5. Sometimes you feel that you are being pushed around in life. 6. What happens to you in the future mostly depends on you. 7. You can do just about anything you really set your mind to. The answer categories were: Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. A score was assigned to each item, from 0 (Strongly agree) to 4 (Strongly disagree). An overall score was derived by summing the scores for the 7 items. Scoring was reversed for items 6 and 7.
	Coping mechanisms The SCMH assessed coping mechanisms by asking respondents: **Are you doing any of the following activities for your health?** • Communicating with friends and family • Meditating • Praying or seeking spiritual guidance • Exercising outdoors • Exercising indoors • Changing food choices • Participating in hobbies • Changing sleep patterns The answer categories were: Yes, for my mental health; Yes, for my physical health; Yes, both for my mental and physical health; and No. The responses were dichotomized to: Yes, for my mental and/or physical health; No. Responses to exercise outdoors and exercise indoors were combined into a single variable.

Note: The questions in the table are as they appear in Statistics Canada's Survey on COVID-19 and Mental Health,[34] Cycle 1, available from https://www23.statcan.gc.ca/imdb/p3Instr.pl?Function=assembleInstr&Item_Id=1286126&TET=1.

with the virus." Examples provided were "police officers, firefighters, paramedics, nurses or doctors."

Nine COVID-19-related risk factors were examined: six COVID-19-related events or concerns, increases in the consumption of alcohol and cannabis since the onset of COVID-19, and concerns about family violence (Table 1). An overall risk factor score (from 0–9) was created by summing the number of risk factors for each respondent.

The protective factors examined were sense of community belonging, mastery and coping mechanisms (Table 1).

Analysis

All analyses were run for the total sample and stratified by gender; separate analyses were not possible for gender-diverse individuals due to insufficient sample sizes, but gender-diverse individuals (n = 20) are included in the total estimates.

Frequency estimates were produced to show the prevalence of MDD in the SCMH and the CCHS. Comparison of estimates between the two surveys was based on the eight provinces for which CCHS depression data were available. Overall comparisons (absolute and relative) were made, as well as comparisons by sociodemographic factors. The comparison by household income quintiles was based on three provinces because total household income was unavailable on the CCHS files for certain years. MDD prevalence estimates, and 95% confidence intervals (CIs), were produced for the SCMH and the CCHS, as well as absolute and relative differences in prevalence between the two surveys and the 95% CIs of the differences.

When making comparisons between the SCMH and the CCHS, we used CCHS data from the years 2015 to 2019 and implicitly assumed that the prevalence of MDD was stable across these years. Although Canadian data collected starting in the mid-1990s indicate that the prevalence of depression was stable for two decades,[16] the final year in this time trend was prior to 2015. A sensitivity analysis was conducted to see if there is validity to the conjecture that the prevalence of MDD was stable over the years 2015 to 2019. For Ontario and Manitoba, three data points were available for these years, and we compared the prevalence estimates of MDD to see if they were stable.

All other analyses were based solely on SCMH data. Bivariate analysis was used to compare risk and protective factors for males and females.

Associations between COVID-19-related risk factors, protective factors and sociodemographic factors in relation to MDD were examined using cross-tabulations and logistic regression models while simultaneously controlling for the three groups of factors.

All analyses were based on weighted data. Weights created by Statistics Canada ensured that the data on the share files were representative of the population. Among other factors, the weights incorporate an adjustment for nonresponse. To account for the survey design effects of the SCMH and CCHS, standard errors, coefficients of variation and 95% CIs were estimated using the bootstrap technique.[36] Differences between estimates were tested for statistical significance ($p < 0.05$) using chi-square tests. A Bonferroni adjustment for multiple comparisons was made when examining provincial/territorial differences. Analyses were conducted in SAS Enterprise Guide version 7.1 (SAS Institute Inc., Cary, NC, USA).

Results

Changes in prevalence over time (research question 1)

Table 2 shows the prevalence of a positive screen for MDD for all Canadians based on data from the SCMH and compares estimates between the SCMH and the CCHS using data from eight provinces. In the fall of 2020, based on data from the SCMH, 15.2% of Canadians screened positive for MDD (Table 2). The prevalence was higher among females than males (17.5% vs. 12.6%).

Based on data from the eight provinces where comparable data are available from the CCHS (2015 through 2019), the prevalence of MDD in the SCMH was 9.6 percentage points higher than it was in the CCHS (16.3% vs. 6.7%). A significant increase in the prevalence of MDD between CCHS and SCMH was observed for all sociodemographic variables except for males aged 65 years or older and males with less than high school education, among whom changes were not statistically significant.

Increases in the prevalence of MDD were similar among sociodemographic subgroups, with the following exceptions. Changes in the prevalence of MDD differed by age group: the largest increase was among young adults aged 18 to 24, for whom a 17.4 percentage point increase in MDD was observed (from 11.2% to 28.5%), and the smallest was among seniors aged 65 or older, for whom the increase was 4.1 percentage points (from 3.2% to 7.3%). A larger increase was observed among females in urban centres than among females living in rural areas. A smaller increase was observed among residents of Newfoundland and Labrador.

We also examined relative changes in the prevalence of MDD between the SCMH and the CCHS. Overall, the prevalence of MDD was 2.4 times higher in the SCMH compared with the CCHS. Although absolute changes differed among young adults aged 18 to 24 and seniors, the relative increases in the prevalence of MDD were similar (2.6 times higher vs. 2.3 times higher). The relative increase was larger for immigrants (3.3 times higher) than non-immigrants (2.2 times higher).

In our sensitivity analysis of the CCHS to assess the conjecture that the prevalence of MDD was stable from 2015 to 2019, we found that in the provinces of Ontario and Manitoba, the prevalence was 6.2% in 2015, 7.2% in 2016, and 6.8% in 2019, indicating stable rates over these years. This was followed by an increase to 16.5% in the 2020 SCMH.

Prevalence of COVID-19-related risk factors and protective factors (research question 2)

Based on SCMH data, among the nine COVID-19-related risk factors considered in the analysis (Table 3), four factors were more prevalent among females than males: death of a family member, friend, or colleague (7.7% vs. 5.0%); feelings of loneliness or isolation (44.4% vs. 33.2%); physical concerns (28.7% vs. 19.8%); and challenges in personal relationships with household members (20.0% vs. 16.1%). Males were more likely to report loss of job or income due to COVID-19 (26.6% vs. 24.0%). Among people who increased their alcohol consumption, on the days they consumed alcohol, males reported an

TABLE 2
Prevalence of a positive screen for MDD, by gender and sociodemographic characteristics, household population aged 18 years or older, Canada, 2020 and 2015 to 2019

