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Original Research

Incident and recurrent depression among older adults with asthma during the COVID-19 pandemic: Findings from the Canadian Longitudinal Study on Aging

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ABSTRACT

Objectives: (1) In a subsample of older adults with asthma without a history of depression, to determine the factors associated with developing depression during the COVID-19 pandemic; (2) in a subsample of older adults with asthma with a history of depression, to identify factors associated with recurrent depression during the pandemic.
Methods: Data came from four waves (Baseline [2011–2015], Follow-up 1 [2015–2018]; COVID Spring 2020, COVID Autumn 2020) of the Canadian Longitudinal Study on Aging's comprehensive cohort (n = 2,047 with asthma). The outcome of interest was a positive screen for depression based on the CES-D-10 during the autumn of 2020. Bivariate and multivariate logistic regression analyses were conducted.
Results: Among older adults with asthma without a history of depression (n = 1,247), approximately 1 in 7 (13.5%) developed depression for the first time during the COVID-19 pandemic. Among those with a history of depression (n = 770), approximately 1 in 2 (48.6%) experienced a recurrence of depression. The risk of incident depression and recurrent depression was higher among those who were lonely, those experiencing family conflict during the pandemic, and those who had difficulty accessing healthcare resources during the pandemic. The risk of incident depression only was higher among those who had difficulty accessing resources and/or loss of income during the pandemic. The risk of recurrent depression only was higher among those with functional limitations.
Conclusions: There is a need for targeted interventions to support the mental health of older adults with asthma who have the above identified vulnerabilities during the pandemic.

1. Introduction

COVID-19 is a respiratory illness caused by SARS-CoV-2 that can lead to lung damage, respiratory failure, and death. Individuals with asthma typically have an increased susceptibility to respiratory viral infections [1]. Consequently, individuals with asthma were labelled early in the COVID-19 pandemic as "high risk" for COVID-19 infection and severe COVID-19 related outcomes, resulting in this population being strongly urged to strictly adhere to physical distancing and lockdown measures. However, more recent evidence suggests that asthma does not increase one's likelihood of COVID-19 infection [2], and further that asthma is not associated with heightened disease severity [3]. There is concern that the earlier emphasis that people with asthma should rigidly adhere to distancing guidelines combined with the stress of being labelled "high risk" may have led to worsening mental health outcomes, such as increases in depressive symptoms, within this population [4].

Research conducted prior to the pandemic has indicated a high comorbidity between asthma and depression [5,6]. A recent meta-analysis of prospective studies on the temporal association between these two conditions found depression to be strongly associated with adult-onset asthma [7]. While the authors found no association between asthma and subsequent depression, they suggested this may be due to the limited number of prospective studies examining this relationship [7]. Although some cross-sectional research has found asthma to be

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associated with current depressive symptoms and lifetime depression, the cross-sectional nature of these findings prohibits determining the temporal relationship of these conditions [8], emphasizing the need for further longitudinal research to examine this relationship.

When considering the high comorbidity between asthma and depression prior to the pandemic, combined with the unprecedented challenges of the COVID-19 pandemic and associated lockdowns for people with asthma, it is evident that there is a need for longitudinal research to examine the relationship between asthma and depression during the pandemic. In order to address this gap in the literature, the current study uses a large Canadian longitudinal panel study of older adults to achieve the following objectives: (1) in a subsample of older adults with asthma without a history of depression, to determine the factors associated with developing incident depression during the COVID-19 pandemic; (2) in a subsample of older adults with asthma with a history of depression, to identify factors associated with recurrence of depression during the pandemic. We hypothesize that older adults with asthma are vulnerable to incident and recurrent depression during the COVID-19 pandemic. We also hypothesize those with low socioeconomic status are more vulnerable to depression than their peers with higher socioeconomic status due to the financial strain that COVID-19 has placed on many low-income individuals.

2. Methods

2.1. Data source

Data were drawn from the Baseline, Follow-up 1, and COVID Spring 2020, and COVID Autumn 2020 waves of the comprehensive cohort of Canadian Longitudinal Study on Aging (CLSA). The CLSA is a national study of Canadian residents aged 45 to 85 between 2011 and 2015 across 7 provinces [9]. The CLSA also collected data about COVID-19, either online or by telephone with all CLSA respondents who agreed to participate. The baseline comprehensive cohort recruited 30,097 community-living men and women in Canada. The study was designed to follow participants every 3 years after baseline for at least 20 years or until death [9]. In total, 27,737 participants of the comprehensive cohort completed the first Follow-up wave (hereafter Follow-up 1) by 2018. In order to investigate the impact of the COVID-19 pandemic among older Canadians, 18,530 and 15,544 of the participants in the comprehensive cohort completed the COVID-19 Spring 2020 and Autumn 2020 questionnaires (hereafter Spring 2020 and Autumn 2020, respectively). Respondents who were lost to follow-up or had missing data on key covariates were excluded from the analysis. A detailed description of the CLSA can be found elsewhere [9].

2.2. Sample

The sample consisted of respondents who had asthma in either Baseline or Follow-up 1 (n = 2,017) prior to the COVID-19 pandemic. Self-reported asthma was measured by the question, "Has a doctor ever told you that you have asthma?" (yes vs. no). Among those with asthma, 1,247 had no pre-pandemic history of depression and 770 had a history of depression.

2.3. Measures

The outcome of interest, depression, was assessed by administering the short form of the Centre for Epidemiologic Studies – Depression (CES-D-10) scale [10]. Ten questions addressing, for example, feelings of depression, loneliness, hopefulness for the future, and restless sleep, are summed to generate a total score between 0 and 30 with higher scores indicating a greater number of symptoms. The positive screen for depression was coded 1 if the CES-D-10 score was 10 or more and 0 otherwise [10]. The CES-D-10 is a well-established, psychometrically sound, single-factor measure of depression with well-documented reliability and validity for screening depressive symptoms among community dwelling older adults [11]. To identify pre-pandemic history of depression, four measures were used. The CES-D-10 scores at Baseline and Follow-up 1 wave of data collection were assessed. At both Baseline and Follow-up 1 the respondents were also asked: "Has a doctor ever told you that you suffer from clinical depression?". If respondents answered no at both the Baseline and Follow-up 1 waves of data collection, and screened negative on the CES-D-10 in both waves, the respondent was classified as having no pre-pandemic history of depression. If at least one of the above four measures indicated depression, the respondent was classified as having a pre-pandemic history of depression.

Demographic factors include age at the Autumn 2020 wave, sex (male vs. female), and marital status (married/common-law, separated/divorced/widowed, single/never married or lived with a partner). Immigrant status was categorized into two groups based on country of origin (Canadian-born vs. immigrant). Visible minority status was classified as white vs. non-white.

