**Introduction**

Perinatal mood and anxiety disorders, affecting one in five individuals, are common (Kendig et al., 2017) and a leading, preventable cause of pregnancy-related death (Davis et al., 2019). Detection, diagnosis, and treatment are critical to help mitigate health consequences (Meltzer-Brody and Stuebe, 2014).

Emerging data suggest that the COVID-19 pandemic (referred to as “the pandemic” henceforth) has increased depression and anxiety in the general population(Czeisler et al., 2020) and amongst individuals in the perinatal period (Wu et al., 2020). There is limited research examining which factors may be exacerbating these problems. People of color (defined as Black, Asian, Multiracial, and/or Hispanic/Latinx) are at higher risk for adverse mental health outcomes and disruptions in healthcare access (McGuire and Miranda, 2008).Pandemic-related hospitalizations and deaths are also affecting people of color more, indicating that the pandemic is widening health disparities (Knittel and Ozaltun, 2020; Price-Haywood et al., 2020). We aimed to identify factors associated with increases in symptoms of perinatal depression and anxiety and disparities in healthcare access during the pandemic.

**Materials and methods**

We examined a cross-sectional subset of individuals recruited within an ongoing randomized control trial (RCT) designed to integrate obstetric and mental healthcare, as described elsewhere (Clinical Trials #NCT02760004) (Moore Simas et al., 2019). The RCT includes English-speaking participants in Massachusetts that screened positive for depression (Edinburgh Postnatal Depression Scale [EPDS])(Cox et al., 1987) at initial interview (conducted 10/2015-present), while pregnant, or up to 3-months postpartum. Validated screening tools are administered and repeated with each interview, including: (1) EPDS (positive screen: [EPDS]≥10), (2) Generalized Anxiety Disorder 7-item scale (GAD-7) for anxiety (positive: GAD-7≥8) (Spitzer et al., 2006), (3) Post-traumatic stress disorder (PTSD) Checklist-Civilian Version (PCL-C) (scored using Diagnostic and Statistical Manual of Mental Disorders symptom cluster scoring) for PTSD (Weathers et al., 1994); and (4) Barriers to Access to Care Evaluation (BACE) instrumental subscale, which measures non-stigma related barriers to care (e.g., transportation problems to appointments) (Clement et al., 2012). Higher scores on the BACE indicate more barriers. Validated screening thresholds for the EPDS range from 9-13; however, score cut-offs in the 9-10 range are often used in non-psychiatric or primary care settings, to lower the rates of false negatives (ACOG, 2018; Cox et al., 1987; Earls et al., 2019).

This sub-study included participants that completed at least one interview with the aforementioned sub-scales and pandemic-related questions from March 23 to September 14, 2020 (n=163, approximately half of total RCT participants). We examined how demographics and positive screens were associated with the pandemic’s perceived effects.

Outcomes of the sub-study included perceived pandemic-related increases in symptoms of depression (“To what extent has coronavirus increased your feelings of depression?”) and anxiety (“To what extent has coronavirus made you feel more anxious?”) and changes in access to care (e.g., “To what extent has coronavirus affected your ability to get the healthcare you need for yourself?”). These were measured using a 5-point Likert-style scale (not at all/slightly/somewhat/moderately/to a great degree; **Supplemental Table 1**).

Differences in outcomes were assessed across demographics, screening scores, and BACE scores using chi-square and t-tests; for association tests only, outcomes were dichotomized (“not at all” versus all other options).

Uni- and multivariate logistic models examined the association of demographics and positive screens with increases in symptoms of depression and anxiety and access to care. To accommodate expected underlying distributions, ordinal logistic regressions were used. For final model parsimony, variables identified *a priori* as possible confounders and independent variables without evidence of collinearity were included (i.e., age, race/ethnicity, income, and positive screeners).

