Depression and Anxiety Symptoms in Young Adults Before and During the Covid-19 Pandemic: Evidence from a Canadian Population-Based Cohort

WATKINS-MARTIN, Kia MA, ORRI, Massimiliano PhD, PENNESTRI, Marie-Hélène PhD, CASTELLANOS-RYAN, Natalie PhD, LAROSE, Simon PhD, GOUIN, Jean-Philippe PhD, OUELLET-MORIN, Isabelle PhD, PHILIPPE, Frederick, PhD, BOIVIN, Michel, PhD, TREMBLAY, Richard E., PhD, CÔTÉ, Sylvana, M. PhD, GEOFFROY, Marie-Claude PhD.

Author Affiliations: McGill Group for Suicide Studies, Douglas Mental Health University Institute, Department of Psychiatry, Montreal, Quebec, Canada (Watkins-Martin, Orri, Geoffroy); Department of Educational and Counselling Psychology, McGill University, Montreal, Quebec, Canada (Watkins-Martin, Pennestri, Geoffroy); Hôpital en santé mentale Rivière-des-Prairies (CIUSSS-NIM; Pennestri); Department of Psychology, University of Montreal, Montreal, Quebec (Pennestri; Tremblay); School of Psychoeducation, University of Montreal, Montreal, Quebec (Castellanos-Ryan); CHU Ste-Justine Research Centre, Montreal, QC, Canada (Castellanos-Ryan, Côté); Educational Sciences, Laval University, Quebec City, Quebec, Canada (Larose); Department of Psychology, Concordia University, Montreal, Quebec, Canada (Gouin); School of Criminology, University of Montreal, Montreal, QC, Canada (Ouellet-Morin); Research Center of the Montreal Mental Health University Institute, Montreal, QC, Canada (Ouellet-Morin); Department of Psychology, UQAM, Montreal, Quebec, Canada (Philippe); School of Psychology, Laval University, Québec, Québec (Boivin); Department of Social and Preventive Medicine, University of Montreal, Quebec, Canada (Côté); Bordeaux Population Health, Université de Bordeaux, INSERM 1219, Bordeaux, France (Orri, Côté).

Corresponding author: Marie-Claude Geoffroy, Department of Educational and Counselling Psychology, McGill University, H3A 1Y2, Montreal, Quebec, Canada

marie-claude.geoffroy@mcgill.ca, 514-398-2817
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Abstract

Background: Concerns have been raised that the Covid-19 pandemic could increase risk for poor mental health, especially in young adults, a vulnerable age group. We investigated changes in depression and anxiety symptoms (overall and severe) from before to during the pandemic, as well as whether these changes are linked to Covid-19 related stressors and pre-existing vulnerabilities in young adults followed in the context of a population-based cohort.

Method: Participants (n=1039) from the Quebec Longitudinal Study of Child Development reported on their depression and anxiety and completed a Covid-19 questionnaire during the first wave of the COVID-19 pandemic in Summer 2020 (age 22 years). Assessments at age 20 (2018) were used to estimate pre-pandemic depression and anxiety symptom severity.

Results: While overall levels of depression and anxiety symptoms did not change, there was an increase in rates of severe depression (but not severe anxiety) from before (6.1%) to during (8.2%) the pandemic. Covid-19 related variables (e.g., loss of education/occupation, frequent news seeking) and pre-existing vulnerabilities (e.g., low SES, low social support) were not associated with changes in depression or anxiety symptoms. Further, youth with pre-existing depression and anxiety symptoms did not report a greater increase in symptoms during the pandemic, compared to those without; instead, they tended to show an improvement.

