Elevated depression and anxiety among pregnant individuals during the COVID-19 pandemic

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Abstract

Mental health problems are common in pregnancy, typically affecting between 10-25% of pregnant individuals. Elevated symptoms of depression and anxiety can negatively impact both the pregnant individual and developing fetus. The current COVID-19 pandemic is a unique stressor with potentially wide-ranging consequences for pregnancy and beyond. We assessed symptoms of anxiety and depression among pregnant individuals during the current COVID-19 pandemic and determined factors that were associated with psychological distress. 1987 pregnant participants were surveyed across Canada in April 2020. The assessment included questions about COVID-19-related stress and standardized measures of depression, anxiety, pregnancy-related anxiety, sleep and social support. We found substantially elevated psychological distress compared to similar pre-pandemic pregnancy cohorts, with 37% reporting clinically relevant symptoms of depression, 57% reporting clinically relevant symptoms of anxiety, and 68% reporting elevated pregnancy-related anxiety. Higher levels of social support and longer sleep duration were associated with lower psychological symptoms across domains. This study shows concerning elevated levels of psychological distress among pregnant individuals during the COVID-19 pandemic, that may have long-term impacts on their children. Potential intervention targets are needed in addition to improving protective factors related to increased social support and sleep -- these should be urgently considered to mitigate long-term negative outcomes.

Introduction

Since it was first recognized in December 2019, the 2019 novel coronavirus (COVID-19) has spread rapidly throughout the world. The health consequences of this virus are distressing: death, strained health care systems, and economic uncertainty. The psychological and social consequences may be equally devastating. People have been physically isolated from family, friends, and community, and schools and daycares around the world have been closed. There is a growing urgency to understand the impact of the COVID-19 pandemic on mental health to best prevent the emergence of serious mental illness as a secondary consequence ^{1,2}.

Although limited, previous work shows significant impacts of infectious disease outbreaks on psychological distress, with increased depression, anxiety, and stress. A study of 129 individuals quarantined during the 2003 severe acute respiratory (SARS) outbreak in Toronto, Canada found that 29% of individuals had symptoms of post-traumatic stress disorder and 31% had symptoms of depression approximately one month following their quarantine; longer periods of quarantine were associated with more severe symptoms ³. In the early phase of the COVID-19 outbreak, 53.8% of respondents in China's Wuhan region reported moderate or severe psychological impact, with 17% and 29% reporting moderate to severe depression and anxiety symptoms, respectively ⁴. A survey by the Kaiser Family Foundation in late March 2020 found that 53% of women and 37% of men said that stress related to coronavirus had a negative impact on their mental health ⁵.

Pregnancy is a particularly vulnerable time when psychological distress can have negative consequences for both mother and baby. Since women tend to report higher levels of psychological distress during disease outbreaks ⁴⁻⁶, women who are pregnant during the COVID-19 pandemic may be especially affected. Sustained, elevated prenatal psychological distress

increase the risk of perinatal depression, as well as prenatal infection and illness rates⁷. Prenatal psychological distress may also cause changes in physical activity, nutrition, and sleep, which in turn affect maternal mood and fetal development. Prenatal psychological distress also increases the risk of miscarriage, preterm birth, lower birthweight, and lower Apgar scores at birth⁸⁻¹². Children of mothers who experienced high stress during pregnancy are more likely to have cognitive and behavioural problems, and are at higher risk for later mental health problems themselves^{8,13-16}. Prenatal anxiety and depression are also associated with changes to brain structure and function in infants and children¹⁷⁻²⁰. These long-lasting psychological and neurological effects highlight the importance of mitigating prenatal distress now, to support both pregnant individuals and their babies.

Given the potential negative psychological sequelae of psychological, health and financial uncertainty coupled with social isolation, there is an urgent need to determine the prevalence of psychological distress among pregnant individuals during this pandemic and identify protective factors so that targeted interventions can be quickly implemented. The goals of the current study were to determine the prevalence of mental health problems in pregnant people during the COVID-19 pandemic and identify potential resilience factors (such as social support, physical activity, sleep) associated with psychological distress. The social distancing universally recommended by governments around the world may be especially problematic during pregnancy because social support has a well-recognized role in buffering the negative effects of stress²¹.

