SSM - Population Health

Mental Health and Economic Concerns from March to May during the COVID-19 Pandemic in Canada: Insights from an Analysis of Repeated Cross-sectional Surveys
--Manuscript Draft--

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Abstract:	Background The COVID-19 pandemic impacted the psychological wellbeing of populations worldwide. In this study, we assess changes in mental health during the early months of the pandemic in Canada and examine its relationship with another prominent problem during this time, economic concerns. Methods Analyses were based on two cycles of the nationally representative repeated cross-sectional Canadian Perspectives Survey Series (N=4,627 in March and 4,600 in May). We described the changes in mental health and economic concerns between March and May, and assessed the relationship between the two characteristics. Results Mental health declined significantly during the early months of the COVID-19 pandemic: the proportion of Canadian adults who reported only good/fair/poor mental health grew from 46% to 52% from March to May. Economic concerns including food insecurity were an important correlate of 'bad' mental health, as was younger age, female gender, and Canada-born status. Contrary to expectations, however, economic concerns lessened during this time frame. Conclusions These findings suggest that policies to mitigate economic stress, such as Canada's Emergency Response Benefit, may have eased mental health deterioration in early pandemic months through a reduction in financial hardship. Interventions to increase the economic security of the population will have far-reaching consequences in terms of improved mental health, and should be continued throughout the pandemic.
Response to Reviewers:	

Western ⬢ SocialScience

Social Science and Medicine-Population Health Editorial Office
Harvard T.H. Chan School of Public Health, 677 Huntington Ave,
Boston, Massachusetts, 02115

October 24, 2020

Dear Dr. Kawachi and Dr. Subramanian,

Thank you for the opportunity to further revise our article SSMPH-D-20-00247R1 on mental health and economic concerns during COVID-19 in Canada. We greatly appreciate your and Reviewer 1's continued positive assessment of our contribution. In this revision, we added clarity and additional detail about the logistic regression model at the center of the analysis.

We would like to bring your attention to the fact that Reviewer 1 continues to make the **incorrect assumption** that we have panel data. In fact, as now state in 7 places in the manuscript, our data is a **repeated cross-sectional survey**. This is a widely utilized data structure for assessing changes (or trends) in population health. We employ statistical methods optimal and widely used for the analysis of repeated cross-sectional data. Our conclusions are justified and warranted based on the analyses.

We hope that the changes we made to the manuscript in this round of reviews, including a change in the title to emphasize the repeated cross-sectional nature of the data, satisfy the concerns and that the current version of our study will be found satisfactory for acceptance in *Social Science and Medicine-Population Health.*

Thank you for the opportunity to share our work.
Sincerely,

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Dear Dr. Kawachi and Dr. Subramanian,

Thank you for your continued consideration of our manuscript SSMPH-D-20-00247 "Mental Health and Economic Concerns from March to May during the COVID-19 pandemic in Canada" for possible publication in SSM-PH. We appreciate your favorable review of our revisions, especially the addition of a change model. We have further clarified our approach, as we detail below.

We would like to note that Reviewer #1 continues to make the incorrect assumption that we have panel data although we state numerous times that we rely on **repeated cross-sectional surveys** and do not <u>use</u> **panel data**. Reviewer #1's comments would be absolutely on-target if we had panel data, we agree, but that's not the case here.

We made numerous additional changes to the manuscript in order to correct this misunderstanding. In addition to the more detailed description of our analytic approach, we changed the title of the manuscript and now refer to the data "cycles" rather than "waves."

EDITOR AND REVIEWER COMMENT

Editor: Like the reviewer, we also found your description of the change analysis to be somewhat opaque. The presentation would be improved by writing out an equation for what you did.

Reviewer #1: I appreciate that the authors introduced a change model in their revised paper. However, the description of the change model is sorely lacking in detail, and I'm fearful that standard panel data strategies have not been taken into account. For example, standard logistic regression that does not take into account the nested data structure (observations clustered in individuals) would be problematic, but I'm not sure if this was. done or not. What kinds of selection bias issues are present when one considered the observations that are dropped in Wave 2? Are there issues with the baseline levels of anxiety that would impact how the levels could/did change? This seems like a very quick and rough approach to the data, and to make for a strong analysis, the authors should really consider being more thoughtful about the data and how to describe and model it.

AUTHORS' RESPONSE

We appreciate the Reviewer #1's quick turnaround and continued positive assessment of our study.

We added the more detail explaining the regression model we estimate (see below).

Reviewer #1 makes the **incorrect** assumption that we have panel data. Our data are **repeated cross-sectional surveys**. We have made several changes in the paper to ensure that we no longer give this impression to the reviewer.

- We no longer use the term "Waves" and have substituted it for the term "Cycles".
- In addition to the four places in the previous draft where we highlighted the fact that we relied on repeated cross-sectional data, we have added several other references to the fact that we are using "repeated cross-sectional data." Please see the Title, the Abstract, pages 4, 7, 11, and 13.
- In the notes section for tables and figures, we also indicate that we analyze repeated cross-sectional data.

Therefore, several comments made by the reviewer are not applicable for our study. We cannot apply panel data strategies, including making adjustments for nested data or handling missing data problems due to (panel) data attrition.

We wish to also note that there is no "baseline levels of anxiety" – the anxiety battery was not given in the first Cycle in March, as we state in the Variables section, which we divide into a section "Variables collected identically in both Cycles" and "Variables collected only in Cycle 2."

Please see Table RM 1 below. The table shows the subset of variables collected in both waves, and the subset available only in Survey 2 in May. This also emphasizes the importance of the "second part of the analysis" using only May data because the excellent mental health indicator GAD-7 anxiety measure and two important covariates – rural residence and food insecurity – were only collected in Survey 2 in May.

Table RM 1. Availability of each variable in Cycles 1 and 2.

	Cycle 1 (March)	Cycle 2 (May)
OUTCOMES		
Self-rated mental health	✓	✓
Anxiety		✓
PREDICTORS		
Demographics	✓	✓
Education	✓	✓
Employment/security	✓	✓
Financial impact of the pandemic	✓	✓
Rural/urban residence		✓
Food insecurity		✓

Sources: CPSS 1 and CPSS-2

Notes: We rely on repeated, cross-sectional surveys. This table displays whether a variable was collected in Survey 1 and/or Survey 2. Demographics include age, gender, immigrant status, dwelling type, marital status, children in household, and household size.

Bolded variables indicate key predictors and outcome.

While we agree that panel data would be nice to have, assessing change between two time points with two cross-sections of nationally representative surveys is a standard approach. In fact, assessments of trends in mortality, disability, pain, or other health measures in populations are normally based on repeated cross-sections, such as in the National Health Interview Surveys. (We don't use the term 'trend' because we only have two time points and hence prefer the term 'change.')