Socioeconomic status was measured by education, household income, home ownership, total savings, and whether income satisfies basic needs. We operationalized education as the highest level of education achieved, categorized as less than secondary school, secondary school/some post-secondary, and post-secondary degree/diploma. Household income was defined as total household income from all sources by all family members in the past 12 months (less than $50,000, $50,000–$99,999, $100,000 or more, and not answered). Home ownership had three categories (rent, own with mortgage, own without mortgage). Total saving had four categories (less than $50,000, $50,000–$99,999, $100,000 or more, and not answered). Whether income satisfies basic needs was measured by a dummy variable (0 = with some difficulty/not very well/totally inadequate; and 1 = very well/adequately).

Health-related variables include body mass index (BMI), chronic pain, and multimorbidity. BMI was classified into three clusters: underweight/normal weight (BMI $<$25.0); overweight (BMI = 25.0–29.9); and obese (BMI $\geq$30.0). Chronic pain was a dummy variable (free of chronic pain vs. have chronic pain). Multimorbidity was defined as having multiple chronic conditions (zero, one, two, three or more, missing). These chronic conditions include (1) diabetes, (2) heart disease, (3) peripheral vascular disease or poor circulation in limbs, (4) dementia or Alzheimer's disease, (5) multiple sclerosis, (6) epilepsy, (7) migraine headaches, (8) intestinal or stomach ulcers, (9) bowel disorder, (10) stroke or CVA (cerebrovascular accident), (11) glaucoma, (12) kidney disease, (13) macular degeneration, (14) ministroke or TIA (Transient Ischemic Attack), and (15) Parkinson's Disease, and (16) cancer.

Adverse childhood experiences (ACEs) were measured by childhood physical abuse, childhood sexual abuse, childhood exposure to chronic intimate partner violence, and being neglected. Childhood physical abuse was present if the respondent reported being kicked, bit or punched, or choked, burned or physically attacked in some other way one or more times. Childhood sexual abuse was present if respondents reported an adult forcing them or attempting to force them into any unwanted sexual activity by threatening them, holding them down, or hurting them in some way one or more times. Childhood exposure to chronic intimate partner violence was present if respondents reported seeing or hearing parents, step-parents or guardians hitting each other more than 10 times. Respondents being neglected were present if they reported their parents or guardians not having taken care of their basic needs such as keeping clean or providing food or clothing one or more times.

Respondents were also asked: "How often do you feel that you lack companionship?", "How often do you feel left out?", and "How often do you feel isolated from others?". The three variables were coded as 1 = often and 0 = hardly ever/some of the time.

Religiosity was measured by two questions: "In the past 12 months,

how often did you participate in church or religious activities?" (hereafter, church activities) and "In the past 12 months, how often did you engage in religious or spiritual activities including prayer, meditation taking place at home?" (hereafter, pray at home). If respondents had taken part in these activities at least once a month, then they were coded as often (=1) otherwise rare (=0).

At the beginning of the COVID-19 pandemic, the Spring 2020 questionnaire asked respondents whether they left home or not in the past month. Moreover, respondents' loneliness during the Spring 2020 wave was operationalized using the question, "How often did you feel lonely?" (rarely or never/some of the time [0–2 days per week] vs. occasionally/all of the time [3–7 days per week]). The type of dwelling during the COVID-19 was classified as the house, apartment, and other. There was a dummy variable indicating whether respondents lived alone or not during the beginning of the COVID-19 pandemic.

The functional limitation scale included three questions: "Do you have any difficulty standing up after sitting in a chair", "Do you have any difficulty walking alone up and down a flight of stairs?", and "Do you have any difficulty walking 2 to 3 neighborhood blocks?". If respondents answered all three questions as no, then they were coded as 0, otherwise 1.

COVID-19 related stressors were measured at the Autumn 2020 wave. They were investigated in a section of the survey which was preceded by the following instructions: "Which of the following have you experienced during the COVID-19 pandemic?" COVID-19 related stressors/experiences were categorized into five composite indicators. Experiences were grouped as "yes" if the participants responded yes to at least one experience in the specific category or no if the participant responded no to all questions in that category. Questions related to health stressors included, "You were ill", "People close to you were ill", and/or "Death of a person close to you". Questions related to difficulties with accessing resources included "Loss of income" and/or "Unable to access necessary supplies or food". Questions related to family conflict included "Increased verbal or physical conflict" and/or "Breakdown in family/marital relationships". Questions related to other family issues included "Separation from family", "Increased time caregiving", and/or "Unable to care for people who require assistance due to health condition or limitation". Questions related to health care included "Unable to access my usual healthcare". Questions related to medication included "Unable to get my usual prescription medications and treatments".

2.4. Statistical analyses

The analysis was conducted in several steps. First, the prevalence of incident and recurrent depression was generated for those with and without asthma. Descriptive statistics were used to characterize the CLSA participants with asthma, both with and without a pre-pandemic history of depression. We further compared the distribution of key risk factors among older adults with asthma with no history of pre-pandemic depression who did not develop depression and those who develop depression, and older adults with asthma with a history of pre-pandemic of depression who did not and those who did develop depression during the pandemic. In order to compare the pandemic incidence and recurrent depression rates to pre-pandemic rates, we conducted a sensitivity analysis examining changes in depression from Baseline to Follow-up 1. Chi-square tests and independent t-tests were used to test the statistical differences at the bivariate level. Second, multivariate analyses were conducted using logistic regression to calculate odds ratios (ORs) and 95% confidence interval (95% CI). The dependent variable is based on the presence or absence of a positive screen for depression based on the CES-D-10 scores at the Autumn 2020 survey. All hypothesis tests were two-sided and p-values less than 0.05 were considered statistically significant. In order to evaluate the goodness-of-fit of logistic models, Nagelkerke R square was reported. We calculated the variance inflation factor (VIF) to assess the multicollinearity among the independent variables in the logistic regression. The VIF values were all below 5, which suggests multicollinearity is not problematic. Data manipulation and statistical analyses were performed using R version 4.1.3.

3. Results

Among those with a history of depression, the recurrence of depressive symptoms during autumn of 2020 was significantly ($p < 0.01$) higher for those asthma (prevalence = 48%; 95% CI = 45%, 52%) compared to those who did not have asthma (prevalence = 43%; 95% CI = 41%, 44%). Among those without a history of depression, the prevalence of depressive symptoms during autumn of 2020 was not statistically significantly different ($p = 0.14$) between those who had asthma (prevalence = 14%; 95% CI = 12%, 15%) compared to those without asthma (prevalence = 12%; 95% CI = 11%, 13%). In light of the significant difference found between those with and without asthma in the prevalence of recurrent depression, this paper is focused solely on the sample of those with asthma.