Interpretation: Depression and anxiety symptoms in young adults from Québec in Summer 2020 were comparable to symptoms reported in 2018. Most Covid-19 related stressors and pre-existing vulnerabilities were not associated with change in symptoms. However, the increased rate of severe depression is concerning.
Introduction

There is concern that the coronavirus disease 2019 (Covid-19) pandemic has negatively impacted depressive and anxiety symptoms (1–3), especially among young adults aged 18-25 years (4–7). While young adulthood is a period of good physical health, mental health problems are common (8,9). To date, most studies that have documented mental health putative consequences of the Covid-19 pandemic have relied on cross-sectional investigations of convenience samples (10–13), from which it is not possible to draw conclusions about whether and how mental health has changed from pre-pandemic levels. Only longitudinal studies with pre-pandemic assessments of depression and anxiety can allow one to quantify such changes according to a clear temporal sequence. The few longitudinal studies with pre-pandemic assessments of depression and anxiety symptoms in young adults have yielded inconsistent findings, with some showing deterioration (14,15) and others reporting no symptom change during the COVID-19 pandemic.

To our knowledge, no population-based study in the Canadian province of Quebec has examined whether the mental health of young adults has changed from before to during the first wave of the pandemic and identified factors associated with these changes. Using a longitudinal population-based cohort of young adults from Quebec, where strict lockdown measures (e.g., stay-at-home orders; social distancing; school and business closures) were implemented during the first wave of the COVID-19 pandemic, we aimed to: 1) examine whether and how depression and anxiety symptoms and severity changed from pre-pandemic (20 years) to during the pandemic in Summer 2020 (22 years); and 2) investigate whether these changes were linked to Covid-19 related stressors (e.g. loss of employment/education; Covid-19 related news seeking) and/or pre-existing vulnerabilities (low SES; severe depression and anxiety).
Method

Participants

The Québec Longitudinal Study of Child Development (QLSCD) (16) is an ongoing population-based cohort that includes 2120 participants born in 1997/98 in the province of Quebec, Canada. From July to August 2020, participants completed an online survey at age 22 years about their well-being during the Covid-19 pandemic. Of the 1593 individuals contacted, 1182 responded in 2020 (acceptance rate: 74%). Of those, 1039 had provided information on their mental health before the pandemic in Spring 2018, at age 20 years. The QLSCD, conducted by the Institut de la Statistique du Québec (ISQ; 17), was approved by ethical committees of the ISQ and the CHU Sainte-Justine Hospital Research Centre and written informed consent was obtained.

Measures

Depression and anxiety symptoms before (20 years) and during (22 years) the Covid-19 pandemic. Depressive symptoms were self-reported using the Centre for Epidemiological Studies Depression Scale, short form, (CES-D) including 12 items; (e.g., “I felt depressed”) rated from 0=rarely/non of the time to 3=most/all of the time (18–20). Anxiety symptoms were self-reported using the Generalized Anxiety Disorder 7-item scale (GAD-7) including 7 items (e.g., “Feeling nervous, anxious or on edge”) rated from 0=not at all to 3=nearly every day (21). Scores of 21 to 36 and of 15 to 21 are thought to indicate severe levels of depression and anxiety, respectively (18).

Covid-19 related stressors. All participants completed a questionnaire assessing their worries about the pandemic. Participants indicated their level of concern on a 4-point Likert scale (1=not at all to 4=extremely concerned) regarding: having a degree/certificate/diploma which will not be considered equivalent, compared to those who completed their degree prior to the pandemic; not having job prospects in the near future; and not having enough money to meet basic needs. The questionnaire also included items about their living status (alone vs. with others) and the level of disruption that the pandemic had on their life from mid-March to Summer 2020, including: loss of employment (“I lost
my job”; “I closed my business”); loss of education (“All or some of my courses have been rescheduled to Fall 2020”; “I have dropped all my courses”; “My internship has been postponed or cancelled”); a positive Covid-19 test result (yes vs. no); Covid-19 related daily news seeking on traditional or social media (<2 hours vs. ≥ 2 hours per day); and participants’ geographic region based on their postal code (Montreal vs. other regions), as Montreal was the hardest hit region in the Province of Québec in March-August 2020, as per the number of confirmed cases and Covid-19 related deaths (22).