We conducted sensitivity analyses that defined outcomes two different ways: 1) using a different cut-point (“minor impact” [not at all, slightly, somewhat] vs. “major impact” [moderately, to a great degree]), and 2) treating outcomes as continuous variables (rather than categorical) and using linear regressions. Analyses were conducted using STATA-14.2.

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. All procedures were approved by University of Massachusetts Medical School Institutional Review Board (#H00009163). Verbal informed consent was obtained from all participants.

**Results**

At the time of sub-study interview, 50.9% screened positive for depression, 41.1% for anxiety, and 19.0% for PTSD (**Supplemental Table 2**). Most participants (80.5%) reported that their obstetric practices changed the way they provided prenatal care during the pandemic.

Most participants reported that the pandemic affected their life in many ways (**Supplemental 2**). Eighty percent of participants perceived increased symptoms of depression (80.4%) and 88.8% perceived increased symptoms of anxiety , and 58.4% reported that their ability to access healthcare for themselves was affected. Higher BACE scores, indicating greater barriers to care, were positively correlated with all access to care measures (**Supplemental Table 3a**).

Positive depression, anxiety, and PTSD screens, having a bachelor’s degree or higher degree, and higher income were associated with increased symptoms of depression and anxiety due to the pandemic (**Table 1**). Positive depression, anxiety, and PTSD screens were all associated with perceived changes in accessing mental healthcare. BACE scores were higher in participants who reported any perceived changes in access to healthcare or mental healthcare (**Supplemental 3a**).

After adjusting for age, race/ethnicity, and positive screens (**Table 2**), higher income was associated with experiencing higher depression due to the pandemic (aOR: 2.33; 95%CI: 1.19, 4.57). After adjusting for age, income and positive screens, participants of color were more likely to report that the pandemic affected their ability to access mental healthcare, compared to non-Hispanic White participants (aOR: 3.25, 95%CI: 1.23, 8.59). In participants who noted any perceived change in their access to general, obstetric, or mental healthcare, BACE scores were significantly higher amongst participants of color (**Supplemental 3b**).

Sensitivity analyses yielded similar results (Supplemental Tables 4-6); when the outcomes were analyzed using the categorical cut-point that was set to “major” vs. “minor impact” and when analyzed evaluating the outcomes as continuous (e.g., correlations and linear regressions), trends were similar.

**Discussion**

In this sample of individuals in the perinatal period with a history of depression symptoms, the majority reported that the COVID-19 pandemic increased their symptoms of depression and anxiety. At time of sub-study participation during the pandemic, half screened positive for depression, two-fifths for anxiety, and one in five for PTSD.

Many factors, including race/ethnicity, income, and positive screens, were associated with perceived effects of the pandemic on depression, anxiety, and access to care. Participants with positive screens for depression and anxiety reported that the pandemic has affected all examined domains. Participants of color reported substantial changes in their ability to access mental healthcare, beyond those reported by non-Hispanic White participants. This is aligned with the emerging data on the pandemic that highlights the increased risk that women of color face, from contracting the disease to access to testing to health outcomes (Alcendor, 2020; Lieberman-Cribbin et al., 2020; Millett et al., 2020; Williams and Cooper, 2020). Our results further demonstrate that adaptations in mental healthcare in response to the pandemic need to reflect the needs of various demographic groups and, especially, to bridge care gaps for people of color. Future studies are needed to uncover the extent to which public health crises may intersect with and exacerbate disparities in mental healthcare (e.g., differential access, geographic proximity).

Our data also suggest that health systems and obstetric practices are changing in response to the pandemic. As healthcare systems continue to adapt in the context of the pandemic, it is important to evaluate the impact of these changes on equitable access and quality of care delivery.

Illuminating health disparities that are worsened by crises can help inform and promote equity- and inclusion-based initiatives. It is important that we continue to adapt existing resources that can help providers identify and treat individuals with maternal mental health conditions (Byatt et al., 2019).