Methods:

Participants. The current study reports data collected from an ongoing study: Pregnancy during the COVID-19 Pandemic. This study recruited pregnant individuals across Canada via social media to complete an online survey. Inclusion criteria are: living in Canada, able to read and write English, and having a confirmed pregnancy <35 weeks gestation. The data reported here was collected between April 5-20, 2020.

Demographics. Participants provided comprehensive demographic information including their birth month and year, postal code, education level, household income range, their baby's due date, and number of other children.

COVID-19. Participants completed a questionnaire about COVID-19 infections and isolations, as well as COVID-19-related life changes such job loss. Participants were asked specifically about concerns due to COVID-19 with the following statements/questions: "During the COVID-19 pandemic, I have felt more alone than usual", "How much do you think your life is in danger during the COVID-19 pandemic?", "How much are you worried that exposure to the COVID-19 virus will harm your unborn baby?", and "Are you concerned that you or your baby are not receiving the care that you need?". Participants answered on a scale of 0 (*not at all*) to 100 (*very much so*). Participants were also asked "How has the COVID-19 pandemic affected your relationship with your partner?" on a scale of 0-100, with 0 (*it has strained our relationship*), 50 (*not much has changed*) and 100 (*it has brought us closer together*).

Mental Health. Maternal depressive symptoms were assessed using the Edinburgh Depression Scale (EPDS) ^{22,23}. While the EPDS is not a diagnostic tool, scores ≥ 13 are consistent with a diagnosis of major depressive disorder ²³. The PROMIS Anxiety Adult 7-item short form was used to assess general anxiety; scores ≥ 60 indicate clinically elevated anxiety ²⁴. Pregnancy-related anxiety was assessed with a 10-item questionnaire about feelings surrounding the health

of the baby and circumstances of the birth ²⁵. On all measures, higher scores indicate worse symptoms. There is no cut score for the pregnancy-related anxiety scale, but previous treatment studies of women experiencing high levels of psychological distress define scores ≥ 17 as indicating high pregnancy anxiety ²⁶.

Social Support. Participants completed the social support effectiveness questionnaire (SSEQ) ²⁷, which evaluates the type and self-perceived effectiveness of the support they receive from their partner or another support person, and the interpersonal support evaluation list (ISEL) ²⁸, which measures broader social support from friends, family, and others.

Physical Activity and Sleep. Participants were asked how many minutes of weekly physical activity they got (in each of mild, moderate, strenuous categories). Participants were asked how many hours of sleep per night they averaged over the past month.

Statistical Analysis. Survey data was manually checked for accuracy and consistency before analysis, and invalid records were removed. Binomial logistic regression was used to identify how COVID-19 related stressors (loss of employment, social isolation, relationship strain) and worries (concern about threat to own life, harm to baby, and not receiving the care needed) were associated with clinically elevated mental health measures (EPDS, PROMIS anxiety, pregnancy-related anxiety). Clinically elevated mental health was defined using cutoffs from previous literature: ≥ 13 on the EPDS ²³, T-scores ≥ 60 for the PROMIS anxiety scale ²⁴, ≥ 17 on the pregnancy-specific anxiety scale ²⁶. The loss of employment variable was binomial (yes/no); all other variables were measured from 0-100 and converted to a 1-5 point scale for analysis for ease of interpretation.

An analysis of covariance (ANCOVA) was used to compare nulliparous to primiparous and multiparous pregnant individuals on measures of mental health (EPDS, PROMIS anxiety,

pregnancy-related anxiety). Mental health measures were included as continuous variables. Age and gestation were included as covariates.