**Pre-existing vulnerabilities.** Pre-existing vulnerabilities increasing risk for poor mental health (23–28) were assessed before the Québec government enforced lockdown measures as of mid-March 2020: not in education or employment at 22 years (just prior to the onset of the pandemic); having parents of low socioeconomic status (SES) (defined as scores ≤1 standard deviation (sd) on SES scale aggregating annual gross income, parental education level, and parental occupational prestige from ages 15 and 17 years) (29); sexual orientation at 17 years (same sex/bisexual/asexual vs. opposite sex; if missing, 15 years was used); low social support at 19 years (defined as score ≤1 sd on the 10-item Social Provision Scale) (30); low life satisfaction at 19 years old (defined as a score of ≤5 on the following item: “Using a scale of 0 to 10, where 0 means ‘very dissatisfied’ and 10 means ‘very satisfied’, how do you feel about your life as a whole right now?”) (31); and a chronic learning disability diagnosis as reported by the mother at 15 or 17 years (no vs. yes).

**Statistical analyses**

All statistical analyses were conducted in IBM SPSS, version 26, using cohort weights to ensure representativeness of the sample. First, we described the Covid-19 related stressors and pre-existing vulnerabilities variables using counts and percentages. Second, we tested whether (a) a mean symptom score and (b) a severity category of depressive and anxiety symptoms changed from before to during the Covid-19 pandemic using paired t-tests. Third, we calculated change in depression and anxiety symptoms by subtracting the mean symptom before the pandemic (20 years) to the mean during the pandemic (22 years). We standardized the mean change score (change/SD of change) to ease...
interpretation; positive scores indicate an increase in depression and anxiety symptoms. Then, we examined crude associations between Covid-19 related stressors and pre-existing vulnerabilities variables and change in depression and anxiety symptoms, using t-tests and ANOVAs. The p-value for significance was set at .05. We used multiple imputation (MI) to generate 100 datasets to handle missing values on risk factors. Missing values ranged from 0.9% (loss of employment) to 17.9% (sexual minority); there was no missing data for Covid-19 related stressors.

**Results**

Descriptive statistics on Covid-19 related stressors and pre-existing vulnerabilities are shown in Table 1. Figure 1 depicts descriptive statistics for Covid-19-related concerns. The vast majority of young adults reported that they were “not at all concerned” about (a) having a compromised diploma, (b) loss of job prospects or (c) having enough money to meet basic needs, whereas 10.2%, 21.4% and 14.0% reported that were ‘very or extremely concerned’, respectively. As shown in Table 2, there was no difference in the means of depression and anxiety symptoms from before to during the pandemic, as reported by participants in July-August 2020. However, while the prevalence of severe anxiety did not increase significantly, that of severe depression did, with 6.2% of participants reporting severe depressive symptoms before the pandemic compared to 8.1% during the pandemic (increase of 1.9%; \( p = .041 \)).

Figure 2 and Supplemental Table 1 depict standardized change in depression and anxiety from before the pandemic (20 years) to during the pandemic (22 years) as a function of Covid-related stressors. Symptoms of depression and anxiety did not vary according to the Covid-19 related stressors, except for participants living alone who reported a slight increase of depressive symptoms (0.22, SD).

Figure 3 and Supplemental Table 1 depict standardized change in depression and anxiety as a function of pre-existing vulnerabilities. Participants with pre-existing severe symptoms of depression and anxiety experienced a significant decrease in depressive and anxiety symptoms from before to during the pandemic. That is, individuals with severe depression at age 20 years experienced a decrease
in depressive symptoms from 20 to 22 years (1.26 SD), while those with severe anxiety experienced decrease in anxiety symptoms of 1.61 SD.