Variable	Total								Males								Females							
	SCMH		CCHS		Absolute change in risk SCMH minus CCHS[a]		Relative risk SCMH/CCHS		SCMH		CCHS		Absolute change in risk SCMH minus CCHS[a]		Relative risk SCMH/CCHS		SCMH		CCHS		Absolute change in risk SCMH minus CCHS[a]		Relative risk SCMH/CCHS	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Total population aged 18+ years	15.2	(14.2, 16.2)	N/A		N/A				12.6	(11.2, 14.0)	N/A		N/A				17.5	(16.0, 19.0)	N/A		N/A			
Estimates based on 8 provinces[b]																								
Total 18+	16.3	(14.9, 17.6)	6.7*	(6.2, 7.2)	9.6	(8.2, 11.0)	2.4	(2.2, 2.7)	13.9	(12.0, 15.8)	5.8*	(5.1, 6.5)	8.1	(6.1, 10.1)	2.4	(2.0, 2.9)	18.5	(16.5, 20.4)	7.5*	(6.8, 8.2)	11.0	(8.9, 13.0)	2.5	(2.2, 2.8)
Estimates by sociodemographic variables (based on 8 provinces[b])																								
Age group (years; reference is other age groups combined)																								
18–24	28.5	(21.9, 35.2)	11.2*	(9.1, 13.2)	17.4[c]	(10.3, 24.5)	2.6	(1.9, 3.5)	23.9	(15.6, 32.3)	9.5*	(6.7, 12.3)	14.4	(5.5, 23.3)	2.5	(1.5, 4.1)	35.2	(24.4, 45.9)	12.6*	(9.7, 15.6)	22.5	(11.4, 33.7)	2.8	(1.9, 4.1)
25–34	22.4	(18.5, 26.3)	8.1*	(6.7, 9.5)	14.3	(10.1, 18.5)	2.8	(2.1, 3.6)	18.7	(13.1, 24.2)	7.7*	(5.3, 10.1)	11.0	(5.0, 17.0)	2.4	(1.5, 3.9)	25.1	(19.6, 30.6)	8.4*	(6.8, 10.1)	16.6	(11.0, 22.3)	3.0	(2.2, 3.9)
35–49	15.7	(13.2, 18.1)	6.6*	(5.7, 7.4)	9.1	(6.6, 11.7)	2.4	(2.0, 2.9)	12.4	(9.4, 15.4)	5.5*	(4.4, 6.7)	6.9	(3.7, 10.1)	2.2	(1.6, 3.1)	18.9	(15.1, 22.7)	7.6*	(6.3, 8.8)	11.3	(7.3, 15.3)	2.5	(1.9, 3.3)
50–64	15.2	(13.0, 17.4)	6.4*	(5.5, 7.3)	8.8	(6.5, 11.1)	2.4	(1.9, 2.9)	14.7	(11.5, 18.0)	5.1*	(3.9, 6.3)	9.7	(6.3, 13.1)	2.9	(2.1, 4.0)	15.7	(12.7, 18.8)	7.7*	(6.4, 9.1)	8.0	(4.7, 11.3)	2.0	(1.6, 2.6)
65 or older	7.3	(5.8, 8.8)	3.2*	(2.7, 3.7)	4.1[c]	(2.5, 5.7)	2.3	(1.8, 3.0)	4.8	(2.9, 6.7)	2.8	(2.1, 3.5)	2.0[c]	(0.0, 4.1)	1.7	(1.1, 2.8)	9.5	(7.1, 11.8)	3.5*	(2.9, 4.2)	5.9[c]	(3.5, 8.4)	2.7	(2.0, 3.7)
Racialized group member																								
Yes (non-White)	16.7	(13.9, 19.5)	6.7*	(5.5, 7.8)	10.0	(7.0, 13.1)	2.5	(2.0, 3.2)	14.7	(11.1, 18.3)	5.5*	(3.8, 7.1)	9.2	(5.3, 13.2)	2.7	(1.8, 4.1)	18.5	(14.3, 22.8)	7.8*	(6.2, 9.4)	10.7	(6.2, 15.3)	2.4	(1.7, 3.2)
No (White; reference)	16.2	(14.7, 17.8)	6.7*	(6.2, 7.2)	9.6	(7.9, 11.2)	2.4	(2.2, 2.7)	13.7	(11.5, 15.9)	5.9*	(5.2, 6.7)	7.7	(5.4, 10.0)	2.3	(1.9, 2.8)	18.6	(16.5, 20.7)	7.3*	(6.6, 8.0)	11.2	(9.1, 13.4)	2.5	(2.2, 2.9)
Immigrant status																								
Yes	12.6	(10.2, 15.0)	3.8*	(3.1, 4.6)	8.8	(6.3, 11.3)	3.3[c]	(2.5, 4.3)	11.6	(8.5, 14.6)	3.3*	(2.4, 4.2)	8.3	(5.1, 11.5)	3.5	(2.4, 5.2)	13.7	(9.8, 17.5)	4.4*	(3.1, 5.6)	9.3	(5.3, 13.4)	3.1	(2.1, 4.7)
No (reference)	17.9	(16.4, 19.5)	8.0*	(7.4, 8.6)	9.9	(8.2, 11.6)	2.2	(2.0, 2.5)	15.2	(12.9, 17.5)	7.0*	(6.0, 7.9)	8.2	(5.7, 10.7)	2.2	(1.8, 2.7)	20.3	(18.1, 22.5)	8.9*	(8.1, 9.7)	11.4	(9.1, 13.7)	2.3	(2.0, 2.6)
Place of residence																								
Urban centre	17.1	(15.5, 18.6)	6.9*	(6.3, 7.4)	10.2	(8.6, 11.9)	2.5	(2.2, 2.8)	14.3	(12.2, 16.4)	6.1*	(5.2, 6.9)	8.2	(6.0, 10.5)	2.4	(1.9, 2.9)	19.7	(17.4, 22.0)	7.6*	(6.8, 8.3)	12.1[c]	(9.8, 14.5)	2.6	(2.2, 3.0)
Rural (reference)	13.1	(10.8, 15.4)	5.9*	(5.1, 6.6)	7.2	(4.8, 9.6)	2.2	(1.8, 2.8)	12.4	(8.7, 16.0)	4.5*	(3.5, 5.5)	7.9	(4.1, 11.6)	2.7	(1.9, 4.0)	13.7	(10.7, 16.8)	7.2*	(6.1, 8.3)	6.5	(3.3, 9.7)	1.9	(1.5, 2.5)
Parent of child younger than 18																								
Yes	15.9	(13.6, 18.3)	5.5*	(4.7, 6.4)	10.4	(7.9, 12.9)	2.9	(2.3, 3.6)	12.9	(9.6, 16.1)	3.9*	(2.7, 5.2)	8.9	(5.5, 12.4)	3.3	(2.1, 5.1)	18.8	(15.2, 22.5)	6.9*	(5.7, 8.1)	11.9	(8.1, 15.7)	2.7	(2.1, 3.5)
No (reference)	16.4	(14.8, 18.0)	7.0*	(6.5, 7.6)	9.4	(7.6, 11.1)	2.3	(2.0, 2.6)	14.3	(12.0, 16.6)	6.3*	(5.5, 7.2)	8.0	(5.5, 10.4)	2.3	(1.8, 2.8)	18.3	(16.1, 20.5)	7.7*	(6.9, 8.5)	10.6	(8.3, 13.0)	2.4	(2.0, 2.8)
Highest level of education attained (reference is other education groups combined)																								
Less than high school	15.2	(9.8, 20.7)	9.8	(8.1, 11.6)	5.4	(–0.2, 11.0)	1.5	(1.1, 2.3)	7.7	(3.3, 12.2)	8.3	(6.0, 10.5)	–0.5[c]	(–5.4, 4.4)	0.9[c]	(0.5, 1.8)	22.9	(13.7, 32.0)	11.3*	(8.7, 14.0)	11.5	(2.1, 21.0)	2.0	(1.3, 3.2)
High school	18.8	(15.6, 22.0)	8.5*	(7.4, 9.7)	10.3	(6.9, 13.7)	2.2	(1.8, 2.7)	17.6	(13.1, 22.1)	7.1*	(5.7, 8.6)	10.4	(5.6, 15.2)	2.5	(1.7, 3.5)	20.0	(15.5, 24.4)	9.9*	(8.2, 11.6)	10.1	(5.3, 14.8)	2.0	(1.5, 2.7)
Postsecondary certificate, diploma or degree	16.7	(15.0, 18.4)	6.0*	(5.4, 6.7)	10.7	(8.8, 12.5)	2.8	(2.4, 3.2)	14.3	(11.8, 16.7)	5.4*	(4.3, 6.4)	8.9	(6.3, 11.5)	2.7	(2.0, 3.5)	18.9	(16.5, 21.4)	6.6*	(5.7, 7.4)	12.4	(9.8, 15.0)	2.9	(2.4, 3.4)
University certificate, diploma or degree above bachelor's level	11.1	(8.4, 13.8)	3.0*	(2.1, 3.8)	8.1	(5.4, 10.9)	3.7	(2.5, 5.6)	8.9	(5.1, 12.7)	2.7*	(1.4, 4.1)	6.1	(2.1, 10.2)	3.2	(1.5, 7.0)	12.7	(9.1, 16.3)	3.2*	(2.1, 4.3)	9.5	(5.7, 13.2)	4.0	(2.5, 6.3)

Continued on the following page

TABLE 2 (continued)
Prevalence of a positive screen for MDD, by gender and sociodemographic characteristics, household population aged 18 years or older, Canada, 2020 and 2015 to 2019