Table 1 presents sample characteristics of individuals with asthma by pre-pandemic depression status (estimated using CES-D-10 score and clinical depression diagnosis). A larger proportion of female respondents had a pre-pandemic history of depression than male respondents. A higher proportion of separated/divorced/widowed respondents and single respondents had a pre-pandemic history of depression than those who were married or living common-law. Sociodemographic and health-related variables were different between those who were free of pre-pandemic depression and who had a history of depression. Respondents who had no history of pre-pandemic depression were more likely to have a higher level of education, higher household income, to own their home without mortgage, to have more savings, to have enough income to satisfy needs, to be under or normal weight, free of chronic pain, and to be without any chronic conditions when compared to those who had a history of pre-pandemic depression. A higher proportion of respondents who had a history of pre-pandemic depression reported they had a lack of companionship, felt left out, felt isolated from others, felt lonely during the pandemic, had functional limitations, and that they had COVID-related stressors.

Table 2 displays the characteristics of individuals with asthma with or without a history of depression who experienced depressive symptoms during the pandemic. Among respondents with asthma with no history of pre-pandemic depression, 13.4% developed depressive symptoms for the first time during the pandemic. Among respondents with asthma with a history of pre-pandemic depression, nearly half experienced recurrent depressive symptoms (48.2%). The prevalence of recurrent depression varied by depression history. More than three quarters (78.1%) of those who screened positive for depression based on CES-D-10 scores in both the Baseline and Follow-up 1 waves experienced depressive symptoms during the pandemic. A little over half (57.3%) of those who screened positive for depression based on CES-D-10 scores at Follow-up 1, but not at Baseline, experienced depressive symptoms during the pandemic. Two fifths (40.9%) of those with depression based on CES-D-10 scores at Baseline, but not at Follow-up 1, experienced depressive symptoms during the pandemic. Fewer than one-third of those (30.1%) who screened negative for depression based on CES-D-10 scores at both Baseline or Follow-up 1, but who reported that they had been diagnosed by a health professional at some point in their life experienced depressive symptoms during the pandemic.

We conducted a sensitivity analysis to compare these findings on incident and recurrent depression among older adults with asthma during the COVID-19 pandemic with the incident and recurrence of depression from the Baseline to the Follow-up 1 wave. Among those who reported they had no history of depression and a CES-D-10 score less than 10 at Baseline, the incidence of new depressive symptoms at Follow-up 1 (prior to the pandemic) according to the CES-D-10 was 6.8% (95% CI: 5.4%, 8.2%). Among those who had a CES-D-10 score of 10 or more and/or a self-reported history of a medical diagnosis of depression at Baseline, the prevalence of recurrent depressive symptoms

Table 1
Characteristics of CLSA respondents with asthma (n = 2,017).

	Overall sample of older adults with asthma (n = 2,017)	Older adults with asthma with no pre-pandemic history of depression (n = 1,247)	Older adults with asthma with a pre-pandemic history of depression (n = 770)	p-value	Source of data
Depression during CLSA COVID-19 Exit Survey 2020				<0.001	CLSA Autumn 2020
No	1,479 (73.3%)	1080 (86.6%)	399 (51.8%)		
Yes	538 (26.7%)	167 (13.4%)	371 (48.2%)		
Age (Mean, SD)	61.1 (8.9)	61.3 (9.0)	60.7 (8.8)	0.127	CLSA Autumn 2020
Sex				<0.001	CLSA Baseline
Female	1,207 (59.8%)	675 (54.1%)	532 (69.1%)		
Male	810 (40.2%)	572 (45.9%)	238 (30.9%)		
Marital status				<0.001	CLSA Follow-up 1
Married/Common-law	1,373 (68.1%)	940 (75.4%)	433 (56.2%)		
Separated/Divorced/Widowed	426 (21.1%)	209 (16.8%)	217 (28.2%)		
Single	218 (10.8%)	98 (7.9%)	120 (15.6%)		
Immigrant status				0.611	CLSA Baseline
No	1,688 (83.7%)	1,039 (83.3%)	649 (84.3%)		
Yes	329 (16.3%)	208 (16.7%)	121 (15.7%)		
Visible minority status				0.138	CLSA Baseline
No	1,916 (95.0%)	1,177 (94.4%)	739 (96.0%)		
Yes	101 (5.0%)	70 (5.6%)	31 (4.0%)		
Education				<0.001	CLSA Baseline
Less than secondary school	68 (3.4%)	25 (2.0%)	43 (5.6%)		
Some post-secondary school	263 (13.0%)	152 (12.2%)	111 (14.4%)		
Post-secondary degree/diploma	1,686 (83.6%)	1,070 (85.8%)	616 (80.0%)		
Household income				<0.001	CLSA Follow-up 1
Less than $50,000	423 (21.0%)	190 (15.2%)	233 (30.3%)		
$50,000–$99,999	700 (34.7%)	432 (34.6%)	268 (34.8%)		
$100,000 or more	789 (39.1%)	569 (45.6%)	220 (28.6%)		
Missing	105 (5.2%)	56 (4.5)	49 (6.4)		
Home ownership				<0.001	CLSA Follow-up 1
Rent	264 (13.1%)	111 (8.9%)	153 (19.9%)		
Own with mortgage	646 (32.0%)	388 (31.1%)	258 (33.5%)		
Own without mortgage	1,087 (53.9%)	739 (59.3%)	348 (45.2%)		
Missing	20 (1.0%)	9 (0.7%)	11 (1.4%)		
Total savings				<0.001	CLSA Follow-up 1
Less than $49,999	387 (19.2%)	164 (13.2%)	223 (29.0%)		
$50,000–$99,999	251 (12.4%)	146 (11.7%)	105 (13.6%)		
$100,000 or more	1,228 (60.9%)	843 (67.6%)	385 (50.0%)		
Missing	151 (7.5%)	94 (7.5%)	57 (7.4%)		
Whether income satisfies needs				<0.001	CLSA Baseline
No	173 (8.6%)	62 (5.0%)	111 (14.4%)		
Yes	1,844 (91.4%)	1,185 (95.0%)	659 (85.6%)		
BMI				<0.001	CLSA Follow-up 1
Underweight or normal weight	523 (25.9%)	349 (28.0%)	174 (22.6%)		
Overweight	752 (37.3%)	505 (40.5%)	247 (32.1%)		
Obese	742 (36.8%)	393 (31.5%)	349 (45.3%)		
Chronic pain				<0.001	CLSA Follow-up 1
No	1,252 (62.1%)	876 (70.2%)	376 (48.8)		
Yes	765 (37.9%)	371 (29.8%)	394 (51.2)		
Multimorbidity				<0.001	CLSA Follow-up 1
0	667 (33.1%)	484 (38.8%)	183 (23.8%)		
1	639 (31.7%)	400 (32.1%)	239 (31.0%)		
2	375 (18.6%)	203 (16.3%)	172 (22.3%)		
3+	287 (14.2%)	127 (10.2%)	160 (20.8%)		
Missing	49 (2.4%)	33 (2.6%)	16 (2.1%)		
Feel they lack companionship				<0.001	CLSA Follow-up 1
No	1,893 (93.9%)	1,221 (97.9%)	672 (87.3%)		
Yes	124 (6.1%)	26 (2.1%)	98 (12.7%)		
Feel left out				<0.001	CLSA Follow-up 1
No	1,957 (97.0%)	1,235 (99.0%)	722 (93.8%)		
Yes	60 (3.0%)	12 (1.0%)	48 (6.2%)		
Feel isolated from others				<0.001	CLSA Follow-up 1
No	1,968 (97.6%)	1,241 (99.5%)	727 (94.4%)		
Yes	49 (2.4%)	6 (0.5%)	43 (5.6%)		
Church activities				0.012	CLSA Follow-up 1
Rare	1,437 (71.2%)	863 (69.2%)	574 (74.5%)		
Often	580 (28.8%)	384 (30.8%)	196 (25.5%)		
Pray at home				0.504	CLSA Follow-up 1
Rare	987 (48.9%)	618 (49.6%)	369 (47.9%)		
Often	1,030 (51.1%)	629 (50.4%)	401 (52.1%)		
Adverse childhood experience (Mean, SD)	0.30 (0.66)	0.20 (0.52)	0.47 (0.80)	<0.001	CLSA Follow-up 1