**Discussion**

Using a population-based cohort of young adults with data collected two years before the pandemic and 4 months after the onset of the first wave of the pandemic (Summer 2020) in the province of Quebec, this study examined changes in symptoms of depression and anxiety and investigated whether these changes are linked to pandemic-related stressors and/or pre-existing vulnerabilities. On average, young adults did not report change in depression and anxiety across the full spectrum of symptoms. However, the prevalence of severe depressive symptoms increased by 1.9% during the initial months of the pandemic, while there was no change in severe anxiety symptoms. Most Covid-19 related stressors (e.g., loss of education/occupation) and variables pertaining to pre-existing vulnerabilities (e.g., low SES, low social support) were not associated with changes in symptoms of depression and anxiety. Contrary to expectations (14,15), we did not observe a generalized worsening of depressive and anxiety symptoms during the pandemic among participants with severe pre-pandemic depression and anxiety. Instead, we found that mental health of those with pre-existing severe depression and anxiety symptoms improved over time.

Our findings showing no increase in depression and anxiety symptoms from before to during the pandemic are comparable to a prior longitudinal study (15) using a sample of 768 young adults living in Switzerland. This study found that internalizing symptoms (assessed using depressive, anxiety, and suicidal ideation and self-injury items from the Social Behavior Questionnaire) did not significantly increase from before (20 years) to during the pandemic in April 2020 (22 years). In contrast, a study of 624 undergraduate students (mean age: 19.6 years) in Baoding, China found that symptoms of depression and anxiety (as measured by the PHQ-4) significantly increased from before (December 2019) to during the pandemic (February 2020) (32).
Although on average we did not observe changes across the full spectrum of symptoms, the prevalence of severe depression slightly increased by 1.9% from before to during the pandemic. However, the prevalence of severe anxiety did not change, suggesting that mental health consequences of the pandemic might be specific to severe depression. This is in line with a recent systematic review and meta-analysis of 65 longitudinal cohort studies by Robinson and colleagues that found that compared to symptoms of anxiety, increases in depressive symptoms tended to be larger and remained elevated beyond the first months of the pandemic (33).

None of the Covid-19 related stressors were associated with a change in depression and anxiety symptoms, except for those living alone who experienced a slight increase in depressive symptoms. These findings are line with results from a large prospective panel study weighted to population proportions (n=36,520) and conducted over the first 20 weeks of lockdown in the UK that identified living alone as a risk factor for higher symptoms of depression and anxiety during the pandemic. While most pre-existing vulnerabilities were not associated with change in depression and anxiety symptoms, we found that participants with pre-existing severe manifestations of depression and anxiety at age 20 years experienced a significant decrease in depressive and anxiety symptoms during the pandemic. While pre-existing mental health vulnerabilities have been identified in several cross-sectional studies as a risk factor for mental health deterioration during the pandemic (34–38), to date, evidence from longitudinal studies is relatively scarce and contradictory (33). For example, in a longitudinal study conducted on three psychiatry case control cohorts in the Netherlands (N=1517, mean age: 56.1 years), the Covid-19 pandemic did not seem to exacerbate the severity of pre-existing symptoms among those with pre-pandemic severe mental health problems (39), which researchers suggested might be explained by stay-at-home orders allowing for the implementation of more structured and consistent daily routines (39,40). In a longitudinal study by Hamza and colleagues conducted with students at a Canadian university (N=773), participants with pre-existing mental health problems showed decreasing depressive and anxiety symptoms (from before (May 2019) to during...
(May 2020) the pandemic, whereas their peers without pre-existing mental health problems showed increasing depressive and anxiety symptoms during the pandemic (41). In contrast, a cohort study on young adults in Switzerland identified pre-pandemic emotional distress as the largest risk factor for increased emotional distress during the pandemic (15). In our study, symptoms of youth with pre-existing severe symptom did not deteriorate but rather improved, possibly reflecting a natural improvement of mental illness over time (regression to the mean), or a reduction in social stressors during periods of confinement.