A logistic regression was used to identify resilience factors (adequate exercise, adequate sleep, partner support, general social support) that contributed to reduction in odds for clinically elevated symptoms (EPDS, PROMIS anxiety, pregnancy-related anxiety). Partner support was operationalized as the Total Support score from the SSEQ and general social support was operationalized as the Total Support from ISEL; both were continuous variables. Exercise and sleep were converted to binomial variables, with adequate exercise defined as those meeting the Canadian guidelines for activity in pregnancy of ≥ 150 minutes of moderate or strenuous activity per week ²⁹, and adequate sleep defined as meeting the recommended average sleep duration of ≥ 7 hours per night ³⁰.

Results:

Participants. A total of 1987 individuals provided data for at least one measure on the survey between April 5-20, 2020 and were included in the current analysis; specific numbers of individuals providing data for each measure are listed in Table 1. Participants were aged 32.4 +/- 4.2 years (range 18.6-47.6 years). 51% of participants had other children (37% had one child, 11% had two children, and 3.5% had three or more other children). Participants lived across Canada, with the highest proportion living in Alberta (41%) and Ontario (29%). The majority were married (77.9%) or cohabitating (19.4%) with a partner. Most participants self-identified as Caucasian (87.1%), with others identifying as First Nations (0.7%), Metis (1.2%), Inuit (0.1%), Black (0.7%), Chinese (1.6%), Filipino (0.9%), Korean (0.2%), West Asian (e.g., Afghan, Iranian; 0.4%), South Asian (e.g., East Indian, Pakistani, Sri Lankan; 2.6%), Southeast Asian

(e.g., Cambodian, Indonesian; 0.3%), Hispanic/Latinx (1.1%), and Mixed Race or Other (3.3%). Most participants reporting having completed a trade or community college diploma (23%), bachelor's degree (41%), or higher (28%). Participants had a median household income range of \$100,000-\$124,999 CDN/year [\$70,000-88,000 USD].

Table 1: Sample characteristics. Mean, standard deviation, and range are provided for key demographic characteristics and mental health measures in the sample. The number of datapoints available for each comparison is also given.

Measure	<i>n</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Range</i>
Gestation (weeks)	1988	22.5	8.4	4-35.9
Age (years)	1900	32.4	4.2	18.6-47.6
<i>Mental Health</i>				
Pregnancy-related anxiety questionnaire	1757	19.1	5.1	8-38
Edinburgh postnatal depression scale (EPDS)	1764	10.7	5.3	0-30
PROMIS anxiety T-scores	1757	60.1	8.1	36-83
<i>COVID-19 Stressors</i>				
Job loss due to COVID-19	1581	254 yes / 1327 no		
Threat to own life from COVID-19	1795	46.4	24.3	0-100
Threat to baby's life from COVID-19	1793	51.7	25.1	0-100
Strained relationship with partner during COVID-19*	1735	56.3	21.3	0-100
Social isolation due to COVID-19	1785	64.1	26.1	0-100

Concerned not receiving necessary care due to COVID-19	1585	35.7	27.6	0-100
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Resilience Factors

Sleep duration (hours)	1647	7.0	1.2	3-12
Physical activity (minutes of moderate or strenuous/week)	1947	106	180	0-2400
Partner social support (SSEQ Total support)	1685	55.8	14.9	4-80
General social support (ISEL)	1674	34.1	6.3	6-42

*Relationship strain was measured on a scale of 0-100, with 0 being *It has strained our relationship* and 100 being *it has brought us closer together*; 50 was *not much has changed*; so values <50 indicate strain and values >50 indicate closeness. All other COVID-19 stressors were measured from 0 [*not at all*] to 100 [*very much so*] with higher values indicating more strain.

COVID-19 Stressors. One participant had a confirmed case of COVID-19; 25 others reported suspected but unconfirmed cases. At the time of this initial survey, most provinces in Canada were only testing serious cases (i.e., in hospital) or healthcare workers. None of these individuals were hospitalized. 11 individuals reported other people with COVID-19 infections within their household (6 partners; 1 child, 1 housemate; 3 unspecified).

At the time of the survey, 18.3% of participants reported job loss due to COVID-19 (16.1% laid off, 2.2% indicated their employment was terminated).