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Table 1 (*continued*)

	Overall sample of older adults with asthma (n = 2,017)	Older adults with asthma with no pre-pandemic history of depression (n = 1,247)	Older adults with asthma with a pre-pandemic history of depression (n = 770)	p-value	Source of data
Left home in the past one month during COVID				0.139	CLSA Spring 2020
No	147 (7.3%)	82 (6.6%)	65 (8.4%)		
Yes	1,870 (92.7%)	1165 (93.4%)	705 (91.6%)		
How often do you feel lonely during COVID				<0.001	CLSA Spring 2020
Rarely or never/Some of the time	1,681 (83.3%)	1,104 (88.5%)	577 (74.9%)		
Occasionally/All of the time	336 (16.7%)	143 (11.5%)	193 (25.1%)		
Type of dwelling				<0.001	CLSA Spring 2020
House	1,581 (78.4%)	1,023 (82.0%)	558 (72.5%)		
Apartment	376 (18.6%)	197 (15.8%)	179 (23.2%)		
Others	60 (3.0%)	27 (2.2%)	33 (4.3%)		
Living along during the COVID-19 pandemic				<0.001	CLSA Spring 2020
No	1,515 (75.1%)	1,003 (80.4%)	512 (66.5%)		
Yes	502 (24.9%)	244 (19.6%)	258 (33.5%)		
Functional limitations				<0.001	CLSA Autumn 2020
No	1,483 (73.5%)	993 (79.6%)	490 (63.6%)		
Yes	534 (26.5%)	254 (20.4%)	280 (36.4%)		
COVID _ Health stressors				<0.001	CLSA Autumn 2020
No	1,272 (63.1%)	851 (68.2%)	421 (54.7%)		
Yes	745 (36.9%)	396 (31.8%)	349 (45.3%)		
COVID _ Difficulties with accessing resources				0.366	CLSA Autumn 2020
No	1,630 (80.8%)	1,016 (81.5%)	614 (79.7%)		
Yes	387 (19.2%)	231 (18.5%)	156 (20.3%)		
COVID _ Family conflict				<0.001	CLSA Autumn 2020
No	1,796 (89.0%)	1,153 (92.5%)	643 (83.5%)		
Yes	221 (11.0%)	94 (7.5%)	127 (16.5%)		
COVID _ Other family Issues				0.198	CLSA Autumn 2020
No	789 (39.1%)	502 (40.3%)	287 (37.3%)		
Yes	1,228 (60.9%)	745 (59.7%)	483 (62.7%)		
COVID _ Health care				0.001	CLSA Autumn 2020
No	1,419 (70.4%)	910 (73.0%)	509 (66.1%)		
Yes	598 (29.6%)	337 (27.0%)	261 (33.9%)		
COVID _ Medications				<0.001	CLSA Autumn 2020
No	1,883 (93.4%)	1187 (95.2%)	696 (90.4%)		
Yes	134 (6.6%)	60 (4.8%)	74 (9.6%)		

at Follow-up 1 was 33.5% (95% CI: 29.6%, 37.3%). As reported above, during COVID-19, these numbers were substantially higher than the incidence and recurrence of depressive symptoms during the pandemic, 13.4% (95% CI: 11.6%, 15.4%) and 48.2% (95% CI 44.6%, 51.6%), respectively. Both incident and recurrent depressive symptoms during the autumn of 2020 were statistically significantly higher compared to those of Follow-up 1, as indicated by the non-overlapping 95% confidence intervals.

For older adults with asthma with no history of depression, the associations between the risk factors and depression status at the Autumn 2020 wave are presented in Table 3. Respondents who felt lonely occasionally/all of the time (3–7 days per week) had a substantially higher odds of incident depressive symptoms than those who felt lonely rarely or never/some of the time (0–2 days per week) during the COVID-19 pandemic (OR = 4.33, 95% CI [2.72; 6.91], $p < 0.001$). COVID-19 related stressors, such as difficulties with accessing resources were associated with significantly higher odds of developing depressive symptoms (OR = 1.60, 95% CI [1.03; 2.50], $p = 0.038$). Moreover, older adults with asthma who had increased verbal or physical conflict during the COVID-19 pandemic had a much higher odds ratio of developing depressive symptoms (OR = 4.18, 95% CI [2.47; 7.07], $p < 0.001$). Individuals with asthma who were unable to access usual healthcare had 1.55 times higher odds of depressive symptoms (95%CI [1.03; 2.30], $p = 0.035$) compared to those who were able to access usual health care. The Nagelkerke R square for this model was 0.238.