Variable	Total								Males								Females							
	SCMH		CCHS		Absolute change in risk SCMH minus CCHS[a]		Relative risk SCMH/CCHS		SCMH		CCHS		Absolute change in risk SCMH minus CCHS[a]		Relative risk SCMH/CCHS		SCMH		CCHS		Absolute change in risk SCMH minus CCHS[a]		Relative risk SCMH/CCHS	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Household income quintile (based on 3 provinces;[d] reference is other income groups combined)																								
1 (lowest)	19.3	(15.4, 23.2)	11.1*	(9.4, 12.8)	8.2	(4.0, 12.3)	1.7	(1.4, 2.2)	16.0	(10.6, 21.4)	9.5*	(7.3, 11.8)	6.4	(0.5, 12.3)	1.7	(1.1, 2.5)	22.8	(16.9, 28.6)	12.2*	(9.8, 14.6)	10.6	(4.4, 16.7)	1.9	(1.4, 2.5)
2	18.6	(14.1, 23.1)	6.5*	(5.2, 7.7)	12.2	(7.5, 16.8)	2.9	(2.1, 3.9)	15.4	(8.7, 22.0)	6.9*	(4.8, 8.9)	8.5	(1.4, 15.5)	2.2	(1.3, 3.9)	20.7	(14.7, 26.6)	6.0*	(4.5, 7.5)	14.7	(8.5, 20.8)	3.4	(2.3, 5.1)
3	17.7	(13.4, 22.1)	6.3*	(5.0, 7.6)	11.4	(6.8, 16.1)	2.8	(2.0, 3.9)	15.8	(9.9, 21.8)	5.2*	(3.6, 6.9)	10.6	(4.5, 16.7)	3.0	(1.8, 5.0)	19.6	(13.1, 26.1)	7.2*	(5.2, 9.2)	12.4	(5.5, 19.2)	2.7	(1.7, 4.3)
4	16.2	(11.5, 21.0)	6.6*	(4.9, 8.3)	9.7	(4.6, 14.7)	2.5	(1.6, 3.8)	11.9	(5.6, 18.2)	6.3*	(3.4, 9.2)	5.6	(−1.2, 12.4)	1.9	(0.8, 4.5)	21.3	(14.6, 28.1)	6.9*	(5.0, 8.8)	14.4	(7.4, 21.5)	3.1	(2.0, 4.8)
5 (highest)	11.1	(7.6, 14.7)	4.3*	(3.2, 5.5)	6.8	(3.1, 10.5)	2.6	(1.7, 4.0)	11.2	(6.4, 16.0)	4.3*	(2.6, 6.1)	6.9	(1.8, 12.0)	2.6	(1.3, 5.3)	11.1	(5.8, 16.4)	4.3*	(2.9, 5.7)	6.8	(1.3, 12.3)	2.6	(1.4, 4.7)
Province (reference is other provinces combined)																								
Newfoundland and Labrador	11.5	(9.0, 14.0)	6.1*	(4.5, 7.7)	5.4[c]	(2.4, 8.4)	1.9	(1.3, 2.7)	8.6	(5.2, 12.0)	4.4*	(2.2, 6.6)	4.1	(0.0, 8.2)	1.9	(1.0, 3.7)	14.1	(10.4, 17.8)	7.7*	(5.0, 10.5)	6.4	(1.8, 11.0)	1.8	(1.1, 3.0)
Prince Edward Island	14.1	(11.1, 17.1)	5.8*	(3.8, 7.8)	8.3	(4.8, 11.9)	2.4	(1.7, 3.6)	12.6	(7.9, 17.3)	3.7*	(1.1, 6.3)	8.9	(3.6, 14.2)	3.4	(1.1, 10.9)	15.5	(11.6, 19.4)	7.7*	(4.8, 10.6)	7.8	(2.9, 12.7)	2.0	(1.3, 3.1)
Nova Scotia	16.5	(13.2, 19.9)	9.1*	(7.2, 11.0)	7.4	(3.6, 11.2)	1.8	(1.3, 2.5)	12.9	(7.5, 18.3)	5.9*	(3.9, 7.9)	7.0	(1.2, 12.7)	2.2	(1.2, 3.9)	20.0	(16.1, 23.8)	12.1*	(9.1, 15.0)	7.9	(3.1, 12.7)	1.7	(1.2, 2.3)
New Brunswick	17.4	(14.1, 20.6)	6.4*	(4.8, 8.0)	11.0	(7.4, 14.6)	2.7	(2.0, 3.8)	17.8	(12.6, 23.0)	5.0*	(3.0, 7.0)	12.8	(7.3, 18.4)	3.6	(2.0, 6.3)	17.0	(13.1, 20.8)	7.6*	(5.2, 10.1)	9.3	(4.8, 13.9)	2.2	(1.5, 3.4)
Ontario	15.9	(13.9, 17.8)	6.8*	(6.0, 7.5)	9.1	(7.1, 11.2)	2.4	(2.0, 2.8)	12.7	(10.1, 15.4)	6.3*	(5.3, 7.4)	6.4	(3.6, 9.2)	2.0	(1.5, 2.6)	18.9	(16.0, 21.8)	7.1*	(6.2, 8.1)	11.8	(8.8, 14.7)	2.6	(2.2, 3.2)
Manitoba	20.1	(17.0, 23.3)	7.9*	(6.0, 9.7)	12.2	(8.6, 15.9)	2.6	(1.9, 3.4)	17.1	(12.6, 21.7)	5.7*	(3.5, 7.8)	11.5	(6.4, 16.5)	3.0	(1.8, 5.0)	21.9	(17.3, 26.4)	9.7*	(6.8, 12.6)	12.1	(6.8, 17.5)	2.2	(1.5, 3.3)
Saskatchewan	14.4	(11.5, 17.3)	5.8*	(4.4, 7.3)	8.6	(5.4, 11.8)	2.5	(1.8, 3.4)	13.1	(8.3, 17.9)	4.2*	(2.4, 6.0)	8.9	(3.8, 14.1)	3.1	(1.8, 5.6)	15.5	(12.1, 18.9)	7.5*	(5.0, 9.9)	8.0	(3.9, 12.2)	2.1	(1.4, 3.0)
British Columbia	17.2	(14.4, 20.0)	6.0*	(5.1, 6.9)	11.2	(8.3, 14.2)	2.9	(2.3, 3.6)	16.9	(12.7, 21.1)	4.9*	(3.7, 6.2)	12.0	(7.7, 16.3)	3.4	(2.4, 5.0)	17.4	(13.8, 21.0)	7.0*	(5.6, 8.4)	10.4	(6.5, 14.2)	2.5	(1.9, 3.3)

Data source: 2020 Survey on COVID and Mental Health; and 2015–2019 Canadian Community Health Survey.

Abbreviations: CCHS, Canadian Community Health Survey; CI, confidence interval; MDD, major depressive disorder; N/A, not applicable; SCMH, Survey on COVID and Mental Health.

Note: A Bonferroni adjustment for multiple comparisons was made when comparing estimates for provinces.

[a] The estimate for SCMH (during the second wave of COVID-19) minus the estimate for CCHS (pre-pandemic).

[b] The comparison between SCMH and CCHS is based on 8 provinces. CCHS data were collected in 2019 for Ontario and Manitoba; 2018 for Prince Edward Island; 2016 for Newfoundland and Labrador, Nova Scotia, New Brunswick and Saskatchewan; and 2015 for British Columbia.

[c] Significantly different from reference ($p < 0.05$).

[d] The comparison between SCMH and CCHS for household income quintiles is based on Ontario, Manitoba and Prince Edward Island.

* Significantly different from SCMH ($p < 0.05$).

average of six drinks per day, and females, an average of four drinks per day. Among people who increased their cannabis use, 43% of males and 44% of females reported using it five or more days per week.

Females were more likely than males to report the use of several coping mechanisms. The average mastery score was higher for males than females (18.5 vs. 17.8). Estimates for a sense of community belonging were similar for males and females.

Associations between risk and protective factors and MDD (research question 3)

All nine COVID-19-related risk factors were individually associated with MDD among both males and females in the SCMH (Table 4). A dose-response relationship was evident; each increase in the number of risk factors was associated with a significant increase in the prevalence of MDD. The prevalence of MDD was more than 60% among those reporting five or more risk factors, compared with 2.2% among those with no risk factors.

Individuals who reported using exercise and hobbies to promote health were less likely to have MDD. Meditating, changing food choices and changing sleep patterns to cope were associated with an increased risk of MDD. Mastery and a sense of community belonging were robust protective factors. People in the lowest mastery quartile were 17 times more likely to have MDD than were those in the highest quartile. Those with a very weak sense of community belonging were 10 times more likely to have MDD than were those with a very strong sense of belonging.

The prevalence of MDD was inversely associated with age, ranging from a high of 27.8% among those aged 18 to 24 to a low of 6.8% among seniors aged 65 or older. Non-immigrant females were at higher risk for MDD than were female immigrants (18.6% vs. 14.2%), as were females living in urban centres compared with those in rural areas (18.7% vs. 12.2%). For males, having less than high school education was associated with a lower risk of MDD. The same was true for having a university certificate, diploma or degree above bachelor's level for both genders. Females with high school but no postsecondary education were at increased risk. MDD was inversely associated with household income quintile—the highest prevalence was for the bottom quintile (17.6%), and the lowest, for the top quintile (12.4%). Among females who had worked during the week before the survey, frontline workers were more likely than other workers to have MDD (24.0% vs. 17.3%). MDD was less common among residents of Quebec (10.5%) than other provinces/territories.