Altogether, these conflicting findings about the mental health consequences of the pandemic may be attributed to several different factors. Firstly, change depression and anxiety symptoms might vary according to the type and severity of government lockdown measures in place when symptoms were assessed (42). Indeed, the systematic review of longitudinal studies by Robinson and colleagues mentioned above found that while there was an overall increase in mental health symptoms from before to during pandemic, this increase was most pronounced during the early stages of the pandemic (March-April 2020) before decreasing back toward pre-pandemic levels over the following months (May-July 2020). Data for the current study was collected in July-August 2020, during which time Quebecers were newly permitted to gather in private (up to 10 people from 3 different households) and public settings (up to 50 people in movie theaters, reception halls, and places of worship, among other locations) after months of strict lockdown (43). Participants’ newfound ability to socialize after months of isolation may have offset the impact of pandemic-related stress experienced during the strict lockdown. Indeed, a German study examining the effects of different kinds and levels of restrictive public health measures during the pandemic (e.g., quarantine/lockdown/stay-at-home orders) on symptoms of anxiety and depression found that stricter restrictions, greater reduction of social contact, and greater perceived changes in daily life were associated with poorer mental health (42).

Secondly, depression and anxiety symptoms may vary in accordance with government socioeconomic policies, which differ across countries. Soon after the onset of the pandemic, the
Canadian government introduced relatively generous payments for workers and post-secondary students whose income earning abilities were negatively impacted (e.g., reduction in hours; job loss) by the Covid-19 pandemic (44,45). These government measures may have had a protective effect against depression and anxiety. For example, a survey study using data collected by the US census Bureau from April to July 2020 found that the prevalence of depressive and anxiety symptoms varied across states by what the investigators called “household income shock” (46) (i.e. the experience of job loss and/or partial income loss), which was buffered by state-level differing socioeconomic policies (e.g. access to Medicaid, unemployment insurance, and suspended utility shut-offs) (46). Despite the potentially buffering effects of the Canadian government’s economic response plan against symptoms of depression and anxiety, it is worth noting that future professional opportunities were still among the primary Covid-related concerns shared by young adults, with 21.4% of our participants stating that they were very or extremely concerned by future job prospects (see Figure 1).

Lastly, the normal process of psychological adaptation following distressing events might also come into play in explaining the inconsistent findings on the impact of the pandemic on the mental health of young adults (13,47). Consistent with findings from a meta-analysis indicating that mental health deteriorated at the onset of the pandemic before returning to baseline levels by mid-2020 (33), a prospective longitudinal study in the UK examining anxiety and depression over the first 20 weeks of lockdown (March 23-August 9, 2020) found that there was a significant decrease in depressive and anxiety symptoms throughout both the strict lockdown period and the period during which lockdown measures were eased (48). Moreover, the same study found that younger adults showed faster improvements in depression and anxiety symptoms compared to older adults (48). This suggests that while some studies find young adults to be at greater risk for mental health problems during the pandemic, they may be better able to psychologically adapt to challenging circumstances relative to older adults, or that factors contributing to persistent internalizing symptoms may have been alleviated by the confinement measures (e.g., lack of commute; additional rest time; accommodations for final
exams). However, given that most studies on the mental health impact of the Covid-19 pandemic on young adults were conducted during the first wave of the pandemic in 2020, the mental health impact of the subsequent waves is still unclear.

**Methodological Considerations**

This study has a number of strengths, including its longitudinal design; the use of standardized measures of depression and anxiety; and data collected before and during the pandemic from the same participants. We acknowledge the following limitations. As in all longitudinal surveys, attrition occurred over the years and the most vulnerable individuals were underrepresented. Although all analyses were weighted, such differential attrition could potentially result in underestimation of the rates of anxiety and depression and consequently of the mental impact of Covid-19. Mental health outcomes were measured by self-report questionnaires, which do not provide clinical diagnoses. While we were able to use longitudinal data with mental health assessments before and during the Covid-19 pandemic, it is difficult to differentiate between mental health changes attributable to the pandemic versus developmental changes that are typical for this age group.