Almost all participants (92.9%) reported feeling more alone than usual due to the COVID-19 pandemic (11.8% “a bit”, 18.4% “somewhat”, 33.2% “quite a bit”, and 29.6% “very much so”). 22.5% of participants reported that COVID-19 had strained their relationship with their partner (scores <40), while 43.1% reported that COVID-19 has brought them and their partner closer together (scores >60). Note that these COVID-19 measures were initially

measured from 0-100; scores were converted to a 5-point scale, with “not at all” (0-20), “a bit” (21-40), “somewhat” (41-60), “quite a bit” (61-80), and “very much so” (81-100) for ease of interpretation.

Most participants (89%) reported changes in prenatal care due to the pandemic, including cancelled appointments (36%), or not being allowed to bring a support person (90%). Most participants believed that the quality of their prenatal care had decreased (26.6% “a bit”, 23.9% “somewhat”, 20.7% “quite a bit” and 11.2% “very much so”). 35% made changes to their birth plan because of the pandemic, including the location (11%), support people (25%), and childcare arrangements (11%). 74% had trouble accessing other healthcare during their pregnancy, most commonly reporting they could not access massage therapy services (58%), followed by chiropractic (26%); 9% reported that they were unable to access psychological counselling services.

15.7% of participants were “not at all” worried their own life was in danger due to COVID-19, with 25.3% “a bit”, 25.1% “somewhat”, 26.9% “quite a bit”, and 7% “very much” worried about their own life. Regarding the virus causing harm to their unborn baby, participants were 5.8% “not at all”, 14.2% “a bit”, 21.3% “somewhat”, 28.9% “quite a bit”, and 29.8% “very much” worried.

Prevalence of Mental Health Problems. Mean scores on mental health measures are shown in Table 1. 37.0% of participants had clinically elevated symptoms of depression (EPDS scores ≥ 13). 46.3% of participants had moderately elevated anxiety, and 10.3% severely elevated anxiety (56.6% total with clinically elevated anxiety). 67.6% has clinically elevated pregnancy-related anxiety. See Figure 1 for comparisons to pregnancy meta-analyses and normative values for anxiety and depression.

Figure 1. Prevalence of clinically elevated anxiety and depression symptoms in the current sample (COVID-19 Pandemic) versus previous pregnancy cohorts and the United States adult population. References: 1³¹, 2³², 3³³, 4³⁴.

COVID-19 worries and stressors in association with psychological health. Binomial logistic regression tested relationships between COVID-19 related worries (threat to own life, harm to the baby, not getting the care needed) and stressors (loss of employment, changes to relationship with partner, feelings of isolation) and clinically elevated mental health concerns. The odds for clinically elevated depression symptoms were increased by COVID-19-related worries and by partner relationship strain, but not by loss of employment. Odds for depression increased by 22-32% for each unit increase in worries, 150% for each unit increase in feelings of isolation, and 28% for each unit increase in relationship strain, with each unit defined as 20% of the score range. Loss of employment did not increase the odds of depression. Similar findings were observed for general anxiety and pregnancy-related anxiety (Table 2). For both depression and general anxiety, the largest effects were for social isolation, whereas for pregnancy-related anxiety the largest effect was for not getting the prenatal care that was needed.

Table 2. COVID-19 specific factors predicting clinically elevated psychological concerns.