Table 5 presents the adjusted odds ratios for MDD, controlling for all factors simultaneously. Unadjusted odds are also included for ease of comparison between the bivariate and multivariate analyses.

Since a dose-response relationship was observed between COVID-19-related risk factors and MDD, in the logistic regression models, the number of COVID-19 risk factors was entered as a continuous variable. Based on the unadjusted odds, on average, each incremental increase in the number of risk factors was associated with a 2.1-fold increase in the odds of MDD. In the multivariate analysis, this finding persisted but was slightly attenuated to 1.7.

The regression models were rerun to examine effects of the nine risk factors individually. As expected, based on the unadjusted odds, all nine risk factors increased the odds of MDD. However, when we simultaneously controlled for all nine risk factors, there was some attenuation in odds, and the association with MDD for two risk factors no longer attained statistical significance: loss of job or income due to COVID-19 was no longer significant, and death of family member, friend or colleague due to COVID-19 only approached statistical significance ($p = 0.08$). In the multivariate model for males, although the odds ratios remained elevated, the only risk factors that attained statistical significance were feelings of loneliness or isolation due to COVID-19 and physical health problems due to COVID-19.

For the protective factors, the associations observed in the bivariate analyses persisted in the multivariate analyses with two exceptions. The association with meditation was no longer statistically significant nor was changes in sleep patterns for females.

It was more common for associations between sociodemographic factors and MDD observed in the bivariate analysis to lose statistical significance in the multivariate analysis. For example, for the total population, the associations with education, income, living in an urban centre and living in Quebec did not persist in the multivariate analyses. For age group, in the gender stratified analysis, all associations failed to attain statistical significance in the multivariate analysis.

Discussion

Based on SCMH data collected during the second wave of the COVID-19 pandemic, 15.2% of Canadians screened positive for MDD. Comparable estimates of the prevalence of MDD in various pre-COVID years (2015 through 2019) are available for eight Canadian provinces. SCMH results showed that in the fall of 2020, the prevalence of MDD in these eight provinces had more than doubled from what it had been in pre-COVID times.

For the most part, relative changes in the prevalence of MDD were similar among all sociodemographic subgroups. However, absolute changes in prevalence differed by age group; the largest increases in the prevalence of MDD were observed among young adults aged 18 to 24, and the smallest among seniors aged 65 or older. The 17.4 percentage point increase in the prevalence of MDD observed for young adults is concerning, and specific targeting of public health interventions may be warranted to deal with the excess burden of MDD for this age group.

All nine COVID-19-related risk factors examined in this study were individually associated with MDD, although in the multivariate analysis, loss of job or income due to COVID-19 and death of family member, friend or colleague due to COVID-19 did not attain statistical significance. Furthermore, a dose-response relationship was observed: each increase in the number of risk factors was associated with a significant increase in the prevalence of MDD. Research has found that stressful life events are the most important causal factor for first-time episodes of depression.[7] Although perception of what constitutes a stressful life event for an individual is subjective, many of the COVID-19-related risk factors considered

TABLE 3
Prevalence of COVID-19-related risk factors for MDD and protective factors and resources, by gender, household population aged 18 years or older, Canada, 2020

Variable	Total		Males		Females	
	%	95% CI	%	95% CI	%	95% CI
COVID-19-related risk factors						
Loss of job or income due to COVID-19	25.3	(24.1–26.5)	26.6	(24.8–28.4)	24.0*	(22.3–25.6)
Difficulty meeting financial obligations or essential needs due to COVID-19	15.6	(14.6–16.6)	16.1	(14.6–17.6)	15.0	(13.7–16.4)
Death of family member, friend or colleague due to COVID-19	6.4	(5.7–7.0)	5.0	(4.1–5.9)	7.7*	(6.7–8.6)
Feelings of loneliness or isolation due to COVID-19	39.0	(37.7–40.3)	33.2	(31.3–35.1)	44.4*	(42.6–46.2)
Physical health problems due to COVID-19	24.5	(23.3–25.6)	19.8	(18.1–21.4)	28.7*	(27.1–30.4)
Challenges in personal relationships with members of your household due to COVID-19	18.2	(17.2–19.2)	16.1	(14.6–17.6)	20.0*	(18.5–21.4)
Increased consumption of alcohol since onset of COVID-19	15.7	(14.7–16.7)	15.2	(13.8–16.6)	16.2	(14.9–17.5)
Increased consumption of cannabis since onset of COVID-19	5.4	(4.8–6.1)	5.8	(4.8–6.8)	4.9	(4.1–5.8)
Concern for family violence in your household	4.2	(3.6–4.8)	4.5	(3.6–5.5)	3.9	(3.2–4.7)
Number of risk factors						
0	32.3	(31.1–33.6)	35.8	(34.0–37.7)	29.0*	(27.4–30.7)
1	25.5	(24.3–26.6)	25.2	(23.5–27.0)	25.8	(24.2–27.3)
2	18.1	(17.0–19.1)	17.7	(16.1–19.3)	18.5	(17.0–20.0)
3	11.8	(10.9–12.7)	10.4	(9.1–11.7)	13.0*	(11.7–14.3)
4	7.0	(6.3–7.7)	5.9	(4.8–6.9)	8.0*	(7.0–9.1)
5 or more	5.4	(4.7–6.0)	5.0	(4.0–5.9)	5.6	(4.7–6.5)
Protective factors						
Coping mechanisms						
Communicating with friends and family	87.0	(86.0–87.9)	82.8	(81.2–84.4)	91.0*	(90.0–92.1)
Meditating	22.2	(21.1–23.3)	18.6	(17.0–20.2)	25.5*	(23.9–27.1)
Praying or seeking spiritual guidance	30.6	(29.4–31.9)	25.6	(23.8–27.5)	35.5*	(33.9–37.2)
Exercising	80.3	(79.2–81.5)	80.1	(78.4–81.8)	80.6	(79.0–82.2)
Changing food choices	37.6	(36.3–38.9)	34.9	(32.9–36.9)	40.1*	(38.3–41.9)
Participating in hobbies	61.6	(60.3–63.0)	59.7	(57.6–61.7)	63.4*	(61.6–65.2)
Changing sleep patterns	20.0	(18.8–21.1)	18.8	(17.1–20.4)	21.1*	(19.5–22.7)
Mastery (average score)	18.1	(18.0–18.3)	18.5	(18.3–18.7)	17.8*	(17.6–18.0)
Sense of community belonging						
Very strong	15.1	(14.2–16.0)	15.6	(14.2–17.1)	14.6	(13.4–15.9)
Somewhat strong	48.6	(47.2–49.9)	48.1	(46.1–50.1)	49.0	(47.2–50.8)
Somewhat weak	28.5	(27.2–29.7)	28.6	(26.7–30.4)	28.3	(26.7–30.0)
Very weak	7.9	(7.1–8.6)	7.7	(6.6–8.7)	8.0	(7.0–9.1)

Data source: 2020 Survey on COVID and Mental Health.

Abbreviations: CI, confidence interval; MDD, major depressive disorder.

* Significantly different from males ($p < 0.05$).