In the methods section, we now introduce the logistic model as follows: "Next, we tested for mental health change from March to May. We estimated logistic model of the form $Logit(P(Y_i)) = \beta_0 + \beta_1 C_i + \beta_2 X_{i1} + \cdots + \beta_{p+1} X_{im}$, where $P(Y_i)$ is the probability of 'bad' mental health. The key parameter of interest is β_1; C_i is the indicator for Cycle such that $C_i = 0$ for observations in Cycle 1, and $C_i = 1$ for observations in Cycle 2. The variables $X_{i1}, \dots, X_{im}$ represent m covariates for individual i such as age, gender, etc. The index i goes from 1 to $n_1 + n_2$ where n_1 is the number of observations in Cycle 1 and n_2 is the number of observations in Cycle 2. The purpose of this step, which is the best approach for a repeated cross-sectional data structure, was to estimate the change in the odds of 'bad' mental health between March

and May (β_1), as well as the association between all covariates and the odds of reporting 'bad' mental health in the pooled, Cycle 1+Cycle 2, sample ($\beta_2, ..., \beta_{m+1}$). We also checked whether the effect of covariates on mental health changed between March and May by including interactions between covariates $X_{i1}, ..., X_{im}$ and the Cycle 2 indicator C_i (Supplemental Table 3; no interaction was statistically significant, indicating that the effects did not change between March and May)."

We also recognize the cross-sectional data as a limitation in the Discussion section. We write: "Several caveats limit the utility of our findings. We relied on repeated cross-sectional data, which did not allow us to examine changes in mental health and in economic concerns within individuals for a more causal interpretation. We hope Statistics Canada considers the collection of panel studies as they continue to collect data aimed at monitoring the impact of COVID-19."

It is important, however, to note that the repeated cross-sectional data have been used in most analyses of trends and changes in health and wellbeing over time in populations, and that our conclusions are justified and correctly grounded in the estimated models.

Highlights

- The disruptions and restrictions of the COVID-19 pandemic have had a powerful effect on mental health, as well as economic concerns, in populations worldwide.

- We found that mental health deteriorated during early stages of the COVID-19 pandemic from March to May 2020 among Canadian adults

- However, economic concerns lessened during this time, contrary to expectations.

- This change, which coincided with the implementation of economic interventions by the Canadian government, reduced the deterioration of mental health in the population

Mental Health and Economic Concerns from March to May during the COVID-19 Pandemic in Canada: Insights from an Analysis of Repeated Cross-sectional Surveys

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Mental Health and Economic Concerns from March to May during the COVID-19

Pandemic in Canada: Insights from an Analysis of Repeated Cross-sectional Surveys

Blinded for review

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ABSTRACT

Background

The COVID-19 pandemic impacted the psychological wellbeing of populations worldwide. In this study, we assess changes in mental health during the early months of the pandemic in Canada and examine its relationship with another prominent problem during this time, economic concerns.

Methods

Analyses were based on two cycles of the nationally representative repeated cross-sectional Canadian Perspectives Survey Series (N=4,627 in March and 4,600 in May). We described the changes in mental health and economic concerns between March and May, and assessed the relationship between the two characteristics.

Results

Mental health declined significantly during the early months of the COVID-19 pandemic: the proportion of Canadian adults who reported only good/fair/poor mental health grew from 46% to 52% from March to May. Economic concerns including food insecurity were an important correlate of 'bad' mental health, as was younger age, female gender, and Canada-born status. Contrary to expectations, however, economic concerns lessened during this time frame.

Conclusions

These findings suggest that policies to mitigate economic stress, such as Canada's Emergency Response Benefit, may have eased mental health deterioration in early pandemic months through a reduction in financial hardship. Interventions to increase the economic security of the population will have far-reaching consequences in terms of improved mental health, and should be continued throughout the pandemic.

KEYWORDS

This study aims to describe how mental health changed during the early phase of the COVID-19 pandemic among Canadian adults, and to assess how economic concerns contributed to overall mental health levels and trends.

Major public health crises, like the COVID-19 pandemic, generate feelings of insecurity, fear, uncertainty, and emotional isolation that can translate into higher levels of psychological distress (Pfefferbaum & North, 2020). Indeed, emergent studies from the United States (US), United Kingdom (UK), China, and other countries documented the high overall levels of depression, anxiety, and distress in their populations (Rajkumar, 2020; Salari et al., 2020; Serafini et al., 2020; Xiong et al., 2020)—levels that are significantly higher than before the pandemic, as studies from the UK (Daly et al., 2020; Pierce et al., 2020) and Canada showed (Findlay & Arim, 2020).

However, it is less clear how mental health has changed *over the course of the pandemic*. This is an important question because governments need to track changes in the wellbeing of their populations in order to assess needs and target interventions appropriately. Unfortunately, the findings are scarce and contradictory. For instance, a UK study described a "pronounced and prolonged" deterioration of mental health from April to June 2020 (Kwong et al., 2020). In contrast, no significant changes in anxiety and depression levels were apparent in a sample of Chinese adults from February to March, 2020 (Wang et al., 2020). Thus, there's urgent need to document changes in mental health as the pandemic develops.

The economic impact of the pandemic is of particular concern to national economies and individuals alike, as financial hardship is a strong predictor of mental health problems (Holmes et al., 2020). At a population level, major economic crises in general are tied to more mental health problems and even increased suicide rates (Uutela, 2010). Moreover, a recent US study found that job insecurity and financial concerns due to COVID-19 are linked to elevated

depression and anxiety among US adults (Wilson et al., 2020). *However, little is known about the pandemic's impact on mental health in many other countries, including Canada.*

Canada is an important case because of its close ties with the United States, shared English language, and integrated economies, as well as important political, public-health, and health-care differences. During the first wave of the pandemic, Canada's infection rates were roughly average among high-income countries –much lower than the US or France, but higher than Denmark or Japan (European Centre for Disease Prevention and Control, 2020). In terms of economic welfare, Canada is also middle-of-the-road, providing a better social safety net than the US but much less than social democratic welfare states in Europe. Yet no prior research exists on mental health trends during the pandemic and the role of economic concerns on mental health among Canadian citizens. How did Canadian adults adjust to the restrictions of the early COVID months? Did they acclimate to, and rebound from, the initial uncertainties, or has there been a continued deterioration of psychological health and well-being? The answers to these questions are vital for monitoring how the population is enduring the pandemic hardships, and represent critical pieces of information for economic, health, and social policies that must be enacted to steer countries successfully through the pandemic.

There is an urgent need to quantify the impact of the pandemic on mental health and identify the risk factors that heighten mental health vulnerabilities of individuals and groups in order to target health and economic interventions effectively and support the groups that need it the most. This need is particularly acute now in the fall of 2020, as Canada, the US, and many other countries wrestle with the second wave of the pandemic.