	<i>B</i>	SE	Wald	<i>df</i>	<i>p</i>	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
Depression								
Constant	-6.18	0.39	251.92	1	<.001	.002		
Threat to life	0.23	0.07	11.03	1	0.001	1.26	1.10	1.44
Harm to baby	0.20	0.07	8.55	1	0.003	1.22	1.07	1.40
Not getting needed care	0.27	0.05	25.48	1	<0.001	1.32	1.18	1.46
Relationship strain	-0.33	0.07	25.00	1	<0.001	0.72	0.63	0.82
Social isolation	0.93	0.08	147.39	1	<0.001	2.53	2.18	2.94
Loss of employment	0.23	0.18	1.68	1	0.20	1.26	0.89	1.78
General Anxiety								
Constant	-4.61	0.31	217.25	1	<.001	0.01		
Threat to life	0.45	0.07	43.97	1	<0.001	1.56	1.37	1.78
Harm to baby	0.22	0.06	11.49	1	0.001	1.24	1.10	1.41
Not getting needed care	0.25	0.06	20.62	1	<0.001	1.29	1.15	1.44
Relationship strain	-0.16	0.07	5.89	1	<0.015	0.85	0.75	0.97
Social isolation	0.65	0.061	114.56	1	<0.001	1.91	1.70	2.16
Loss of employment	0.20	0.18	1.24	1	0.27	1.22	0.86	1.73
Pregnancy-Related Anxiety								
Constant	-2.35	0.27	78.60	1	<.001	0.10		
Threat to life	0.23	0.07	11.73	1	0.001	1.26	1.10	1.43
Harm to baby	0.33	0.06	27.16	1	<0.001	1.39	1.23	1.57
Not getting needed care	0.41	0.06	47.54	1	<0.001	1.51	1.34	1.70
Relationship strain	-0.07	0.06	1.18	1	0.28	0.93	0.82	1.06
Social isolation	0.16	0.06	8.34	1	0.004	1.18	1.05	1.31
Loss of employment	-0.11	0.17	0.40	1	0.53	0.90	0.64	1.26

Loss of employment was binary (yes/no); all other factors were converted from the original 0-100 scale to a 5-point scale for ease of interpretation. Each unit thus represents a 20% increase in worry or strain.

Parity. Nulliparous individuals were younger than primiparous and multiparous individuals (31.3 years vs 33.3, 33.6 years, respectively; $F=67.4$, $p<0.001$) and were further along in gestation (23.2 weeks vs 21.8, 21.6 weeks, respectively; $F=7.9$, $p<0.001$). Comparison of mental health by parity revealed no differences for EPDS ($F = 2.6$, $p = .078$) or PROMIS

Anxiety ($F = 0.34, p = .71$), controlling for age and gestation. However, nulliparous individuals had higher pregnancy-related anxiety ($F = 35.7, p < .0001$) compared to primiparous and multiparous individuals (Table 3).

Table 3: Comparison of mental health scores by parity.

	Nulliparous (n=971)	Primiparous (n=735)	Multiparous (n=277)	F-value	p-value
Edinburgh postnatal depression scale	10.6	10.6	10.8	2.6	0.078
PROMIS Anxiety T-scores	60.4	60.0	59.3	0.34	0.71
Pregnancy-related anxiety	20.2	18.3	17.6	35.7	<0.001

The number provided in the top reflects the full sample; numbers for each group were slightly lower for the depression and anxiety scores.

Resilience factors. Participants reported averaging 216 minutes of mild exercise, 88 minutes of moderate exercise and 18 minutes of strenuous exercise per week. Only 24% met the recommended Canadian guidelines for activity in pregnancy of ≥ 150 minutes of moderate or strenuous activity per week²⁹. Mean sleep duration was 6.98 +/- 1.25 hours. Most individuals (63.9%) were getting adequate sleep (≥ 7 hours³⁰). Average scores on the SSEQ Total Support (partner social support) were 55.8 +/- 14.9. Average scores on the ISEL Total Support (general social support) were 34.1 +/- 6.3.

The odds of clinically elevated depression and anxiety symptoms were reduced if participants met current sleep recommendations and had better social support (independent effects for partner and general support), but not if they met physical activity recommendations (Table 4). Partner and general social support were also resilience factors for pregnancy-related anxiety.

Table 4. Resilience factors predicting reduced psychological concerns.