**Conclusion**

On average, depressive and anxiety symptoms did not significantly change during the first wave of the COVID-19 pandemic among young adults, although the prevalence of severe depression did increase. While the majority of the young adults showed a pattern of symptoms consistent with adaptation to the pandemic, these findings underscore the need for facilitating access to treatment for the subgroup of individuals who may be newly struggling with severe symptoms of depression. Future studies should track the mental health of young adults throughout the subsequent waves of the Covid-19 pandemic after Summer 2020.
Table 1. Descriptive statistics of the Covid-19 related stressors and pre-existing vulnerabilities, weighted.

| Covid-19 Related Stressors                                      | n  | %   |
|-----------------------------------------------------------------|----|-----|
| **Sex**                                                         |    |     |
| Male                                                            | 417| 40.1|
| Female                                                          | 622| 59.9|
| **Living Status**                                               |    |     |
| Alone                                                           | 90 | 8.7 |
| With Others                                                     | 949| 91.3|
| **Loss of Employment**                                          |    |     |
| No                                                               | 790| 76.0|
| Yes                                                              | 249| 24.0|
| **Loss of Education**                                           |    |     |
| No                                                               | 805| 77.5|
| Yes                                                              | 234| 22.5|
| **Positive Covid-19 Test**                                     |    |     |
| No                                                               | 1030| 99.0|
| Yes                                                              |   9 | 1.0 |
| **Daily Covid-19 Related News Seeking**                        |    |     |
| <2 hours                                                         | 783| 75.0|
| ≥2 hours                                                        | 256| 25.0|
| **Living in Montreal**                                         |    |     |
| No                                                               | 831| 80.0|
| Yes                                                              | 208| 20.0|

| Pre-Existing Vulnerabilities                                   | n  | %   |
|-----------------------------------------------------------------|----|-----|
| Not in Education or Employed (22 years, pre-pandemic)           |    |     |
| No                                                               | 941| 90.6|
| Yes                                                              | 98 | 9.4 |
| Low SES Families (15, 17 years)                                 |    |     |
| No                                                               | 873| 84.0|
| Yes                                                              | 166| 16.0|
| Sexual Minority (15, 17 years)                                  |    |     |
| No                                                               | 921| 88.6|
| Yes (Gay, Lesbian, Asexual)                                    | 118| 11.4|
| Low Social Support (19 years)                                   |    |     |
| No                                                               | 892| 87.3|
| Yes                                                              | 147| 12.7|
| Low Life Satisfaction (19 years)                                |    |     |
| No                                                               | 901| 86.7|
| Yes                                                              | 138| 13.3|
| Learning Disability Diagnosis (15, 17 years)                    |    |     |
| No                                                               | 963| 92.7|
| Yes                                                              | 76 | 7.3 |
| Pre-Existing Depression Symptoms (20 years)                     |    |     |
| No/low/moderate                                                 | 975| 93.8|
| Severe                                                           | 64 | 6.2 |
| Pre-Existing Anxiety Symptoms (20 years)                        |    |     |
| No/low/moderate                                                 | 990| 95.3|
| Severe                                                           | 49 | 4.7 |

Note: Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2020), Québec Government, Québec Statistical Institute.

Maximum N available ranges from 869 to 1039.

a Defined as scores <1 standard deviation of the sample mean.
b Defined as scores 0 to 5 on a scale of 0 to 10, where 0 means ‘very dissatisfied’ and 10 means ‘very satisfied’.
c Severe symptoms were defined by Centre for Epidemiological Studies-Depression scale scores ≥ 21 and Generalized Anxiety Disorder 7-item scale scores ≥ 15.
Table 2. Descriptive statistics for depression and anxiety symptoms before (20 years) and during (22 years) the Covid-19 pandemic, \( n=1039 \), weighted.