METHOD

Data

Analyses are based on two cycles of the nationally representative repeated cross-sectional Canadian Perspectives Survey Series (CPSS), administered by Statistics Canada (2020a). The

purpose of this survey series is to collect information about the health and economic impacts of the COVID-19 pandemic. The first survey, The Canadian Perspective Survey Series 1: Impacts of COVID-19 (CPSS1-COVID), was administered between March 29th and April 3rd, 2020. The second survey, CPSS2: Monitoring the Effects of COVID-19, was administered between May 4 and May 10, 2020. We refer to these surveys as Cycle 1 and Cycle 2. Both had a sampling frame of respondents aged 15 and older from all ten provinces; institutionalized adults and residents of the Yukon, Nunavut, and Northwest Territories were excluded. The data were collected online and sampling weights were calculated to be representative of the Canadian population. The sample sizes were 4,627 respondents in Cycle 1 and 4,600 in Cycle 2. The data are available to Canadian researchers via Statistics Canada's Data Liberation Initiative and to international researchers by request at dli-idd@statcan.gc.ca from Statistics Canada. The data are de-identified; as such, they are classified as "no human subjects" and exempt from ethics review.

Variables

Most variables were collected identically in Cycle 1 and Cycle 2, while some were only available in Cycle 2 (see below). The dependent variables are self-rated mental health (SRMH) and anxiety; the main independent variables captured economic concerns; sociodemographic characteristics were included as controls.

<u>Variables collected identically in both Cycles</u>. The SRMH item asked respondents to assess their mental health as "excellent," "very good," "good," "fair," or "poor." We dichotomized SRMH in the main analyses as excellent and very good versus good, fair, and poor (see below for information about sensitivity analyses with alternative specifications for this and other variables).

For economic concerns, respondents were asked two questions: about their employment security and about the financial impact of the COVID-19 pandemic. First, they were asked to indicate to what extent they agree or disagree with the statement, "I might lose my main job or

main self-employment income sources in the next four weeks." We combined "agree" and "strongly agree" as "fearing job loss;" "neither agree nor disagree" was merged with "disagree" and "strongly disagree" as "not fearing job loss" (reference). Respondents not in the labor force were included in a third category, as they were not asked this item. Second, respondents were asked about the "impact of COVID-19 on [their] ability to meet financial obligations or essential needs, such as rent or mortgage payments, utilities, and groceries." Respondents could choose to indicate "major impact," "moderate impact," "minor impact," "no impact" (reference), or "too soon to tell." For parsimony, we combined minor, moderate, and major impact in the main analyses.

Demographics comprise age (in 10-year groups from 25-34 to 75+), gender (male as reference), immigrant status (foreign-born versus Canadian-born as reference), marital status (married/common-law as reference versus previously married, and never married), and the presence of children at home (no children under 18 reside in the respondent's household as reference versus at least one child at home). We also control for the type of dwelling (detached house as the reference, versus apartment in low-rise, apartment in high-rise, and other) as a noisy measure of rural/urban residence, an important characteristic that was not collected in Cycle 1. Socioeconomic status is captured with educational attainment (less than high school as the reference, high school diploma, trades certificate, college diploma, university diploma or certificate below the bachelor's level, bachelor's degree, and an advanced degree; included in the models as a continuous variable).

Variables collected only in Cycle 2. Three additional variables of interest were collected in Cycle 2 in May. Respondents completed the 7-item Generalized Anxiety Disorder Scale, a widely-used screening instrument for anxiety levels in the general population (Spitzer et al., 2006). The scores range from 0 to 21, with higher values indicating higher levels of anxiety. We dichotomized the scores using the widely-accepted threshold of 10 or above to capture elevated, moderate-to-severe, anxiety (Löwe et al., 2008), versus scores below 10 as reference.

Cycle 2 also included a dichotomous urban – rural indicator (urban as reference). Lastly, food security information was assessed as "food secure" versus "marginally," "moderately," or "severely" food insecure; we combine the three 'insecure' levels in analyses for parsimony.

Approach

We first described the distribution of the dependent variables and key predictors (economic concerns) in both Cycles and tested for differences between the Cycles (Table 1, Figure 1, Supplemental Table 1). We also estimated descriptives and comparisons between the Cycles for all control variables (Supplemental Table 2).

Next, we tested for mental health change from March to May. We estimated logistic model of the form $Logit\big(P(Y_i)\big) = \beta_0 + \beta_1 C_i + \beta_2 X_{i1} + \cdots + \beta_{p+1} X_{im}$, where $P(Y_i)$ is the probability of 'bad' mental health. The key parameter of interest is β_1; C_i is the indicator for Cycle such that $C_i = 0$ for observations in Cycle 1, and $C_i = 1$ for observations in Cycle 2. The variables $X_{i1}, \dots, X_{im}$ represent m covariates for individual i such as age, gender, etc. The index i goes from 1 to $n_1 + n_2$ where n_1 is the number of observations in Cycle 1 and n_2 is the number of observations in Cycle 2. The purpose of this step, which is the best approach for a repeated cross-sectional data structure, was to estimate the *change* in the odds of 'bad' mental health between March and May (β_1), as well as the association between all covariates and the odds of reporting 'bad' mental health in the pooled, Cycle 1+Cycle 2, sample ($\beta_2, \dots, \beta_{m+1}$). We also checked whether the effect of covariates on mental health changed between March and May by including interactions between covariates $X_{i1}, \dots, X_{im}$ and the Cycle 2 indicator C_i (Supplemental Table 3; no interaction was statistically significant, indicating that the effects did not change between March and May).

In the second part of the analysis, we focused on only the May data from Cycle 2. We estimated logistic regression models of SRMH and anxiety as a function of socio-demographic and economic covariates (Table 3, Supplemental Table 4). The purpose of this step was to assess

7

the relationship between economic concerns and mental health in more detail because Cycle 2 included three important variables not assessed in Cycle 1: anxiety, food insecurity, and rural residence. Further, we also visualized the effects of economic concerns on mental health (Figure 2). Using the findings from the models summarized in Table 3, we calculated the counterfactual adjusted predicted probabilities of 'bad' mental health and elevated anxiety that would be expected if all respondents had a given level of economic concerns but otherwise kept their actual sociodemographic characteristics (Williams, 2012). Finally, we calculated the probabilities of 'bad' mental health in May under another counterfactual assumption: what it would have been if the levels of economic concerns remained at March levels (summarized in the Results section).

All analyses used sampling weights. Missingness in the data was low; it ranged from 0% for most variables, to 3.6% of total cases. We conducted multiple-imputation via chained equations with 10 imputed datasets (Royston & White, 2011) for regression models to ensure equal sample sizes across the nested models (findings were nearly identical to complete-case analysis). We conducted extensive sensitivity analyses to check the robustness of the findings to alternative variable and model specifications; they are summarized in the online supplement, together with the supplemental tables.