TABLE 4
Prevalence of a positive screen for MDD, by gender and selected characteristics, household population aged 18 years or older, Canada, 2020

Variable	Total		Males		Females	
	%	95% CI	%	95% CI	%	95% CI
Total	15.2	(14.2–16.2)	12.6	(11.2–14.0)	17.5[a]	(16.0–19.0)
COVID-19-related risk factors						
Loss of job or income due to COVID-19						
Yes	23.2*	(20.6–25.8)	18.3*	(15.0–21.7)	28.1*	(24.2–32.0)
No (reference)	12.7	(11.6–13.7)	10.7	(9.2–12.3)	14.4	(12.9–15.8)
Difficulty meeting financial obligations or essential needs due to COVID-19						
Yes	34.2*	(30.9–37.6)	27.6*	(23.0–32.2)	40.5*	(35.5–45.4)
No (reference)	11.9	(10.9–12.9)	9.9	(8.5–11.4)	13.6	(12.2–15.1)
Death of family member, friend or colleague due to COVID-19						
Yes	27.4*	(22.3–32.6)	27.2*	(18.7–35.7)	27.3*	(20.9–33.7)
No (reference)	14.5	(13.5–15.5)	12.0	(10.6–13.4)	16.9	(15.4–18.4)
Feelings of loneliness or isolation due to COVID-19						
Yes	29.5*	(27.5–31.4)	27.1*	(23.9–30.4)	30.9*	(28.4–33.5)
No (reference)	6.3	(5.4–7.2)	5.6	(4.4–6.8)	7.0	(5.7–8.3)
Physical health problems due to COVID-19						
Yes	38.5*	(35.8–41.2)	37.0*	(32.4–41.5)	39.4*	(35.9–42.8)
No (reference)	7.9	(7.0–8.7)	6.8	(5.6–8.0)	9.0	(7.6–10.3)
Challenges in personal relationships with members of your household due to COVID-19						
Yes	35.7*	(32.6–38.8)	30.9*	(26.2–35.7)	38.8*	(34.8–42.9)
No (reference)	10.8	(9.8–11.8)	9.2	(7.9–10.5)	12.4	(11.0–13.9)
Increased consumption of alcohol since onset of COVID-19						
Yes	26.9*	(23.9–30.0)	24.4*	(19.9–29.0)	28.9*	(24.9–32.9)
No (reference)	13.0	(12.0–14.1)	10.5	(9.1–11.9)	15.4	(13.8–16.9)
Increased consumption of cannabis since onset of COVID-19						
Yes	42.2*	(35.9–48.5)	35.2*	(26.4–44.1)	49.8*	(41.2–58.3)
No (reference)	13.6	(12.7–14.6)	11.2	(9.9–12.6)	15.8	(14.4–17.2)
Concern for family violence in your household						
Yes	33.4*	(26.3–40.6)	29.2*	(18.6–39.8)	38.0*	(28.5–47.5)
No (reference)	14.4	(13.4–15.4)	11.8	(10.5–13.2)	16.7	(15.3–18.2)
Number of risk factors (reference is previous category)						
0	2.2	(1.5–2.8)	2.2	(1.3–3.1)	2.2	(1.2–3.1)
1	7.4*	(6.0–8.8)	7.4*	(5.2–9.5)	7.4*	(5.7–9.1)
2	19.1*	(16.3–21.8)	16.2*	(12.2–20.1)	21.8*	(17.9–25.6)
3	26.1*	(22.6–29.6)	21.1*	(16.2–26.1)	30.0*	(25.3–34.6)
4	42.5*	(37.0–48.0)	39.9*	(31.3–48.4)	43.8*	(36.9–50.7)
5 or more	61.6*	(55.5–67.7)	55.4*	(45.5–65.3)	66.6*	(59.2–74.0)
Protective factors						
Coping mechanisms						
Communicating with friends and family						
Yes	15.1	(14.0–16.2)	12.4	(10.8–13.9)	17.4	(15.8–18.9)
No (reference)	16.1	(13.4–18.9)	14.0	(10.6–17.4)	19.9	(15.0–24.9)
Meditating						
Yes	17.6*	(15.5–19.8)	14.4	(10.9–17.9)	19.6	(16.6–22.7)
No (reference)	14.5	(13.4–15.6)	12.1	(10.6–13.6)	16.9	(15.2–18.6)

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TABLE 4 (continued)
Prevalence of a positive screen for MDD, by gender and selected characteristics, household population aged 18 years or older, Canada, 2020

Variable	Total		Males		Females	
	%	95% CI	%	95% CI	%	95% CI
Praying or seeking spiritual guidance						
Yes	15.0	(13.2–16.9)	13.4	(10.6–16.2)	16.2	(13.8–18.6)
No (reference)	15.4	(14.2–16.6)	12.5	(10.9–14.1)	18.4	(16.5–20.3)
Exercising						
Yes	13.1*	(12.0–14.1)	11.1*	(9.6–12.6)	14.7*	(13.2–16.3)
No (reference)	24.0	(21.2–26.8)	19.0	(15.2–22.9)	29.0	(24.7–33.2)
Changing food choices						
Yes	18.7*	(17.0–20.5)	15.5*	(12.9–18.1)	21.0*	(18.5–23.6)
No (reference)	13.1	(11.9–14.3)	11.2	(9.6–12.9)	15.2	(13.4–17.0)
Participating in hobbies						
Yes	13.3*	(12.1–14.5)	11.1*	(9.4–12.8)	15.0*	(13.2–16.8)
No (reference)	18.4	(16.6–20.1)	14.9	(12.5–17.4)	22.0	(19.6–24.5)
Changing sleep patterns						
Yes	26.4*	(23.6–29.2)	25.3*	(20.9–29.7)	27.2*	(23.4–31.0)
No (reference)	12.5	(11.5–13.5)	9.7	(8.4–11.1)	15.1	(13.5–16.6)
Mastery quartile (reference is previous category)						
1 (lowest)	36.5	(33.9–39.1)	32.5	(28.4–36.5)	39.4	(35.9–42.9)
2	10.6*	(9.0–12.2)	8.5*	(6.4–10.5)	12.7*	(10.2–15.2)
3	5.6*	(4.0–7.1)	6.1*	(3.5–8.6)	5.1*	(3.3–6.8)
4 (highest)	2.2*	(1.5–2.9)	1.5*	(0.6–2.3)	3.0*	(1.8–4.1)
Sense of community belonging (reference is previous category)						
Very strong	4.7	(3.3–6.1)	3.6	(1.8–5.3)	5.9	(3.6–8.2)
Somewhat strong	9.6*	(8.4–10.8)	7.7*	(6.0–9.5)	11.1*	(9.4–12.8)
Somewhat weak	21.1*	(18.9–23.2)	17.8*	(14.8–20.8)	24.2*	(21.0–27.5)
Very weak	48.3*	(43.3–53.4)	42.9*	(35.3–50.4)	53.0*	(46.2–59.8)
Sociodemographic characteristics						
Age group (years; reference is other age groups combined)						
18–24	27.8*	(22.4–33.2)	21.0*	(14.4–27.6)	37.2*	(28.4–45.9)
25–34	20.7*	(17.9–23.6)	16.5*	(12.4–20.6)	23.8*	(19.7–27.9)
35–49	15.2	(13.4–17.1)	13.3	(10.9–15.7)	17.1	(14.3–19.9)
50–64	13.5*	(11.9–15.1)	12.3	(9.9–14.6)	14.8*	(12.4–17.1)
65 or older	6.8*	(5.6–8.0)	4.4*	(2.9–5.8)	8.9*	(7.1–10.7)
Racialized group member						
Yes (non-White)	16.6	(14.3–19.0)	13.9	(10.9–16.9)	19.3	(15.7–22.9)
No (White; reference)	14.7	(13.6–15.8)	12.2	(10.6–13.8)	16.9	(15.3–18.4)
Immigrant status						
Yes	12.5*	(10.5–14.5)	10.9	(8.3–13.4)	14.2*	(11.0–17.4)
No (reference)	16.2	(15.1–17.4)	13.5	(11.8–15.1)	18.6	(16.9–20.2)
Place of residence						
Urban centre	16.0*	(14.9–17.2)	13.1	(11.5–14.7)	18.7*	(17.0–20.5)
Rural (reference)	11.4	(9.6–13.1)	10.5	(7.8–13.3)	12.2	(9.9–14.5)
Parent of child younger than 18 years						
Yes	14.8	(13.0–16.7)	12.4	(10.0–14.9)	17.0	(14.3–19.8)
No (reference)	15.3	(14.1–16.5)	12.7	(11.0–14.4)	17.7	(15.9–19.4)

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TABLE 4 (continued)
Prevalence of a positive screen for MDD, by gender and selected characteristics, household population aged 18 years or older, Canada, 2020