Table 4 shows the association of depression status at the Autumn 2020 wave and covariates among respondents with asthma with a pre-pandemic history of depression. Individuals with asthma who participated in few or no religious activities such as prayer at home had a higher risk of recurrent depressive symptoms than those who often participated in religious activities at home (OR = 1.49, 95% CI [1.02; 2.19], $p = 0.040$). Respondents who often felt lonely during the first few months of the COVID-19 pandemic were significantly more likely to have recurrent depressive symptoms (OR = 2.28, 95% CI [1.54; 3.37], $p < 0.001$). Older adults with asthma with functional limitations had a higher risk for depressive symptoms compared to their counterparts without such limitations (OR = 2.58, 95% CI [1.76; 3.79], $p < 0.001$). Respondents who had increased verbal or physical family conflict during the pandemic had 3.82 times higher odds (95% CI [2.36, 6.18], $p < 0.001$) of depressive symptoms than those who did not have an increase in family conflict. The odds of depressive symptoms were 1.71 times (95% CI [1.19; 2.45], $p < 0.001$) higher for those who were unable to access usual healthcare than those who were able to access usual healthcare. The Nagelkerke R square for this model was 0.257.

4. Discussion

This study examined the incidence and recurrence of depression

Table 2
Cumulative incidence and recurrence of depression by Autumn 2020 among older adults with asthma in the Canadian Longitudinal Study on Aging

	Older adults with asthma without a pre-pandemic history of depression		p-value	Older adults with asthma with a pre-pandemic history of depression		p-value
	No depression	Depression in Autumn 2020		No depression	Depression in Autumn 2020	
	(n = 1080)	(n = 167)		(n = 399)	(n = 371)	
History of depression prior to pandemic			<0.001			<0.001
No history of Depression	1080 (86.6%)	167 (13.4%)		–	–	
Any history of Depression		–		399 (51.8%)	371 (48.2%)	
Reported diagnosed by a health professional but not depressed at Baseline or Follow-up 1				197 (69.9%)	85 (30.1%)	
Depressed at Baseline	–	–		104 (59.1%)	72 (40.9%)	
Depressed at Follow-up 1	–	–		61 (42.7%)	82 (57.3%)	
Depressed at Baseline and Follow-up 1	–	–		37 (21.9%)	132 (78.1%)	
Age	61.4 (8.9)	60.9 (9.3)	0.535	60.6 (8.5)	60.8 (9.2)	0.766
Sex			0.001			0.263
Male	516 (90.2%)	56 (9.8%)		131 (55.0%)	107 (45.0%)	
Female	564 (83.6%)	111 (16.4%)		268 (50.4%)	264 (49.6%)	
Marital status			0.492			0.082
Married/Common-law	820 (87.2%)	120 (12.8%)		232 (53.6%)	201 (46.4%)	
Separated/Divorced/Widowed	178 (85.2%)	31 (14.8%)		99 (45.6%)	118 (54.4%)	
Single	82 (83.7%)	16 (16.3%)		68 (56.7%)	52 (43.3%)	
Immigrant status			0.555			0.405
No	903 (86.9%)	136 (13.1%)		341 (52.5%)	308 (47.5%)	
Yes	177 (85.1%)	31 (14.9%)		58 (47.9%)	63 (52.1%)	
Visible minority status			0.299			0.836
No	1,016 (86.3%)	161 (13.7%)		384 (52.0%)	355 (48.0%)	
Yes	64 (91.4%)	6 (8.6%)		15 (48.4%)	16 (51.6%)	
Education			0.677			0.866
Less than secondary school	–	–		21 (48.8%)	22 (51.2%)	
Some post-secondary school	130 (85.5%)	22 (14.5%)		56 (50.5%)	55 (49.5%)	
Post-secondary degree/diploma	927 (86.6%)	143 (13.4%)		322 (52.3%)	294 (47.7%)	
Household income			0.738			0.050
Less than $50,000	166 (87.4%)	24 (12.6%)		115 (49.4%)	118 (50.6%)	
$50,000–$99,999	371 (85.9%)	61 (14.1%)		144 (53.7%)	124 (46.3%)	
$100,000 or more	492 (86.5%)	77 (13.5%)		116 (52.7%)	104 (47.3%)	
Missing	51 (91.1%)	5 (8.9%)		24 (49.0%)	25 (51.0%)	
Home ownership			0.047			0.050
Rent	95 (85.6%)	16 (14.4%)		68 (44.4%)	85 (55.6%)	
Own with mortgage	340 (87.6%)	48 (12.4%)		130 (50.4%)	128 (49.6%)	
Own without mortgage	640 (86.6%)	99 (13.4%)		197 (56.6%)	151 (43.4%)	
Missing	–	–		–	7 (63.6%)	
Total saving			0.188			0.169
Less than $49,999	138 (84.1%)	26 (15.9%)		102 (45.7%)	121 (54.3%)	
$50,000–$99,999	123 (84.2%)	23 (15.8%)		56 (53.3%)	49 (46.7%)	
$100,000 or more	742 (88.0%)	101 (12.0%)		212 (55.1%)	173 (44.9%)	
Missing	77 (81.9%)	17 (18.1%)		29 (50.9%)	28 (49.1%)	
Whether income satisfies needs			1.000			0.040
No	54 (87.1%)	8 (12.9%)		47 (42.3%)	64 (57.7%)	
Yes	1026 (86.6%)	159 (13.4%)		352 (53.4%)	307 (46.6%)	
BMI			0.009			0.098
Underweight or normal weight	300 (86.0%)	49 (14.0%)		90 (51.7%)	84 (48.3%)	
Overweight	454 (89.9%)	51 (10.1%)		141 (57.1%)	106 (42.9%)	
Obese	326 (83.0%)	67 (17.0%)		168 (48.1%)	181 (51.9%)	
Chronic pain			0.004			0.034
No	775 (88.5%)	101 (11.5%)		210 (55.9%)	166 (44.1%)	
Yes	305 (82.2%)	66 (17.8%)		189 (48.0%)	205 (52.0%)	
Multimorbidity			<0.001			<0.001
0	427 (88.2%)	57 (11.8%)		92 (50.3%)	91 (49.7%)	
1	352 (88.0%)	48 (12.0%)		133 (55.6%)	106 (44.4%)	
2	165 (81.3%)	38 (18.7%)		96 (55.8%)	76 (44.2%)	
3+	107 (84.3%)	20 (15.7%)		70 (43.8%)	90 (56.2%)	
Missing	29 (87.9%)	4 (12.1%)		8 (50.0%)	8 (50.0%)	
Feel that lack companionship			0.019			0.008
No	1062 (87.0%)	159 (13.0%)		361 (53.7%)	311 (46.3%)	
Yes	18 (69.2%)	8 (30.8%)		38 (38.8%)	60 (61.2%)	
Feel left out			0.447			<0.001
No	1071 (86.7%)	164 (13.3%)		386 (53.5%)	336 (46.5%)	
Yes	–	–		13 (27.1%)	35 (72.9%)	
Feel isolated from others			0.403			<0.001