RESULTS

Figure 1 shows the weighted distributions of SRMH and economic concerns in both March and May. As the pandemic unfolded in the spring of 2020, there was a decline in psychological wellbeing, as measured with the SRMH. While 46.0% of the population rated their health as only poor/fair/good in March, 52.3% did so by May, a 6.3 percentage point increase (Table 1). That is, less than half the population rated their health as excellent or very good by May. Contrary to our expectations, employment security and financial concerns became less acute in May compared to March. The share of securely employed people (who did not expect to lose their

jobs) increased from 37.7% to 46.8%, and the percentage of those who expected to lose their jobs halved from 19.8% to 9.0% (Table 1). The share who said that COVID-19 had no (negative) impact on their ability to meet financial obligations increased from 31.5% to 42.8%, while the share who experienced a "major" impact decreased from 13.6% to 9.2% (Supplemental Table 1). The most considerable shift was in the share who felt it was "too early to tell," which declined from 23.8% to 10.9%. Supplemental Table 1 also shows a detailed distribution of food insecurity, which was assessed only in Cycle 2 in May: 14.6% of Canadians experienced some degree of food insecurity, from marginal (5.8%), moderate (6.8%), to severe (2.0%).

Supplemental Table 2 displays the distribution of all sociodemographic characteristics and compares them between Cycles 1 and 2. The comparison is important because it serves as an assurance that the two Cycles are equivalent in their representativeness. The assumption is that basic socio-demographic characteristics should not change over five weeks. And indeed, the distributions of all characteristics from age, gender, immigrant status, to educational attainment, are statistically equal in both Cycles.

Table 2 summarizes findings from logistic regression models that test for change in mental health between March and May. The mental health of Canadians worsened during this time. Specifically, the odds of reporting good/fair/poor mental health, as opposed to excellent or very good health, increased by about 30% in the population on average (OR=1.29, 95% CI 1.12,1.49 in unadjusted Model 1 and OR=1.32, 95% CI 1.13,1.53 in demographics-adjusted Model 2). Adjusting for demographics does not meaningfully impact the mental health change because the characteristics, as shown in Supplemental Table 3, did not change between the two Cycles. Models 3 and 4 further control for economic concerns. Employment security was significantly associated with 'bad' mental health (Model 3). However, its effects became non-significant net of financial impact (Model 4), which, in itself, was associated with significantly higher odds of 'bad' mental health, compared with excellent or very good rating (OR=2.02, 95% CI 1.62,2.53

among those impacted by the pandemic and OR=1.66, 95% CI 1.39,1.98 among those who said it was 'too soon to tell,' compared with respondents who were not negatively impacted by the pandemic). Net of changes in the economic concerns, the odds of 'bad' mental health increased by 46% from March to May (OR=1.46, 95% CI 1.25,1.71 in Model 4).

Table 3 shows the associations of all covariates with the two mental-health measures in May. Younger, female, Canada-born, and previously married adults were more likely to report 'bad' SRMH, compared with older, male, immigrant, and currently married adults (Model 1). Rural residence, household size, the presence of children, education, and employment security were not correlated with SRMH net of other covariates. However, the financial impact of COVID-19 and food insecurity were associated with 'worse' mental health. Adults who said the financial impact was still uncertain ("too soon to tell") had 44% higher odds of reporting 'bad' mental health and those who were already impacted had 77% higher odds, compared to respondents who experienced no impact. Further, adults in food-insecure households had 79% higher odds of reporting 'bad' mental health, compared with adults in food-secure households.

The patterns for elevated anxiety were similar across many, but not all, covariates. Younger, female, and previously married respondents had higher odds of elevated anxiety, compared with older, male, married Canadians. Unlike for SRMH, immigrant status was not a salient covariate, but rural residency was associated with nearly half the odds of elevated anxiety. Among economic covariates, respondents who felt they were likely to lose their jobs had nearly twice the odds of elevated anxiety (unlike the zero effect for SRMH). Financial impact and food insecurity had a substantial effect on elevated anxiety: adults who experienced an economic impact from COVID-19, or were still uncertain had nearly twice the odds of elevated anxiety; food-insecure adults had nearly triple the odds of elevated anxiety, compared with food-secure adults. Supplemental Table 4 shows results for detailed categories of financial impact and food insecurity. The table shows roughly a dose-response pattern in both variables: the more severe financial impact or food insecurity, the larger the detrimental effect on psychological well-being.

10

Figure 2 visualizes the results from Table 4, using adjusted predicted probabilities of both outcomes. The results highlight the large differences by all economic-concerns variables. In May 2020, if all Canadians felt a major financial impact of the pandemic, about 60% of the population would report 'bad' mental health, as compared to roughly 47% if all Canadians felt no impact. For anxiety, employment security was a crucial indicator: while only about 15% of Canadians would have elevated anxiety if they were securely employed, some 33% would if they were expecting to lose their jobs. Finally, food insecurity had a major effect on both outcomes: it was associated with about 15 percentage points higher probability of reporting 'bad' mental health and more than double the probability of elevated anxiety (about 15% in food-secure versus 36% in insecure groups).

Finally, we calculated what the probability of 'bad' mental health would have been in May, if economic concerns did not lessen from their March levels. If these concerns remained at their high March levels, the proportion of Canadians reporting 'bad' mental health would be 54.3%, or 2 percentage points higher than the observed 52.3%. The proportion with elevated anxiety would be 19.3%, or 1.2 percentage points higher than the actual 18.1%.

DISCUSSION

The aims of this study were twofold. First, we assessed changes in mental health and economic concerns among Canadian adults from March to May 2020 during the first few months of the COVID-19 pandemic. Second, we examined how the economic concerns, as well as other variables, were associated with 'bad' mental health and elevated anxiety.

Nationally representative repeated cross-sectional data showed a high level of mental health difficulties, which increased over the five-week period from March to May. Already by March, 46% of Canadian adults rated their health as only good, fair, or poor, as compared to very good or excellent. This is substantially worse than before the pandemic (Findlay & Arim, 2020); moreover, further deterioration occurred by May when over 52% of the population reported 'bad'

mental health. While few studies examined changes in mental health during COVID-19, our findings echo those from the UK, which also described continued deterioration of mental health (Kwong et al., 2020). While we did not have data on anxiety from March, the overall level of anxiety in May in the population was high: 18% of Canadians reported moderate to severe levels of anxiety. To put this in context, this is three times the prevalence in general populations who were not suffering with the stress of a pandemic (Hinz et al., 2017; Löwe et al., 2008) and much closer to the 20% prevalence found in local residents six months after they lived through the devastating Fort McMurray wildfire, which was the costliest natural disaster and largest evacuation in Canadian history, destroying the town and surrounding area (Agyapong et al., 2018).