Variable	Total		Males		Females	
	%	95% CI	%	95% CI	%	95% CI
Highest level of education attained (reference is other education groups combined)						
Less than high school	13.3	(9.6–17.0)	7.4*	(3.4–11.4)	18.6	(12.8–24.4)
High school	18.1*	(15.7–20.6)	15.4	(11.9–18.8)	20.6*	(17.1–24.2)
Postsecondary certificate, diploma or degree	15.5	(14.2–16.8)	13.3	(11.4–15.1)	17.5	(15.7–19.4)
University certificate, diploma or degree above bachelor's level	10.2*	(8.1–12.3)	8.0*	(5.1–11.0)	11.8*	(9.0–14.7)
Household income quintile (reference is other income groups combined)						
1 (lowest)	17.6*	(15.4–19.7)	15.0	(11.9–18.1)	20.0	(16.9–23.2)
2	16.4	(14.0–18.8)	14.1	(10.6–17.6)	18.1	(14.9–21.4)
3	16.6	(14.2–19.0)	13.7	(10.4–17.0)	19.1	(15.5–22.8)
4	13.9	(11.3–16.5)	11.1	(7.6–14.5)	17.0	(13.2–20.7)
5 (highest)	12.4*	(10.1–14.7)	12.2	(8.8–15.6)	12.7*	(9.4–15.9)
Frontline worker (among those who worked in previous week)						
Yes	20.9*	(16.6–25.2)	16.3	(10.1–22.5)	24.0*	(18.2–29.8)
No (reference)	14.4	(13.0–15.9)	11.7	(9.9–13.6)	17.3	(15.0–19.5)
Province/territorial (reference is other provinces/territories combined)						
Newfoundland and Labrador	11.5	(9.0–14.0)	8.6	(5.2–12.0)	14.1	(10.4–17.8)
Prince Edward Island	14.1	(11.1–17.1)	12.6	(7.9–17.3)	15.5	(11.6–19.4)
Nova Scotia	16.5	(13.2–19.9)	12.9	(7.5–18.3)	20.0	(16.1–23.8)
New Brunswick	17.4	(14.1–20.6)	17.8	(12.6–23.0)	17.0	(13.1–20.8)
Quebec	10.5*	(8.9–12.1)	8.3*	(6.0–10.5)	12.5*	(10.0–15.0)
Ontario	15.9	(13.9–17.8)	12.7	(10.1–15.4)	18.9	(16.0–21.8)
Manitoba	20.1	(17.0–23.3)	17.1	(12.6–21.7)	21.9	(17.3–26.4)
Saskatchewan	14.4	(11.5–17.3)	13.1	(8.3–17.9)	15.5	(12.1–18.9)
Alberta	18.3	(15.5–21.1)	14.1	(10.3–17.9)	22.1	(17.9–26.3)
British Columbia	17.2	(14.4–20.0)	16.9	(12.7–21.1)	17.4	(13.8–21.0)
Yukon (Whitehorse)	15.0	(11.4–18.6)	6.5	(2.9–10.0)	23.3	(17.0–29.5)
Northwest Territories (Yellowknife)	16.8	(11.6–22.0)	13.3	(5.6–21.1)	20.4	(13.4–27.5)
Nunavut (Iqaluit)	21.5	(14.1–28.8)	10.5	(2.9–18.1)	30.6	(18.8–42.5)

Data source: 2020 Survey on COVID and Mental Health.

Abbreviations: CI, confidence interval; MDD, major depressive disorder; SCMH, Survey on COVID and Mental Health.

Note: A Bonferroni adjustment for multiple comparisons was made when comparing estimates for provinces/territories.

[a] Significantly different from males ($p < 0.05$).

* Significantly different from reference ($p < 0.05$).

in this analysis may be regarded as stressful life events. Indeed, the COVID-19 pandemic itself may be perceived as a stressful life event.

Although we observed that those who increased their use of cannabis and alcohol were more likely to screen positive for MDD, it is possible that they increased use to alleviate their depressive symptoms. However, longitudinal studies have shown that both alcohol use disorders and cannabis use (particularly heavy use) are associated with increased risk of *subsequent* depressive disorders.[14,15] Among those who increased their consumption of alcohol, on the days they consumed alcohol, males reported an average of six drinks per day, and females an average of four drinks per day. These consumption levels considerably surpass what is recommended in Canada's low-risk drinking guidelines, which state that females should have no more than two drinks most days, and males no more than three drinks.[37] Among those who increased their cannabis use, 43% of males and 44% of females reported using it five or more days per week. According to Canada's low-risk cannabis guidelines, frequent users (daily or near-daily) are more likely to develop health problems.[38] It will be important to continue to monitor consumption levels, given that increased use of these substances to deal with stress is a predictor of problem usage and dependence.[39,40]

We observed that concern for family violence was associated with a higher risk of MDD. Longitudinal studies provide evidence of a bidirectional relationship between experiencing family violence and depressive symptoms.[41] Family violence has been shown to be associated with subsequent depression, but at the same

TABLE 5

Unadjusted and adjusted odds ratios for a positive screen for MDD, by gender and selected characteristics, household population aged 18 years or older, Canada, 2020

Variable	Total				Males				Females			
	Unadjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Unadjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Unadjusted odds ratio	95% CI	Adjusted odds ratio	95% CI
Number of COVID-19-related risk factors (continuous)	2.1*	(2.0–2.2)	1.7*	(1.6–1.8)	2.0*	(1.8–2.2)	1.7*	(1.5–1.9)	2.1*	(2.0–2.3)	1.8*	(1.6–1.9)
Protective factors												
Coping mechanisms (reference is no)												
Communicating with friends and family	0.9	(0.7–1.2)	1.0	(0.7–1.3)	0.9	(0.6–1.2)	0.9	(0.6–1.4)	0.8	(0.6–1.2)	1.1	(0.7–1.7)
Meditating	1.3*	(1.1–1.5)	1.1	(0.8–1.4)	1.2	(0.9–1.7)	1.0	(0.6–1.7)	1.2	(1.0–1.5)	1.2	(0.9–1.7)
Praying or seeking spiritual guidance	1.0	(0.8–1.2)	1.0	(0.7–1.2)	1.1	(0.8–1.4)	1.0	(0.7–1.6)	0.9	(0.7–1.1)	0.9	(0.7–1.3)
Exercising	0.5*	(0.4–0.6)	0.6*	(0.5–0.8)	0.5*	(0.4–0.7)	0.7*	(0.4–1.0)	0.4*	(0.3–0.5)	0.6*	(0.4–0.8)
Changing food choices	1.5*	(1.3–1.8)	1.3*	(1.0–1.6)	1.5*	(1.1–1.9)	1.3	(0.9–1.9)	1.5*	(1.2–1.8)	1.4*	(1.0–1.8)
Participating in hobbies	0.7*	(0.6–0.8)	0.6*	(0.5–0.7)	0.7*	(0.5–0.9)	0.6*	(0.4–0.9)	0.6*	(0.5–0.8)	0.5*	(0.4–0.7)
Changing sleep patterns	2.5*	(2.1–3.0)	1.4*	(1.1–1.8)	3.1*	(2.4–4.2)	1.8*	(1.2–2.6)	2.1*	(1.7–2.6)	1.2	(0.9–1.7)
Mastery quartile (reference is quartile 1)												
2	0.2*	(0.2–0.3)	0.3*	(0.2–0.4)	0.2*	(0.1–0.3)	0.2*	(0.2–0.3)	0.2*	(0.2–0.3)	0.3*	(0.2–0.4)
3	0.1*	(0.1–0.1)	0.2*	(0.1–0.2)	0.1*	(0.1–0.2)	0.2*	(0.1–0.4)	0.1*	(0.1–0.1)	0.1*	(0.1–0.2)
4	0.0*	(0.0–0.1)	0.1*	(0.1–0.1)	0.0*	(0.0–0.1)	0.1*	(0.0–0.1)	0.0*	(0.0–0.1)	0.1*	(0.1–0.2)
Sense of community belonging (reference is very weak)												
Very strong	0.1*	(0.0–0.1)	0.2*	(0.1–0.3)	0.0*	(0.0–0.1)	0.2*	(0.1–0.3)	0.1*	(0.0–0.1)	0.2*	(0.1–0.4)
Somewhat strong	0.1*	(0.1–0.1)	0.2*	(0.2–0.3)	0.1*	(0.1–0.2)	0.2*	(0.1–0.3)	0.1*	(0.1–0.2)	0.3*	(0.2–0.4)
Somewhat weak	0.3*	(0.2–0.4)	0.4*	(0.3–0.5)	0.3*	(0.2–0.4)	0.3*	(0.2–0.5)	0.3*	(0.2–0.4)	0.4*	(0.3–0.6)
Sociodemographic characteristics												
Female (reference is male)	1.5*	(1.2–1.7)	1.3*	(1.1–1.7)								
Age group (years; reference is 35 to 49)												
18–24	2.1*	(1.6–2.9)	1.6*	(1.0–2.6)	1.7*	(1.1–2.8)	1.8	(0.8–3.7)	2.9*	(1.9–4.4)	1.8	(1.0–3.3)
25–34	1.5*	(1.2–1.8)	1.2	(0.9–1.7)	1.3	(0.9–1.8)	1.2	(0.7–2.1)	1.5*	(1.1–2.1)	1.3	(0.9–1.9)
50–64	0.9	(0.7–1.1)	1.0	(0.7–1.3)	0.9	(0.7–1.2)	1.0	(0.6–1.7)	0.8	(0.6–1.1)	0.9	(0.6–1.4)
65 or older	0.4*	(0.3–0.5)	0.6*	(0.4–0.9)	0.3*	(0.2–0.4)	0.5	(0.3–1.0)	0.5*	(0.3–0.6)	0.6	(0.4–1.0)