(*continued on next page*)

Table 2 (*continued*)

	Older adults with asthma without a pre-pandemic history of depression		p-value	Older adults with asthma with a pre-pandemic history of depression		p-value
	No depression	Depression in Autumn 2020		No depression	Depression in Autumn 2020	
	(n = 1080)	(n = 167)		(n = 399)	(n = 371)	
No	1076 (86.7%)	165 (13.3%)		389 (53.5%)	338 (46.5%)	
Yes	–	–		10 (23.3%)	33 (76.7%)	
Church activities			0.212			0.067
Rare	740 (85.7%)	123 (14.3%)		285 (49.7%)	289 (50.3%)	
Often	340 (88.5%)	44 (11.5%)		114 (58.2%)	82 (41.8%)	
Pray at home			0.061			0.067
Rare	547 (88.5%)	71 (11.5%)		178 (55.1%)	191 (44.9%)	
Often	533 (84.7%)	96 (15.3%)		221 (48.2%)	180 (51.8%)	
Adverse childhood experience	0.2 (0.5)	0.3 (0.7)	<0.001	0.4 (0.8)	0.5 (0.9)	0.058
Left home in the past one month during COVID			1.000			0.962
No	71 (86.6%)	11 (13.4%)		33 (50.8%)	32 (49.2%)	
Yes	1009 (86.6%)	156 (13.4%)		366 (51.9%)	339 (48.1%)	
How often do you feel lonely during COVID			<0.001			<0.001
Rarely or never/Some of the time	989 (89.6%)	115 (10.4%)		334 (57.9%)	243 (42.1%)	
Occasionally/All of the time	91 (63.6%)	52 (36.4%)		65 (33.7%)	128 (66.3%)	
Type of dwelling			0.228			0.447
House	891 (87.1%)	132 (12.9%)		297 (53.2%)	261 (46.8%)	
Apartment	164 (83.2%)	33 (16.8%)		86 (48.0%)	93 (52.0%)	
Others	–	–		16 (48.5%)	17 (51.5%)	
Living along during the COVID-19 pandemic			0.007			0.087
No	882 (87.9%)	121 (12.1%)		277 (54.1%)	235 (45.9%)	
Yes	198 (81.1%)	46 (18.9%)		122 (47.3%)	136 (52.7%)	
Functional limitation			0.010			<0.001
No	873 (87.9%)	120 (12.1%)		294 (60.0%)	196 (40.0%)	
Yes	207 (81.5%)	47 (18.5%)		105 (37.5%)	175 (62.5%)	
COVID _ Health stressors			0.006			0.026
No	753 (88.5%)	98 (11.5%)		234 (55.6%)	187 (44.4%)	
Yes	327 (82.6%)	69 (17.4%)		165 (47.3%)	184 (52.7%)	
COVID _ Difficulties with accessing resources			<0.001			0.094
No	900 (88.6%)	116 (11.4%)		328 (53.4%)	286 (46.6%)	
Yes	180 (77.9%)	51 (22.1%)		71 (45.5%)	85 (54.5%)	
COVID _ Family conflict			<0.001			<0.001
No	1021 (88.6%)	132 (11.4%)		368 (57.2%)	275 (42.8%)	
Yes	59 (62.8%)	35 (37.2%)		31 (24.4%)	96 (75.6%)	
COVID _ Other family Issues			0.001			0.005
No	455 (90.6%)	47 (9.4%)		168 (57.2%)	119 (42.8%)	
Yes	625 (83.9%)	120 (16.1%)		231 (24.4%)	252 (75.6%)	
COVID _ Health care			<0.001			<0.001
No	813 (89.3%)	97 (10.7%)		293 (57.6%)	216 (42.4%)	
Yes	267 (79.2%)	70 (20.8%)		106 (40.6%)	155 (59.4%)	
COVID _ Medications			0.178			0.002
No	1032 (86.9%)	155 (13.1%)		374 (53.7%)	322 (46.3%)	
Yes	48 (80.0%)	12 (20.0%)		25 (33.8%)	49 (66.2%)	

Note: — indicates a value that could not be released due to insufficient cell size.

during the COVID-19 pandemic in a large longitudinal study of Canadian older adults with a subsample of those with asthma, both with and without a history of depression. Our results revealed that approximately 1 in 7 (13.4%) older adults with asthma with no history of depression developed depressive symptoms that met the cut-off criteria for depression based on the CES-D-10 for the first time during the COVID-19 pandemic. Among those with a history of depression, approximately 1 in 2 (48.2%) experienced a recurrence of depressive symptoms that met the cut-off criteria for depression based on the CES-D-10 during the pandemic. Even among respondents who had not been depressed during the Baseline and Follow-up 1 waves, but had a diagnosis of depression in previous decades, the prevalence of recurrent depression was high (30%).

We conducted sensitivity analyses to examine the incidence and recurrence of depression of depression among older adults with asthma between the Baseline (2011–2015) and Follow-up 1 (2015–2018) waves. Our results indicate that the incidence and recurrence of depression at Follow-up 1 were 6.8% and 33.5%, respectively, which was substantially lower than the incidence and recurrence of depression during the pandemic, as described above. We also examined whether the incidence and recurrence of depression during the pandemic was higher among respondents with asthma when compared to respondents without asthma. We found that the recurrence of depression was significantly higher for respondents with asthma than those without asthma. This finding highlights the high vulnerability to depression during the COVID-19 pandemic among older adults with asthma who have a previous history of depression. The COVID-19 pandemic created substantial stressors for many older adults with asthma. When considering the pressure placed upon this population to strictly adhere to physical distancing limitations, combined with the concerns over being labelled "high-risk" for severe COVID-19 morbidity and mortality, it is unsurprising that this population experienced a precipitous decline in mental health during the pandemic.

Our hypothesis that older adults with low socioeconomic status would have higher levels of depression was partially supported. Although neither income nor education was associated with incident or

Table 3
Logistic regression results for incident depression by Autumn 2020 among older adults with asthma with no pre-pandemic history of depression (n = 1,247).