Economic anxiety is a close correlate of distress (Mann et al., 2020), and at the forefront of concerns during the pandemic. We expected that job-security concerns and worries about the financial impact of the pandemic would increase between March and May. Unexpectedly, we found the opposite: a statistically significant decrease in both fears about job security and in the impact of COVID-19 on the ability to meet financial obligations. With the current data, we cannot assess the reasons behind the changes. Perhaps it is a combination of heightened fears at the beginning of the pandemic, coupled with amelioration of the actual situation as a result of economic policies that supported the most vulnerable groups, such as the Canadian Emergency Response Benefit (CERB), better information as the pandemic unfolded, or people 'adjusted' to the new reality and their fears about job losses and their inability to meet financial obligations subsided slightly. Given the importance and unexpected nature of this finding, we urge Statistics Canada to include these items and other measures of economic security in subsequent Cycles of the CPSS collection efforts. The agency should also include measures of mental health in its ongoing and future economic-focused surveys to probe the associations in further detail.

The lessened economic concerns are important for mental health because of the powerful correlation between the two. Both 'bad' general mental health and anxiety were significantly

12

higher for people who were anticipating that they may lose their jobs, or who experienced a financial impact of the pandemic on their ability to meet financial obligations. We calculated that if the economic concerns had not decreased as they did between March and May, the observed prevalence of health problems would have been even higher: 2 percentage points higher for poor/fair/good SRMH and 1.2 percentage points higher for moderate/severe anxiety.

Food insecurity is also a salient correlate of poor mental health and anxiety in our analysis. However, food insecurity was not assessed in Cycle 1; therefore, we do not know how this predictor has changed since the beginning of the pandemic. In 2017/18, 10.5% of Canadian adults were food insecure, in contrast to the May prevalence of 14.6% (Statistics Canada, 2020c). This is an almost 40% increase from the prior value, a worrisome finding for multiple reasons, including mental health: food insecurity increased the likelihood of poor mental health by 80% and nearly tripled the odds of elevated anxiety.

Several caveats limit the utility of our findings. We relied on repeated cross-sectional data, which did not allow us to examine changes in mental health and in economic concerns *within individuals* for a more causal interpretation. We hope Statistics Canada considers the collection of panel studies as they continue to collect data aimed at monitoring the impact of COVID-19. We also did not have access to several important covariates, such as the province of residence, race/ethnicity, or household income, which may influence mental health, or access to mental health services (Scharf & Oinonen, 2020). Moreover, it would have been useful to understand the causes of the lessened economic concerns between March and May, especially to what degree government policies contributed.

The May CPSS survey was in the field during the peak of the first wave of the pandemic (Statistics Canada, 2020b). As the pandemic unfolds through 2020 and beyond, it is critical to continue collecting information on psychological well-being. It is also worth exploring how changing policies such as relaxing of restrictions on social interaction influence mental health.

Finally, it is essential to continue gathering data about the impacts in different provinces and for vulnerable populations, such as racialized minorities or First Nations communities. Research during the early stages of the pandemic in Canada found large disparities across geography and race/ethnicity in COVID-19 infection and mortality rates (Choi et al., 2020; Denice et al., 2020). These are vital questions that are important to answer and need to be continually asked, not only as the pandemic unfolds, but as an ongoing program of research. We hope Statistics Canada continues to collect additional data on the intersections of mental health, economic well-being, and socio-demographic characteristics to address these questions, not only in new Cycles of the CPSS, but also in its other initiatives.

Good mental health is important under all circumstances, but perhaps particularly for enduring and rebuilding after COVID-19, the largest pandemic in a century. We found that mental health declined even as economic security improved. We therefore need to understand the impact on mental health not only of economic stressors, but also other potential drivers, including social isolation due to lockdown and working from home, stresses on parents and other caregivers, and additional hardships imposed by the pandemic (Holmes et al., 2020). Our study showed the continued wear-and-tear that COVID-19 is having on Canadians' psychological health, as well as positive developments of lessened economic distress, at least for the dimensions measured in the study and for the specific times when the surveys were administered. Policies that buttress Canadian's economic wellbeing not only impact their spending and employment but also their mental as well as physical health. It is, therefore, extremely important that Federal and Provincial governments maintain their economic relief support programs.

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Table 1. Mental health and economic concerns in March and May 2020.

	Cycle 1	Cycle 2	C1-C2 difference (pp)	p-value
Poor/fair/good mental health	46.0%	52.3%	6.3	.0006
Elevated anxiety	---	18.1%	---	---
Employment security				<.0001
Does not expect to lose job	37.7%	46.8%	9.1	
Might lose job	19.8%	9.0%	-10.8	
Not employed	42.5%	44.2%	1.7	
Financial impact of the pandemic				<.0001
No impact	31.5%	42.8%	11.3	
Impacted	44.7%	46.4%	1.7	
Too soon to tell	23.8%	10.9%	-12.9	
Food insecurity				---
Food secure	---	85.4%	---	
Insecure	---	14.6%	---	

Source: CPSS nationally representative two repeated cross-sections. N=4,627 in March (Cycle 1) and 4,600 in May (Cycle 2).

Weighted proportions. P-value from design adjusted F-test assessing the difference between Cycle 1 and Cycle 2. Elevated anxiety and food insecurity were not assessed in Cycle 1.

Table 2. Change in good/fair/poor mental health from March to May 2020

	Model 1		Model 2		Model 3		Model 4	
Cycle 2 (May 2020)	**1.29*** **	**1.12,1.49**	**1.32*** **	**1.13,1.53**	**1.36*** **	**1.17,1.58**	**1.46*** **	**1.25,1.71**
Age			0.76***	0.72,0.81	0.75***	0.70,0.80	0.77***	0.72,0.82
Female			1.45***	1.25,1.69	1.44***	1.24,1.67	1.46***	1.26,1.70
Immigrant status			0.72**	0.59,0.89	0.71**	0.58,0.87	0.67***	0.55,0.83
Dwelling type (detached)								
Apartment in low-rise			1.13	0.90,1.42	1.14	0.90,1.43	1.09	0.87,1.38
Apartment in high-rise			1.41*	1.06,1.87	1.40*	1.06,1.86	1.42*	1.08,1.88
Other			1.17	0.95,1.45	1.19	0.96,1.46	1.19	0.96,1.48
Marital (married)								
Previously married			1.37**	1.10,1.72	1.35**	1.08,1.70	1.33*	1.06,1.67
Never married			1.09	0.87,1.36	1.06	0.84,1.32	1.11	0.88,1.39
Children in household			0.90	0.73,1.09	0.90	0.73,1.10	0.89	0.73,1.10
Household size			1.07	0.97,1.19	1.06	0.96,1.18	1.05	0.95,1.17
Education			1.00	0.96,1.04	1.01	0.97,1.05	1.02	0.98,1.06
Employed and secure								
Employed but not secure					1.37**	1.11,1.71	1.15	0.91,1.44
Not employed					1.21*	1.01,1.45	1.13	0.94,1.37
Financial impact (none)								
Impacted							2.02***	1.62,2.53
Too soon to tell							1.66***	1.39,1.98

* p<.05, ** p<.01, *** p<.001

Source: CPSS nationally representative two repeated cross-sections. N=4,627 in March (Cycle 1) and 4,600 in May (Cycle 2).