|                                | Before Covid-19 Pandemic (20y) | During Covid-19 Pandemic (22y) | \( P \) Value for Differences Before vs. During the Pandemic |
|--------------------------------|---------------------------------|---------------------------------|-------------------------------------------------------------|
| Depressive symptoms, mean (SD) | 9.30 (6.42)                     | 9.59 (6.79)                     | .153                                                        |
| Severe depression symptoms, N (%) \(^a\) | 64 (6.2%)                    | 80 (8.1%)                       | .041                                                        |
| Anxiety symptoms, mean (SD)    | 4.73 (4.61)                     | 4.45 (4.70)                     | .060                                                        |
| Severe anxiety symptoms, N (%) \(^a\) | 51 (4.9%)                     | 49 (4.7%)                       | .807                                                        |

Note: Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2020), Québec Government, Québec Statistic Institute.

\(^a\) Severe symptoms were defined by Centre for Epidemiological Studies-Depression scale scores \( \geq 21 \) and Generalized Anxiety Disorder 7-item scale scores \( \geq 15 \).
Figure 1. Descriptive statistics of the COVID-related concerns, \( n=1039 \), weighted

![Bar chart showing the percentage of sample feeling concerned about various issues related to COVID-19.]

*Note:* Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2020), Québec Government, Québec Statistic Institute.
Figure 2. Change in Depression and Anxiety Z-Scores from Before the Pandemic (20 years) to During the COVID-19 Pandemic (22 years) as a function of variables in the Covid-19 questionnaire; n=1039, weighted.

Note: Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2020), Québec Government, Québec Statistic Institute. Positive scores indicate a deterioration of mental health.
Figure 3. Change in Depression and Anxiety Z-Scores from Before the Pandemic (20 years) to During the COVID-19 Pandemic (22 years) as a function of pre-existing vulnerabilities; $n=1039$, weighted.

Note: Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2020), Québec Government, Québec Statistic Institute. Positive scores indicate a deterioration of mental health.
**Supplemental Table 1.** Change in depression and anxiety symptoms from before the pandemic to during the pandemic.

| Variables                             | Mean difference: depressive symptoms (SE) | p value | Mean difference: anxiety symptoms (SE) | p value |
|---------------------------------------|-------------------------------------------|---------|----------------------------------------|---------|
| **COVID-19 questionnaire**            |                                           |         |                                        |         |
| Living alone                          | 0.22 (0.10)                               | .020    | 0.05 (0.12)                            | .657    |
| Loss of employment                    | 0.06 (0.07)                               | .451    | 0.12 (0.07)                            | .107    |
| Loss of education                     | 0.02 (0.08)                               | .769    | 0.00 (0.08)                            | .959    |
| Positive Covid-19 test                | 0.10 (0.37)                               | .795    | 0.03 (0.24)                            | .917    |
| Frequent Daily Covid-related news seeking | 0.02 (0.07)                               | .772    | -0.04 (0.07)                          | .560    |
| Living in Montreal                    | 0.16 (0.09)                               | .063    | 0.10 (0.09)                            | .262    |
| **Pre-existing vulnerabilities**      |                                           |         |                                        |         |
| Not in education or employed          | -0.22 (0.12)                              | .060    | -0.09 (0.11)                           | .398    |
| Low family SES                        | 0.04 (0.09)                               | .686    | 0.10 (0.09)                            | .239    |
| Sexual orientation minority           | 0.05 (0.13)                               | .680    | 0.10 (0.13)                            | .435    |
| Learning disability diagnosis         | -0.03 (0.14)                              | .824    | -0.04 (0.13)                           | .770    |
| Low social support                    | -0.01 (0.10)                              | .924    | 0.04 (0.10)                            | .712    |
| Low life satisfaction                 | -0.09 (0.11)                              | .428    | -0.18 (0.12)                           | .118    |
| Severe pre-existing depression        | -1.26(0.15)                               | <.001   | -0.62 (0.16)                           | <.001   |
| Severe pre-existing anxiety           | -0.48 (0.20)                              | .016    | -1.61 (0.15)                           | <.001   |
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