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TABLE 5 (continued)

Unadjusted and adjusted odds ratios for a positive screen for MDD, by gender and selected characteristics, household population aged 18 years or older, Canada, 2020

Variable	Total				Males				Females			
	Unadjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Unadjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Unadjusted odds ratio	95% CI	Adjusted odds ratio	95% CI
Racialized group member (reference is White)	1.2	(1.0–1.4)	0.8	(0.6–1.1)	1.2	(0.9–1.6)	0.8	(0.4–1.3)	1.2	(0.9–1.5)	0.8	(0.5–1.2)
Immigrant (reference is non-immigrant)	0.7*	(0.6–0.9)	0.7*	(0.5–1.0)	0.8	(0.6–1.1)	0.7	(0.4–1.2)	0.7*	(0.5–1.0)	0.7	(0.5–1.1)
Place of residence urban centre (reference is rural)	1.5*	(1.2–1.8)	1.1	(0.8–1.4)	1.3	(0.9–1.8)	0.7	(0.5–1.2)	1.7*	(1.3–2.1)	1.3	(0.9–1.8)
Parent of child younger than 18 years (reference is non-parent)	1.0	(0.8–1.1)	0.9	(0.7–1.2)	1.0	(0.7–1.3)	0.9	(0.6–1.4)	1.0	(0.8–1.2)	0.8	(0.6–1.2)
Frontline worker (reference is not frontline worker)	1.5*	(1.2–2.0)	1.7*	(1.2–2.6)	1.5	(0.9–2.4)	1.5	(0.7–3.2)	1.5*	(1.0–2.1)	1.9*	(1.2–3.1)
Highest level of education attained (reference is high school)												
Less than high school	0.7*	(0.5–1.0)	1.0	(0.6–1.6)	0.4*	(0.2–0.8)	0.4*	(0.2–0.9)	0.9	(0.6–1.4)	1.5	(0.8–2.8)
Postsecondary certificate, diploma or degree	0.8	(0.7–1.0)	0.8	(0.6–1.1)	0.8	(0.6–1.2)	0.9	(0.6–1.4)	0.8	(0.6–1.1)	0.8	(0.6–1.1)
University certificate, diploma or degree above the bachelor's level	0.5*	(0.4–0.7)	0.7	(0.5–1.0)	0.5*	(0.3–0.8)	0.7	(0.4–1.4)	0.5*	(0.4–0.7)	0.7	(0.4–1.2)
Household income quintile (reference is quintile 3)												
1	1.1	(0.9–1.3)	1.2	(0.9–1.6)	1.1	(0.8–1.6)	1.4	(0.9–2.4)	1.1	(0.8–1.4)	1.1	(0.7–1.6)
2	1.0	(0.8–1.3)	1.2	(0.9–1.6)	1.0	(0.7–1.6)	1.5	(0.9–2.5)	0.9	(0.7–1.3)	1.0	(0.7–1.5)
4	0.8	(0.6–1.1)	0.9	(0.7–1.3)	0.8	(0.5–1.2)	1.0	(0.6–1.8)	0.9	(0.6–1.2)	0.9	(0.6–1.5)
5	0.7*	(0.5–0.9)	1.1	(0.7–1.5)	0.9	(0.6–1.3)	1.6	(0.9–2.9)	0.6*	(0.4–0.9)	0.8	(0.5–1.2)
Province/territorial capital (reference is Ontario)												
Newfoundland and Labrador	0.7	(0.5–0.9)	0.9	(0.6–1.3)	0.6	(0.4–1.1)	0.9	(0.5–1.8)	0.7	(0.5–1.0)	0.8	(0.5–1.3)
Prince Edward Island	0.9	(0.6–1.2)	1.2	(0.8–1.7)	1.0	(0.6–1.6)	1.3	(0.6–2.6)	0.8	(0.6–1.1)	1.1	(0.7–1.7)
Nova Scotia	1.0	(0.8–1.4)	1.0	(0.6–1.5)	1.0	(0.6–1.8)	0.8	(0.3–2.0)	1.1	(0.8–1.5)	0.9	(0.6–1.5)
New Brunswick	1.1	(0.8–1.5)	1.1	(0.8–1.7)	1.5	(0.9–2.3)	2.0	(1.0–4.0)	0.9	(0.6–1.2)	0.8	(0.5–1.2)
Quebec	0.6*	(0.5–0.8)	0.7	(0.5–1.0)	0.6*	(0.4–0.9)	0.8	(0.5–1.3)	0.6*	(0.5–0.8)	0.6	(0.4–0.9)
Manitoba	1.3	(1.0–1.7)	1.4	(1.0–1.9)	1.4	(0.9–2.1)	1.7	(0.9–3.0)	1.2	(0.9–1.7)	1.2	(0.8–1.8)
Saskatchewan	0.9	(0.7–1.2)	1.0	(0.7–1.5)	1.0	(0.6–1.7)	1.4	(0.7–2.8)	0.8	(0.6–1.1)	0.8	(0.5–1.2)
Alberta	1.2	(0.9–1.5)	0.9	(0.6–1.2)	1.1	(0.8–1.7)	0.8	(0.5–1.4)	1.2	(0.9–1.7)	0.8	(0.6–1.3)
British Columbia	1.1	(0.9–1.4)	1.2	(0.9–1.7)	1.4	(1.0–2.0)	1.5	(0.9–2.5)	0.9	(0.7–1.2)	1.0	(0.7–1.6)
Yukon (Whitehorse)	0.9	(0.7–1.3)	1.2	(0.8–1.9)	0.5	(0.2–0.9)	0.9	(0.3–2.5)	1.3	(0.9–1.9)	1.4	(0.8–2.3)
Northwest Territories (Yellowknife)	1.1	(0.7–1.6)	1.4	(0.8–2.4)	1.1	(0.5–2.3)	1.0	(0.4–2.5)	1.1	(0.7–1.8)	1.7	(0.8–3.6)
Nunavut (Iqaluit)	1.4	(0.9–2.3)	2.7	(1.3–5.6)	0.8	(0.3–2.1)	1.6	(0.5–4.9)	1.9	(1.0–3.5)	3.3	(1.2–9.2)

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TABLE 5 (continued)

Unadjusted and adjusted odds ratios for a positive screen for MDD, by gender and selected characteristics, household population aged 18 years or older, Canada, 2020

Variable	Total				Males				Females			
	Unadjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Unadjusted odds ratio	95% CI	Adjusted odds ratio	95% CI	Unadjusted odds ratio	95% CI	Adjusted odds ratio	95% CI
Odds ratios for individual COVID-19-related risk factors for depression[a] (reference is no)												
Loss of job or income due to COVID-19	2.1*	(1.8–2.5)	1.0	(0.7–1.3)	1.9*	(1.4–2.5)	0.8	(0.5–1.2)	2.3*	(1.9–2.9)	1.2	(0.8–1.6)
Difficulty meeting financial obligations or essential needs due to COVID-19	3.9*	(3.2–4.6)	1.5*	(1.1–2.0)	3.5*	(2.6–4.6)	1.4	(0.9–2.3)	4.3*	(3.4–5.5)	1.5*	(1.1–2.1)
Death of family member, friend or colleague due to COVID-19	2.2*	(1.7–2.9)	1.4	(1.0–2.1)	2.8*	(1.7–4.4)	2.1	(1.0–4.7)	1.8*	(1.3–2.6)	1.1	(0.7–1.7)
Feelings of loneliness or isolation due to COVID-19	6.2*	(5.2–7.4)	2.3*	(1.8–2.8)	6.3*	(4.7–8.3)	2.5*	(1.7–3.8)	5.9*	(4.7–7.5)	2.3*	(1.7–3.1)
Physical health problems due to COVID-19	7.4*	(6.2–8.7)	2.9*	(2.3–3.7)	8.1*	(6.1–10.6)	3.2*	(2.1–4.8)	6.6*	(5.3–8.2)	2.8*	(2.1–3.7)
Challenges in personal relationships with members of your household due to COVID-19	4.6*	(3.9–5.4)	1.5*	(1.2–2.0)	4.4*	(3.4–5.8)	1.2	(0.8–1.8)	4.5*	(3.6–5.5)	1.6*	(1.2–2.2)
Increased consumption of alcohol since onset of COVID-19	2.5*	(2.1–3.0)	1.5*	(1.2–2.0)	2.8*	(2.1–3.7)	1.5	(0.9–2.3)	2.2*	(1.8–2.8)	1.6*	(1.2–2.3)
Increased consumption of cannabis since onset of COVID-19	4.6*	(3.5–6.1)	1.9*	(1.3–2.8)	4.3*	(2.8–6.5)	1.7	(0.9–3.2)	5.3*	(3.7–7.5)	2.2*	(1.3–3.6)
Concern for family violence in your household	3.0*	(2.1–4.1)	1.9*	(1.2–3.1)	3.1*	(1.8–5.3)	2.1	(0.9–5.0)	3.1*	(2.0–4.7)	2.0*	(1.2–3.5)

Data source: 2020 Survey on COVID and Mental Health.