Results from weighted, multiply imputed logistic models of dichotomized SRMH (good/fair/poor versus excellent or very good) estimated using a pooled, Cycle 1 and Cycle 2, sample. Odds ratios and 95% confidence intervals are shown. The bolded line shows the odds of good/fair/poor mental health in Cycle 2 (May) compared to Cycle 1 (March). N=9,227

Table 3. Economic and sociodemographic correlates of good/fair/poor mental health in Cycle 2 (May 2020)

	SRMH				Anxiety			
	Model 1		Model 2		Model 1		Model 2	
Age	0.73***	0.67,0.79	0.73***	0.67,0.80	0.87**	0.78,0.96	0.92	0.80,1.06
Female	1.40**	1.14,1.72	1.41**	1.14,1.74	1.46*	1.08,1.98	1.55**	1.14,2.11
Immigrant status	0.74*	0.56,0.98	0.68*	0.50,0.92	0.95	0.63,1.44	0.86	0.53,1.39
Rural	0.79	0.61,1.03	0.77*	0.59,1.00	0.50***	0.34,0.73	0.43***	0.30,0.64
Marital (married)								
Previously married	1.43*	1.04,1.96	1.30	0.94,1.80	1.85**	1.22,2.81	1.64*	1.09,2.46
Never married	1.13	0.82,1.56	1.08	0.77,1.50	1.35	0.89,2.04	1.38	0.88,2.19
Child in household	0.85	0.64,1.13	0.83	0.61,1.12	0.91	0.62,1.33	0.88	0.57,1.36
Household size	1.06	0.93,1.21	1.03	0.90,1.18	1.20	0.98,1.46	1.17	0.97,1.40
Educational attainment	1.03	0.97,1.09	1.05	0.99,1.11	0.94	0.86,1.03	0.93	0.85,1.03
Employed and secure								
Employed but not secure			1.01	0.71,1.44			1.97**	1.27,3.06
Not employed			1.19	0.91,1.55			0.87	0.58,1.29
Financial impact (none)								
Too soon to tell			1.44**	1.13,1.83			1.96**	1.29,2.99
Financial impact			1.77**	1.21,2.58			1.91*	1.16,3.15
Food insecure			1.79**	1.24,2.59			2.93***	2.00,4.29

* p<.05, ** p<.01, *** p<.001

Source: CPSS nationally representative cross-sectional data collected in May 2020. N=4,600.

Results from weighted, multiply imputed logistic models of dichotomized SRMH (good/fair/poor versus excellent or very good) and elevated anxiety (score of 10 or above on the Generalized Anxiety Disorder GAD-7 scale) estimated using the Cycle 2 sample. Odds ratios and 95% confidence intervals are shown.

Figure 1. Distribution of SRMH and economic concerns in Cycles 1 and 2.
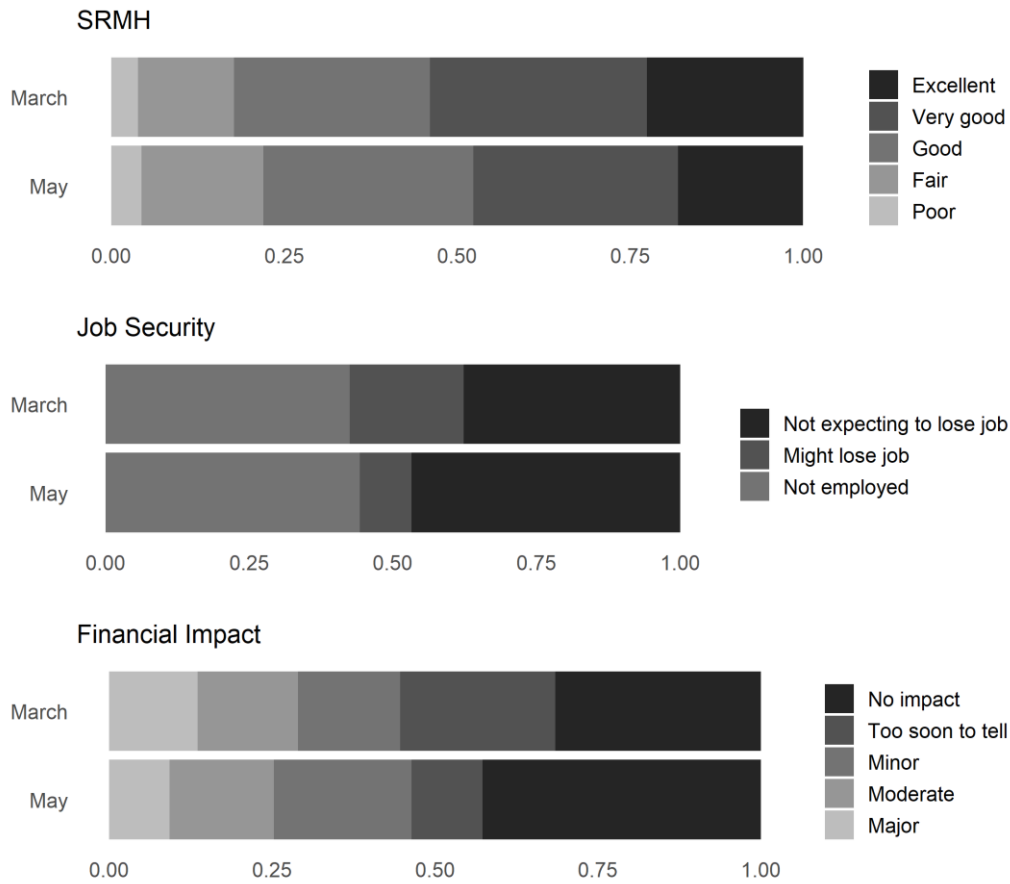
Source: CPSS nationally representative two repeated cross-sections. N=4,627 in March (Cycle 1) and 4,600 in May (Cycle 2).

Note: weighted proportions. Supplemental Table 1 shows the percentages and statistical tests comparing the distributions of each variable between the two surveys. The differences in all three variables are statistically significant (p<.001). N=4,627 in the March Cycle 1 and 4,600 in May.