	<i>B</i>	SE	Wald	<i>df</i>	<i>p</i>	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
Depression								
Constant	3.49	.34	108.57	1	<0.001	32.91		
Adequate sleep	-0.77	0.11	46.77	1	<0.001	.46	.37	.58
Adequate exercise	-0.14	0.13	1.14	1	0.29	0.87	0.67	1.12
Partner support	-0.03	0.004	52.20	1	<0.001	0.97	0.96	0.98
General support	-0.06	0.01	32.22	1	<0.001	0.95	0.93	0.97
General Anxiety								
Constant	3.44	0.34	103.26	1	<0.001	31.12		
Adequate sleep	-0.50	0.11	20.07	1	<0.001	0.61	0.49	0.76
Adequate exercise	-0.21	0.12	3.09	1	0.08	0.81	0.64	1.03
Partner support	-0.03	.004	46.55	1	<0.001	0.97	0.96	0.98
General support	-0.03	0.01	11.89	1	<0.001	0.97	0.95	0.99
Pregnancy-Related Anxiety								
Constant	3.26	0.36	84.10	1	<0.001	25.91		
Adequate sleep	-0.16	0.12	1.94	1	0.16	0.85	0.68	1.07
Adequate exercise	-0.09	0.12	0.54	1	0.47	0.91	0.72	1.17
Partner support	-0.01	0.004	9.49	1	0.002	0.99	0.98	0.99
General support	-0.05	0.01	20.79	1	<0.001	0.95	0.94	0.97

Adequate sleep and exercise were defined according to guidelines. Partner support is the Total Support measure from the SSEQ; general support is the Total Support from the ISEL.

Discussion:

Pregnant participants reported high levels of psychological distress across domains. Depression, general anxiety, and pregnancy-specific anxiety symptoms were all substantially higher than in previous community pregnancy cohorts with similar demographic profiles. These findings suggest that COVID-19 presents serious psychological challenges for pregnant individuals, with the potential for both short term (e.g., preterm birth, postpartum depression)

and long-lasting impacts on the developing fetus. These findings highlight the urgent need for interventions to reduce psychological distress during pregnancy. Factors associated with reduced psychological distress in our sample included increased social support and adequate sleep duration, which may be targets for policy recommendations.

Clinically significant symptoms of depression (37%), anxiety (59%), pregnancy-specific anxiety (67%) were high. In a survey of Chinese residents early in the COVID-19 outbreak (Jan 31-Feb 2, 2020), 17% of respondents reported moderate or severe depression, and 29% reporting moderate to severe anxiety (C. Wang et al., 2020). The rates of clinically relevant depressive and anxiety symptoms in our pregnancy cohort are even higher, suggesting that the psychological impact of the outbreak may be of particular concern for pregnant individuals.

Prenatal depression is estimated to affect 9-11% of individuals at any given time, with 18% of individuals experiencing depression at some point during pregnancy^{35,36}.³⁵ The England-based Avon Longitudinal Study of Parents and Children (ALSPAC) found that 17% of 2390 pregnant women reported clinically elevated depressive symptoms (≥ 13 on the EPDS) in the first wave of the study (1990-1992), while 25% of 180 women in the second generation (2012-2016) reported clinical elevated depressive symptoms³³. In the Canadian Alberta Pregnancy Outcomes and Nutrition (APrON) study³⁷, a study with similar demographic profiles to those seen here, 11% of women had clinically elevated depression symptoms on the EPDS³⁸. Normative data for the United States indicates prevalence of clinically-relevant depression symptoms in 8% of adults³⁴. These comparisons suggest that symptoms of depression have increased substantially during COVID-19 (see Figure 1).

Pregnancy anxiety was similarly elevated in our cohort compared to a recent study with similar demographics, which reported a mean score of 7.3³⁹. General anxiety was also elevated

compared to a meta-analysis of pregnancy which reports 18-25% prevalence³¹ and the general US population prevalence of 16%³². High levels of prenatal distress, particularly pregnancy anxiety, are concerning due to unique associations with elevated risk of preterm birth⁴⁰. The elevated psychological distress appears to be, at least in part, a consequence of the COVID-19 pandemic. The odds of depression increased by 17-43% for each unit (20% of range) increase in COVID-19 worries, results that were mirrored in the anxiety outcomes.

Factors that appear to be protective against high depression and anxiety were better social support and adequate sleep duration. Social support is an important determinant of physical and psychological well-being, especially during pregnancy when individuals take on new responsibilities and roles⁴¹. Supportive social relationships directly affect mental health by encouraging positive health behaviors, increasing positive feelings, and enhancing emotion regulation⁴² and indirectly by reducing the physiological stress response⁴³. Social support also reduces the effects of prenatal maternal stress on infant stress responses, suggesting that positive social relationships buffer the biological cascade of stress from mother to infant⁴⁴.