Abbreviations: CI, confidence interval; MDD, major depressive disorder.

Note: The 95% CIs for the odds ratios for some provinces/territories overlap with 1.0 but the result is nonsignificant because of the Bonferroni adjustment made to account for multiple comparisons.

[a] In the second set of models examining individual COVID-19-related risk factors, the adjusted odds control for all variables included in the first set of models, but the adjusted odds ratios are only presented for the COVID-19-related risk factors.

* Significantly different from reference ($p < 0.05$).

time, depressive symptoms predict subsequent family violence.

As found in previous research, mastery[26,29] and a sense of community belonging[27,28] were protective factors for MDD. In our study, mastery was a potent protective factor; those in the lowest mastery quartile were 17 times more likely to have MDD than were those in the highest quartile. Those reporting a very weak sense of community belonging were 10 times more likely to have MDD than were those with a very strong sense of belonging. It is hypothesized that feeling "connected" to one's community enhances social engagement. Having social ties can improve self-esteem, thereby enriching positive mental health.[27]

Consistent with other studies,[30,42] we found some evidence that coping strategies aimed at promoting health were protective factors for MDD. Exercising and participating in hobbies were associated with a decreased risk of MDD. However, changes in food choices and sleep patterns to promote health did not emerge as protective factors and were unexpectedly associated with an increased risk of MDD. The higher prevalence of MDD among those who changed their food choices and sleep patterns to promote health may reflect the use of these strategies by those who have MDD and are using these strategies to combat their depressive symptoms. It is still plausible that these strategies may be useful in preventing MDD and reducing symptoms among those with MDD.

The increased risk of MDD among females and the negative association with age have been found in most community epidemiological studies.[43-45] The decreased risk for immigrants is consistent with the "healthy immigrant" effect.[46] However, while recent immigrants are healthier on their arrival, over time, the initial health advantage diminishes.[46] The comparison of estimates between the CCHS and the SCMH suggests that the gap between immigrants and non-immigrants has narrowed since the onset of COVID-19. Consistent with our findings, a rapid review of the psychological impact of COVID-19 on frontline health care workers identified many studies that reported increased levels of depression, with female nurses having higher risk than other frontline workers.[47]

After more than two decades of stability,[16] the prevalence of MDD among Canadians has increased substantially. It is estimated that a third to half of those with first-time depression will have a recurrence.[44] Since SCMH respondents were not asked about lifetime symptoms of depression, it is not possible to quantify the extent of first-time episodes, but likely a sizable proportion of Canadians have experienced MDD for the first time during COVD-19. Research suggests that the etiology of subsequent episodes of depression is highly variable.[6,7,9,11-13] While the first occurrence of a depressive episode is more commonly associated with a severe stressful life event, subsequent episodes often arise in the absence of severe stressful life events.[6,7,9,11-13] The stress sensitization model postulates that after an initial episode of depression, individuals are more sensitized to stress, and over time, less severe and even minor events such as daily hassles can trigger an episode.[12,13] Regardless of the cause of subsequent episodes, a larger percentage of Canadians may be more susceptible to episodes of depression in the near future.

Strengths and limitations

A major strength of this study is that it is based on a large representative sample from the 10 Canadian provinces as well as data from the capitals of the three territories. The scale used to measure MDD has good psychometric properties, and the cut-point used to define MDD has high sensitivity and specificity.[31-33] As well, we were able to examine how social and financial upheavals related to COVID-19, changes in behaviour since the onset of COVID-19 and protective factors (mastery, sense of community belonging) are related to MDD.

Nonetheless, some limitations should be considered when interpreting the results of this analysis:

- Changes in estimates of the prevalence of MDD over time were based only on certain provinces, and the baseline years for comparisons differ, ranging from 2015 to 2019. We implicitly assumed stable estimates of MDD across these years. Sensitivity analyses based on the provinces of Ontario and Manitoba supported the conjecture of stable estimates followed by an increase in the SCMH in the fall of 2020. These results suggest that the increases in MDD occurred after the onset of COVID-19.
- Methodological differences between the SCMH and the CCHS may influence comparisons. Data collection modes differed.
- CCHS data were collected throughout the year. SCMH data were collected during the fall months, and are, therefore, potentially subject to seasonality bias.[48]
- For the comparison by household income, it should be noted that the SCMH is based on self-reported data, whereas the CCHS uses a combination of tax records, respondent-provided data and imputed data. It is unknown how this may have impacted the comparison of MDD estimates between the two surveys.
- The degree to which the response rates to the SCMH and the CCHS affect the prevalence of MDD in our study and the comparison of estimates between the two surveys is unknown.
- Marital status and social support were not collected in the SCMH. Being married and having social support have consistently been found to be protective factors for depression.[43,49]
- The SCMH and CCHS excluded subpopulations among whom the prevalence of depression is likely higher, such as individuals experiencing homelessness, residents of reserves and other Indigenous settlements and residents of institutions. Depression is more common among seniors living in long-term care facilities.[50] Our study did not address the impact of COVID-19 on the mental health of seniors in long-term care.
- Although the PHQ-9 has been found to be a reliable and valid measure of MDD,[31] these are unprecedented times. New validity studies may be needed to assess whether the pandemic has increased the relative number of positive screens that are false positives based on a clinical diagnosis. Furthermore, trends based on the clinical diagnosis of MDD may differ.
- The cross-sectional nature of the SCMH data precludes establishing the temporal order of events and conclusions regarding the causal nature of associations.

Conclusion

Depression is a highly recurrent chronic condition that causes substantial suffering and results in increased mortality risk.[44,51] The World Health Organization has identified depression as a leading cause of disability worldwide and a major contributor to the overall burden of disease.[52] The SCMH was administered from September to December 2020, a period during which COVID-19 cases, hospitalizations and deaths were rising. The psychological impact of and economic fallout from lockdowns have yet to be fully understood. Given the recurrent nature of MDD and the likelihood that less severe events may result in subsequent episodes,[12,13,44] the recent increase, particularly among young adults, is cause for concern. Our findings highlight the need to identify evidence-based approaches for assessment and treatment of depressive disorders that can be delivered through public health programing to meet the increased numbers of those experiencing symptoms indicative of MDD during the pandemic, rather than relying solely on existing clinical services.

While delivery of mental health services is the responsibility of provinces and territories, planning should be based on up-to-date national estimates about the prevalence and associated risk factors of conditions such as MDD. This planning could include determining ways to make evidence-based treatments for depressive disorders, such as cognitive behavioural therapy, more broadly available, including remotely. Intervention strategies that enhance protective factors, such as identifying ways to promote community belonging, are important to consider. Ongoing monitoring is vital to determine if currently elevated levels of MDD persist.

Acknowledgments

The editorial assistance provided by Mary Sue Devereaux and Dawn Slawecki and the comments and support provided by the survey team at Statistics Canada (David Laferriere, Leslie Poon, Ayan Haji Egeh and Melanie Hoover) and Wendy Thompson (Acting Director at the Public Health Agency of Canada) are gratefully acknowledged. The excellent comments provided by Dr. Kathy Georgiades, the guest editor, and the anonymous peer reviewers considerably strengthened the paper.

Conflicts of interest

The authors have no conflicts of interest.

Authors' contributions and statement

MS and LT conceived the project. MS and LT decided on the analytic approach. MS conducted the statistical analyses. MS, LT, AG, MW, SP, AMR, DLB and HM interpreted the results. MS drafted and revised the manuscript in response to feedback provided from LT, AG, MW, SP, AMR, DLB and HM.

The content and views expressed in this article are those of the authors and do not necessarily reflect those of the Government of Canada.

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