Figure 2. Predicted adjusted probabilities of mental health outcomes in May 2020.
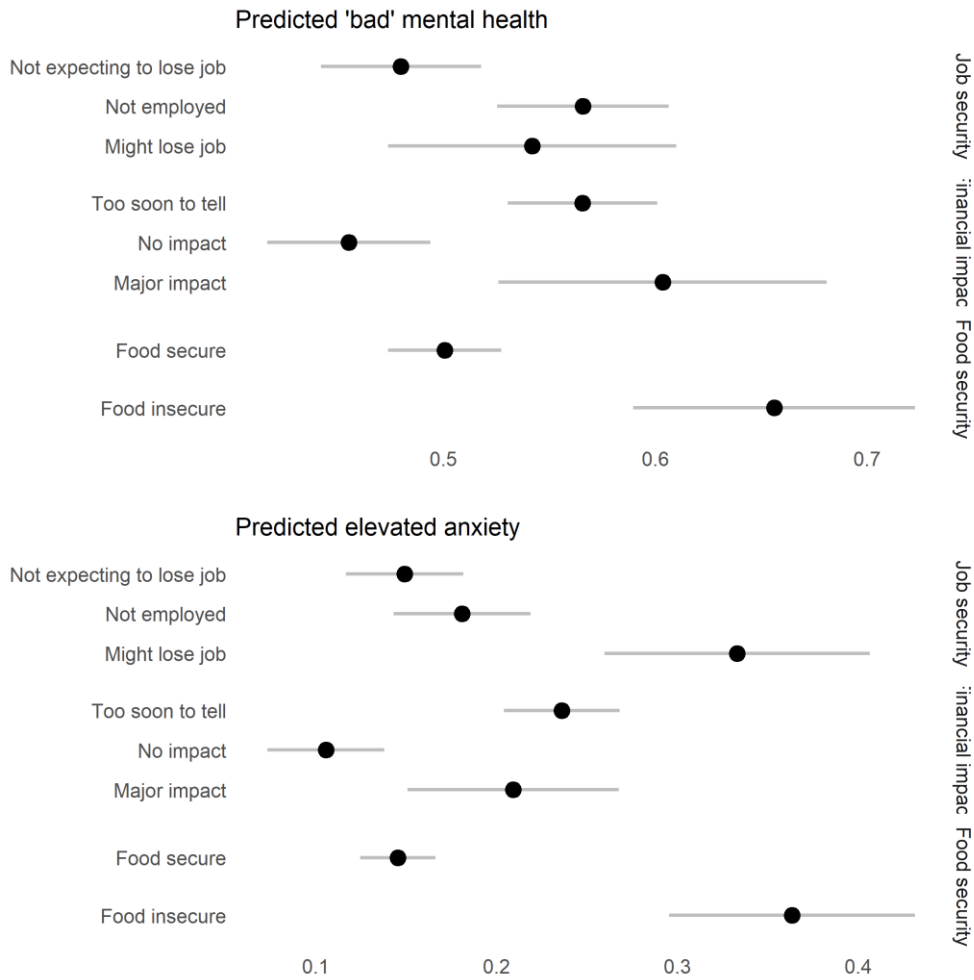
Source: CPSS nationally representative two repeated cross-sections. N=4,627 in March (Cycle 1) and 4,600 in May (Cycle 2).

Note: Shown are adjusted predicted probabilities using the weighted, multiply imputed logistic regression models of each outcome using Cycle 2 May data, shown in Model 2 of Table 2. N=4,600.

ONLINE SUPPLEMENT

Sensitivity analyses. We conducted extensive sensitivity checks to assess the robustness of the findings to different model and variable specifications. 1) We estimated the SRMH models using the original 5-point measure using OLS and ordered logistic models, and as a dichotomized measure with a different threshold (excellent, very good, and good, versus fair or poor). 2) We estimated the full 0-21-point anxiety score using OLS, Poisson, and negative binomial regression models. 3) We examined working-age adults (aged 25-64) separately as a group potentially most sensitive to employment and economic concerns. 4) We excluded dwelling type from regression models of change in SRMH. 5) We included education as a series of 6 dummy variables to test for possible threshold effects. 6) We included employment information that distinguished adults who were temporarily absent from work due to COVID-19 or for other reasons from those currently employed; we found that these groups did not differ for either mental health outcome. 7) We measured financial impact (minor, moderate, and severe) and food insecurity (marginal, moderate, and severe) as categorical variables, and found a dose-response relationship. A higher level of impact and insecurity was associated with increasingly worse mental health; these results are included in Supplemental Table 3 below. 8) We conducted complete-case analyses parallel to those shown in Tables 2 and 3, which are multiply imputed. 9) We included a yes/no variable where respondents were asked whether they applied for the Canadian Emergency Response Benefit (CERB) benefit. This variable is only available in the May Cycle, as the benefit became available on March 25th. On its own, applying for the CERB benefit was associated with worse mental health, but it was not statistically significant when we included the economic concerns. This makes sense in that applying for CERB is an indicator of financial vulnerability but receiving CERB then lessens financial concerns. 10) We examined men and women separately because of the substantial gender disparity in mental health in the general population (Rosenfield & Mouzon, 2013). There were gender differences in prevalence of both mental health measures and some demographic covariates but not for economic concerns. 11) We checked for collinearity in the predictors, finding no concerns. All variance inflation factors for individual variables were below 2. The results from all sensitivity checks were substantively the same as those shown in the paper, corroborating the robustness of our reported results.

Supplemental Table 1. Mental health and economic concerns (original detailed distributions) in March and May 2020.

	Cycle 1	Cycle 2	C1-C2 difference (pp)	p-value
SRMH				.0046
Excellent	22.6%	18.1%	-4.5	
Very good	31.3%	29.6%	-1.7	
Good	28.3%	30.4%	2.1	
Fair	13.9%	17.6%	3.7	
Poor	3.8%	4.4%	0.6	
GAD-7 anxiety mean score (s.d.)	---	5.2 (5.1)	---	---
Financial impact of the pandemic				<.0001
No impact	31.5%	42.8%	11.3	
Minor impact	15.7%	21.1%	5.4	
Moderate impact	15.4%	16.1%	0.7	
Major impact	13.6%	9.2%	-4.4	
Too soon to tell	23.8%	10.9%	-12.9	
Food insecurity				---
Food secure	---	85.4%	---	
Marginally insecure	---	5.8%	---	
Moderately insecure	---	6.8%	---	
Severely insecure	---	2.0%	---	

Source: CPSS nationally representative repeated cross-sections. N=4,627 in March (Cycle 1) and 4,600 in May (Cycle 2).

Weighted results: proportions for SRMH and mean and standard deviation for anxiety score. P-value from design adjusted F-test assessing the difference between Cycle 1 and Cycle 2. GAD-7 anxiety instrument was not administered in Cycle 1. N=4,627 in the March Cycle 1 and 4,600 in May Cycle 2.