Many individuals did not meet the recommended sleep duration of ≥ 7 hours/night. Poor sleep in pregnancy is a risk factor for postpartum depression⁴⁵, and short sleep duration is associated with elevated risk of preterm birth⁴⁶. Furthermore, sleep problems and anxiety interact to confer additional risk of shorter gestational age at birth³⁹. In this sample, individuals who had less sleep had significantly worse symptoms of depression and anxiety. Sleep interventions may be effective at reducing symptoms of distress in this population as well as mitigating potential adverse outcomes such as preterm birth and postpartum depression⁴⁷.

Physical activity at or above guidelines was not significantly associated with lower depressive and anxiety symptoms. This contrasts previous studies that show physical activity is

associated with reduced depressive and anxiety symptoms in multiple populations ⁴⁸⁻⁵⁰, including pregnant individuals ⁵¹. The association between increased physical activity and reduced anxiety approached significance, suggesting that encouraging physical activity among pregnant individuals may still help reduce the subjective feelings of distress.

Given the serious consequences of untreated mental illness in pregnancy on physical and psychological outcomes, interventions are urgently needed to reduce psychological distress and build resilience factors. Psychological interventions for preventing and treating depression, anxiety, and insomnia in pregnancy are effective, with cognitive behavior therapy emerging as a front-line treatment ⁵²⁻⁵⁴. Preliminary evidence also provides support for e-health interventions; however, trials to date are relatively small and scaling for widespread dissemination is urgently needed ^{55,56} ⁴⁷. Evaluation of e-health treatments should be a priority, given that in-person psychological treatments are currently not available or severely limited. Treatment of pregnancy anxiety is also effective with brief midwife or obstetric lead interventions; however, the ability to deliver these via telehealth has not been tested ⁵⁷. There is also suggestion that online programs improve partner social support and satisfaction, but to our knowledge these have not been tested in pregnancy ⁵⁸. Psychological treatments may require specific investments from government to ensure wide access but could have large future returns.

It is important to note that this sample has few sociodemographic risk factors and is a low-risk group for prenatal distress. Our sample was slightly older and more likely to be married or cohabitating than the Canadian averages for pregnancy ^{59,60}. While this suggests that our data may not be entirely representative of Canadian pregnant individuals, samples with higher education, older age, and where more individuals are partnered are at lower risk for prenatal anxiety and depression. Thus, the elevated stress seen here would be highly unexpected under

normal circumstances. These data may therefore represent a best-case scenario of the population of pregnant individuals in Canada.

The high psychological distress reported by participants is concerning for both maternal and child health. Prenatal stress can weaken the immune system, increasing inflammation and the risk of prenatal infection and illness ^{7,61}. It also dysregulates the hypothalamic-pituitary-adrenal (HPA) axis, which can change glucocorticoid levels and may lead to epigenetic changes in the fetus ⁶²⁻⁶⁴. High prenatal stress is also associated with reduced blood flow to the uterus ⁶³. Children whose mothers experienced high prenatal stress are at higher risk of cognitive and behavioural problems, as well as mental illness in their own lives ^{8,13,63,65-71}. Furthermore, prenatal anxiety and depression are associated with changes to brain structure and function in children ^{17,18,20,72}, indicating long-lasting effects of prenatal stress exposure. These potential risks to the pregnant individual and the baby show the urgency in providing adequate support and reliable information to reduce the consequences of stress experienced during the COVID-19 pandemic.

Conclusions. Pregnant individuals are experiencing substantial psychological distress, including significantly elevated anxiety and depression during the COVID-19 pandemic. These levels far exceed those normally expected during pregnancy and those experienced by other groups of people during the current pandemic. Protective resilience factors include longer sleep duration and social support. Given the known effects of stress on pregnancy, infant, and child outcomes, there is an urgent need to support pregnant individuals during this critical time to mitigate long-term negative outcomes.

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