	Odds Ratio	95% Confidence Interval	p-value
Age	1.01	[0.99; 1.04]	0.340
Sex			
Male			
Female (ref.)	1.45	[0.97; 2.18]	0.073
Marital status			
Married/Common-law (ref.)			
Separated/Divorced/Widowed	0.75	[0.40; 1.40]	0.336
Single	1.17	[0.53; 2.59]	0.693
Immigrant status			
No (ref.)			
Yes	1.43	[0.88; 2.31]	0.148
Visible minority status			
No (ref.)			
Yes	0.47	[0.18; 1.24]	0.128
Education			
Less than secondary school (ref.)			
Secondary and some post-secondary	1.21	[0.23; 6.23]	0.830
Post-secondary degree/diploma	1.02	[0.21; 5.11]	0.977
Household income			
Less than $50,000 (ref.)			
$50,000–$99,999	1.43	[0.77; 2.69]	0.260
$100,000 or more	1.81	[0.89; 3.68]	0.100
Missing	0.33	[0.10; 1.08]	0.067
Dwelling ownership			
Rent (ref.)			
Own with mortgage	0.93	[0.43; 2.00]	0.854
Own without mortgage	1.07	[0.50; 2.19]	0.895
Missing	6.37*	[1.18; 30.50]	0.033
Total saving			
Less than $49,999 (ref.)			
$50,000–$99,999	0.97	[0.48; 1.97]	0.931
$100,000 or more	0.76	[0.41; 1.39]	0.366
Missing	1.77	[0.75; 4.17]	0.192
Whether income satisfies needs			
No	0.69	[0.28; 1.69]	0.420
Yes (ref.)			
BMI			
Underweight or normal weight (ref.)			
Overweight	0.68	[0.42; 1.08]	0.103
Obese	1.03	[0.64; 1.74]	0.916
Chronic pain			
No (ref.)			
Yes	1.40	[0.93; 2.10]	0.107
Multimorbidity			
0 (ref.)			
1	0.87	[0.55; 1.38]	0.562
2	1.29	[0.76; 2.18]	0.347
3+	1.03	[0.54; 2.00]	0.921
Missing	0.51	[0.14; 1.82]	0.300
Feel that lack companionship			
No (ref.)			
Yes	1.59	[0.49; 5.23]	0.443
Feel left out			
No (ref.)			
Yes	0.67	[0.10; 4.31]	0.673
Feel isolated from others			
No (ref.)			
Yes	1.76	[0.20; 15.61]	0.610
Church activities			
Rare	1.78*	[1.10; 2.89]	0.020
Often (ref.)			
Pray at home			
Rare	0.65*	[0.42; 0.99]	0.050
Often (ref.)			
Adverse childhood experience	1.29	[0.96; 1.74]	0.094
Left home in the past one month during COVID			
No (ref.)			
Yes	1.08	[0.51; 2.31]	0.841
How often do you feel lonely during COVID			
Rarely or never/Some of the time (ref.)			
Occasionally/All of the time	4.33***	[2.72; 6.91]	<0.001
Type of dwelling			
House (ref.)			
Apartment	1.16	[0.67; 2.00]	0.599

(*continued on next page*)

Table 3 (*continued*)

	Odds Ratio	95% Confidence Interval	p-value
Others	0.42	[0.08; 2.08]	0.278
Living along during the COVID-19 pandemic			
No (ref.)			
Yes	1.40	[0.78; 2.54]	0.264
Functional limitation scale			
No (ref.)			
Yes	1.29	[0.81; 2.07]	0.285
COVID _ Health stressors			
No (ref.)			
Yes	1.29	[0.88; 1.89]	0.198
COVID _ Difficulties with accessing resources			
No (ref.)			
Yes	1.60*	[1.03; 2.50]	0.038
COVID _ Family conflict			
No (ref.)			
Yes	4.18***	[2.47; 7.07]	<0.001
COVID _ Other family Issues			
No (ref.)			
Yes	1.26	[0.83; 1.91]	0.278
COVID _ Health care			
No (ref.)			
Yes	1.54*	[1.03; 2.30]	0.035
COVID _ Medications			
No (ref.)			
Yes	1.14	[0.53; 2.45]	0.740
Likelihood ratio test statistic	173.6***		
Nagelkerke R square	0.238		

recurrent depression, older adults who experienced a loss of income or an inability to access necessary supplies or food due to the pandemic were 60% more likely to develop incident depression when compared to those who had no loss of income or inability to access necessities during the pandemic. This aligns with other emerging longitudinal research that has found increases in depressive symptoms due to income loss during the COVID-19 pandemic [12]. Previous research has also shown that subjective stress about the adequacy of income for meeting basic needs is associated with poor mental health outcomes beyond the objective ability to meet financial requirements [13]; Wilkinson, 2016). This may partially explain why the precariousness and uncertainty of income loss during COVID-19 was associated with depression, while objective measures, such as pre-pandemic household income, were not associated with depression during the pandemic.

COVID-19 related factors that were associated with both incident depression and recurrent depression included disruptions to healthcare access and family conflict. Respondents who were unable to access their usual healthcare services hada 53% and a 71% higher risk of incident and recurrent depression, respectively. Even in the absence of in-person health services, it is important to find alternative care options to support the physical and mental health of older adults with asthma, such as providing remote care through telemedicine [14]. Ensuring that older adults with asthma have regular access to healthcare services is also important for monitoring medication adherence. Previous research has highlighted a negative association between depressive symptoms and treatment adherence in older adults with asthma [15,16]. There have been substantial declines in medication adherence among older adults with asthma during the pandemic [17], emphasizing the importance of increasing healthcare accessibility so that clinicians can be attuned to both adherence behaviours and mental health symptoms among asthma patients.

Older adults who experienced an increase in verbal or physical conflict and/or a breakdown in family or marital relationships had approximately quadruple the risk of incident and recurrent depression in this study. The COVID-19 pandemic disrupted many traditional coping mechanisms that may buffer family conflict, such as external social support and time spent outside the household. Interpersonal conflict has been previously identified as a risk factor for depression in later life [18].

As expected, respondents who reported feeling lonely at the beginning of the pandemic in the spring of 2020 had approximately double the risk of recurrent depression and quadruple the risk of incident depression by autumn 2020. This finding is consistent with pre-pandemic research on loneliness and depression among middle-aged and older adults, which found that 50% of female respondents and 42% of male respondents endorsing past-week loneliness met the CES-D-10 cut-off for depression, compared with less than 10% of female and 7% of male respondents who reported being rarely or never lonely during the past week [19]. This is of particular concern when considering that loneliness was previously identified as a major public health crisis among older adults prior to the pandemic [20], in conjunction with the high levels of loneliness among older adults during the pandemic [21].