Supplemental Table 2. Distribution of control variables in March and May 2020

	Cycle 1	Cycle 2	p-value
Age			0.999
15-24	14.2%	14.2%	
25-34	16.9%	16.9%	
35-44	16.1%	16.2%	
45-54	15.2%	15.1%	
55-64	16.7%	16.6%	
65-74	14.9%	15.1%	
75+	6.1%	6.0%	
Gender			0.565
Male	48.3%	49.4%	
Female	51.7%	50.7%	
Immigrant status			0.863
Canada-born	76.3%	76.0%	
Immigrant	23.8%	24.0%	
Marital status			0.856
Married/common law	63.1%	62.8%	
Widowed/divorced	9.7%	10.2%	
Never married	27.3%	27.0%	
Child in household			0.655
No	65.4%	66.2%	
Child	34.6%	33.8%	
Household size			0.9185
1	15.6%	15.4%	
2	51.7%	51.6%	
3	17.3%	18.5%	
4+	15.4%	14.5%	
Education			0.983
Less than high school	13.8%	14.0%	
High school	26.9%	25.9%	
Trade certificate	9.4%	9.3%	
College/GEGEP degree	19.3%	19.8%	
University below a BA	2.5%	2.4%	
Bachelor's degree	19.4%	19.2%	
Postbaccalaureate degree	8.8%	9.3%	

Source: CPSS nationally representative repeated cross-sections. N=4,627 in March (Cycle 1) and 4,600 in May (Cycle 2).

Weighted proportions. P-value from design adjusted F-test assessing the difference between Cycle 1 and Cycle 2. N=4,627 in the March survey and 4,600 in May.

Supplemental Table 3. Economic and sociodemographics correlates of
mental health in May 2020, detailed indicators of economic concerns.

	SRMH		Anxiety	
Age	0.73***	0.73***	0.86**	0.92
Female	1.41**	1.41**	1.47*	1.57**
Immigrant status	0.74*	0.68*	0.95	0.85
Rural	0.80	0.78	0.50***	0.46***
Marital (married)				
Previously married	1.42*	1.29	1.87**	1.64*
Never married	1.13	1.08	1.35	1.46
Child in household	0.85	0.82	0.90	0.87
Household size	1.06	1.03	1.20	1.17
Educational attainment	1.03	1.05	0.94	0.92
Employed and secure				
Employed but not secure		0.99		1.65*
Not employed		1.18		0.81
Financial impact (none)				
Minor impact		1.26		1.38
Moderate impact		1.70**		2.36***
Major impact		1.42		3.32***
Too soon to tell		1.77**		1.98**
Food insecurity (secure)				
Marginally insecure		1.44		1.44
Moderately insecure		1.80*		2.91***
Severely insecure		3.79***		7.93***

* p<.05, ** p<.01, *** p<.001

Source: CPSS nationally representative repeated cross-sectional data, collected in May 2020. N=4,600.

Results from weighted, multiply imputed logistic models of dichotomized SRMH (good/fair/poor versus

excellent or very good) and elevated anxiety (score of 10 or above on the Generalized Anxiety Disorder

GAD-7 scale) estimated using the Cycle 2 sample. Odds ratios shown. N=4,600.

Supplemental Table 4. Change in good/fair/poor mental health from March to May 2020, testing whether the effects of covariates differ between Cycles.

	Model 1		Model 2		Model 3	
MAIN EFFECTS						
Cycle 2 (May 2020)	1.59***	1.26,2.00	1.62***	1.25,2.12	1.78	0.98,3.25
Age	0.78***	0.73,0.83	0.78***	0.73,0.83	0.82***	0.75,0.90
Female	1.48***	1.27,1.72	1.48***	1.27,1.72	1.60***	1.29,1.97
Immigrant status	0.69***	0.56,0.84	0.69***	0.56,0.84	0.70*	0.52,0.92
Dwelling type (detached)						
Apartment in low-rise	1.09	0.86,1.37	1.09	0.87,1.37	1.14	0.83,1.57
Apartment in high-rise	1.45**	1.10,1.92	1.46**	1.10,1.92	1.52*	1.02,2.26
Other	1.17	0.95,1.46	1.17	0.95,1.46	1.26	0.95,1.68
Marital (married)						
Previously married	1.32*	1.05,1.65	1.32*	1.05,1.65	1.29	0.95,1.75
Never married	1.13	0.90,1.41	1.13	0.90,1.41	1.14	0.84,1.55
Children in household	0.93	0.76,1.13	0.93	0.76,1.13	0.99	0.75,1.31
Household size	1.06	0.96,1.17	1.06	0.96,1.17	1.06	0.91,1.22
Education	1.01	0.97,1.06	1.01	0.97,1.06	0.98	0.93,1.03
Employed and secure						
Employed but not secure	1.10	0.88,1.39	1.14	0.85,1.52	1.10	0.82,1.48
Not employed	1.13	0.94,1.36	1.16	0.90,1.48	1.05	0.81,1.36
Financial impact (none)						
Impacted	2.17***	1.64,2.86	2.16***	1.64,2.85	2.16***	1.64,2.84
Too soon to tell	1.81***	1.40,2.34	1.80***	1.39,2.34	1.84***	1.42,2.38
INTERACTIONS (WITH CYCLE 2)						
Age					0.89	0.78,1.01
Female					0.86	0.64,1.16
Immigrant status					0.96	0.64,1.45
Dwelling type (detached)						
Apartment in low-rise					0.90	0.57,1.42
Apartment in high-rise					0.92	0.53,1.59
Other					0.87	0.57,1.34
Marital (married)						
Previously married					1.05	0.67,1.63
Never married					0.97	0.62,1.51
Children in household					0.86	0.58,1.28
Household size					1.00	0.82,1.23
Education					1.07	0.99,1.16
Employed and secure						
Employed but not secure			0.93	0.59,1.47	0.99	0.63,1.56
Not employed			0.96	0.69,1.32	1.16	0.80,1.67
Financial impact (none)						
Impacted	0.88	0.55,1.40	0.88	0.55,1.41	0.88	0.55,1.40
Too soon to tell	0.87	0.63,1.21	0.88	0.63,1.25	0.85	0.60,1.21

* p<.05, ** p<.01, *** p<.001.   Source: CPSS nationally representative repeated cross-sections. N=4,627 in March (Cycle 1) and 4,600 in May (Cycle 2). Results from weighted, multiply imputed logistic models of dichotomized SRMH (good/fair/poor versus excellent or very good) estimated using a pooled sample. Odds ratios and 95% confidence intervals are shown. Age and education are centered about their approximate respective means.

Mental Health and Economic Concerns from March to May during the COVID-19 pandemic in Canada

The study is based on a secondary analysis of publicly available de-identified data, which was subject to ethical review at the point of collection by Statistics Canada.

AUTHOR STATEMENT

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