Functional limitations were associated with an approximately doubled risk of recurrent depression, but were not associated with incident depression. Functional impairment is an important predictor of persistent depressive symptoms in older adults [22,23]. Emerging research has already indicated an increase in functional impairment and frailty among older adults during the COVID-19 pandemic, likely due to decreases in physical activity during periods of lockdown [24,25]. The physical functioning of older adults with asthma is an important determinant of quality of life including mental health within this population [26]. The current findings highlight the importance of promoting physical activity among older adults with asthma to mitigate some of the potential consequences of extended periods of lockdown, and ultimately support the mental well-being of this population.

5. Limitations

These findings should be considered in light of some limitations. First, depression was based on upon the CES-D-10, which is a self-report measure. Although this is a frequently utilized measure with high reliability and validity, a clinical assessment would have been preferable. Second, the current study did not have any information on illness severity among respondents with asthma. It is possible that the mental health effects of the COVID-19 pandemic may vary by asthma severity. Third, the CLSA dataset excluded residents living in long-term care institutions at baseline. When considering the extensive lockdown measures implemented in long term care homes during the pandemic, it is

Table 4
Logistic regression results for depression by Autumn 2020 among older adults with asthma with a pre-pandemic history of depression (n = 770).

	Odds Ratio	95% Confidence Interval	p-value
Age	1.01	[0.98; 1.03]	0.529
Sex			
Male (ref.)			
Female	1.26	[0.87; 1.82]	0.221
Marital status			
Married/Common-law (ref.)			
Separated/Divorced/Widowed	0.91	[0.54; 1.52]	0.709
Single	0.67	[0.37; 1.21]	0.183
Immigrant status			
No (ref.)			
Yes	1.11	[0.70; 1.76]	0.672
Visible minority status			
No (ref.)			
Yes	0.67	[0.27; 1.64]	0.374
Education			
Less than secondary school (ref.)			
Secondary and some post-secondary	1.14	[0.50; 2.61]	0.758
Post-secondary degree/diploma	1.15	[0.54; 2.44]	0.712
Household income			
Less than $49,999 (ref.)			
$50,000–$99,999	1.15	[0.72; 1.83]	0.571
$100,000 or more	1.21	[0.70; 2.15]	0.485
Missing	1.28	[0.58; 2.76]	0.559
Dwelling ownership			
Rent (ref.)			
Own with mortgage	0.91	[0.53; 1.58]	0.748
Own without mortgage	0.77	[0.44; 1.34]	0.352
Missing	1.21	[0.23; 6.37]	0.824
Total saving			
Less than $50,000 (ref.)			
$50,000–$99,999	0.81	[0.46; 1.46]	0.479
$100,000 or more	0.78	[0.49; 1.23]	0.287
Missing	1.01	[0.48; 2.09]	0.986
Whether income satisfies needs			
No	1.35	[0.81; 2.25]	0.248
Yes (ref.)			
BMI			
Underweight or normal weight (ref.)			
Overweight	0.80	[0.52; 1.25]	0.331
Obese	0.91	[0.60; 1.41]	0.711
Chronic pain			
No (ref.)			
Yes	0.92	[0.66; 1.30]	0.651
Multimorbidity			
0 (ref.)			
1	0.71	[0.46; 1.11]	0.135
2	0.64	[0.39; 1.05]	0.078
3+	0.78	[0.47; 1.30]	0.346
Missing	0.62	[0.18; 2.11]	0.448
ACE	1.12	[0.90; 1.38]	0.316
Feel that lack companionship			
No (ref.)			
Yes	1.17	[0.66; 2.09]	0.589
Feel left out			
No (ref.)			
Yes	1.89	[0.80; 4.47]	0.144
Feel isolated from others			
No (ref.)			
Yes	1.84	[0.74; 4.60]	0.190
Church activities			
Rare	1.15	[0.74; 1.79]	0.523
Often (ref.)			
Pray at home			
Rare	1.49*	[1.02; 2.19]	0.040
Often (ref.)			
Left home in the past one month during COVID			
No (ref.)			
Yes	1.07	[0.58; 1.94]	0.837
How often do you feel lonely during COVID			
Rarely or never/Some of the time (ref.)			
Occasionally/All of the time	2.28***	[1.54; 3.37]	<0.001
Type of dwelling			
House (ref.)			
Apartment	1.08	[0.69; 1.69]	0.736

(*continued on next page*)

Table 4 (*continued*)

	Odds Ratio	95% Confidence Interval	p-value
Others	0.77	[0.31; 1.92]	0.578
Living along during the COVID-19 pandemic			
No (ref.)			
Yes	1.07	[0.65; 1.76]	0.801
Functional limitation scale			
No (ref.)			
Yes	2.58***	[1.76; 3.79]	<0.001
COVID _ Health stressors			
No (ref.)			
Yes	1.19	[0.86; 1.66]	0.286
COVID _ Difficulties with accessing resources			
No (ref.)			
Yes	0.82	[0.53; 1.66]	0.369
COVID _ Family conflict			
No (ref.)			
Yes	3.82***	[2.36; 6.18]	<0.001
COVID _ Other family Issues			
No (ref.)			
Yes	1.24	[0.87; 1.76]	0.231
COVID _ Health care			
No (ref.)			
Yes	1.71**	[1.19; 2.46]	<0.001
COVID _ Medications			
No (ref.)			
Yes	1.57	[0.85; 2.88]	0.148
Likelihood ratio test statistic	164.7***		
Nagelkerke R square	0.257		

likely that the mental health of this group may have been disproportionately affected during the pandemic, resulting in the exclusion of a particularly vulnerable subset of older adults from this analysis. Finally, CLSA respondents had to be able to speak English or French, which limits the generalizability of these findings to community-dwelling older adults with fluency in English or French.

6. Conclusions

Despite these limitations, the current study uses a large, longitudinal sample of Canadian older adults to provide an in-depth analysis on the mental health of older adults with asthma during the COVID-19 pandemic. As the life returns to "normal" through widespread vaccination and the removal of physical distancing limitations, it is important to consider the potential longstanding mental health effects of the COVID-19 pandemic, and to provide care to those who may be vulnerable to adverse mental health outcomes beyond the pandemic.

CRediT authorship contribution statement

Andie MacNeil: Conceptualization, Writing – original draft, Writing – review & editing. **Grace Li:** Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Ying Jiang:** Conceptualization, Writing – review & editing, Supervision. **Margaret de Groh:** Conceptualization, Writing – review & editing, Supervision. **Esme Fuller-Thomson:** Conceptualization, Writing – review & editing, Methodology, Supervision, Project administration.

Declaration of competing interest

None.

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