*Limitations*

The generalizability of our results is limited by the sample size and study population -- participants enrolled in the parent study after a positive depression screen. Additionally, the study’s cross-sectional design and nature of outcomes measured pandemic-related changes without explicitly determining directionality. However, participants who reported pandemic-related changes in access to care, including participants of color, had higher BACE scores, and pandemic-related access to care measures were positively correlated with higher BACE scores. Together, these data suggest that pandemic-related changes in access to care are deleterious, though additional exploration is required.

**Conclusions**

The COVID-19 pandemic is associated with increased symptoms of depression and anxiety and perceived changes in access to mental healthcare among individuals in the perinatal period with a history of depression. The degree to which the pandemic impacted these participants varied by race/ethnicity, income, and positive screens – most notably, participants of color were more impacted. It is important that providers and systems are aware of the widened health and mental health disparities during this time and take action to ensure equitable mental healthcare for all.

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| **Table 1: Impact of COVID-19 pandemic on access to care and mental health by participant sociodemographic and clinical characteristics.a**  Participants are individuals in the perinatal period, who previously screened positive on Edinburgh Postnatal Depression Scale (EPDS; positive screen defined as ≥10) and participated in an ongoing randomized control trial (RCT) in Massachusetts – the PRogram In Support of Moms (PRISM, conducted 10/2015-present). This sub-study examined participants with at least one interview between March and September 2020. | | | | | | | | |
|  | **Has the pandemic increased your depression?** | | **Has the pandemic increased your anxiety?** | | **Has the pandemic affected your ability to get healthcare**? | | Has the pandemic affected **your ability to get mental healthcare**? | |
|  | ***Not at all (%)*** | ***Any effect***  ***(%)*** | ***Not at all***  ***(%)*** | ***Any effect***  ***(%)*** | ***Not at all (%)*** | ***Any effect***  ***(%)*** | ***Not at all***  ***(%)*** | ***Any effect***  ***(%)*** |
| *All participants*  *(n =163)* | 19.3 | 80.8 | 11.3 | 88.8 | 41.6 | 58.4 | 64.1 | 35.9 |
| *>35 years (n =45)* | 13.3 | 86.7 | 9.1 | 90.9 | 37.8 | 62.2 | 66.7 | 33.3 |
| *< 35 years (n =118)* | 21.6 | 78.5 | 12.1 | 87.9 | 43.1 | 56.9 | 63.0 | 37.0 |
| *College education*  *(n =72)* | **11.3\*** | **88.7\*** | **2.8\*\*** | **97.2\*\*** | 40.9 | 59.2 | 69.8 | 30.2 |
| *Less than college education (n =91)* | **25.6\*** | **74.4\*** | **18.0\*\*** | **82.0\*\*** | 42.2 | 57.8 | 59.4 | 40.6 |
| *Participants of colorb (n=80)* | 24.1 | 76.0 | 15.4 | 84.6 | 43.0 | 57.0 | 57.1 | 42.9 |
| *Non-Hispanic White participants (n =79)* | 15.4 | 84.6 | 7.7 | 92.3 | 42.3 | 57.7 | 72.4 | 27.6 |
| *Public insurance*  *(n =74)* | **28.8\*\*** | **71.2\*\*** | 15.3 | 84.7 | 43.8 | 56.2 | 66.0 | 34.0 |
| *Private insurance*  *(n =88)* | **11.5\*\*** | **88.5\*\*** | 6.9 | 93.1 | 40.2 | 59.8 | 63.5 | 36.5 |
| *Married/Partnered*  *(n =108)* | 16.0 | 84.0 | **5.7\*\*** | **94.3\*\*** | 43.4 | 56.6 | 63.0 | 37.0 |
| *Unmarried/No partner (n =55)* | 25.5 | 74.6 | **22.2\*\*** | **77.8\*\*** | 38.2 | 61.8 | 65.9 | 34.1 |
| *Income <$60,000 (n =79)* | **29.5\*\*** | **70.5\*\*** | **18.2\*** | **81.8\*** | 41.0 | 59.0 | 67.3 | 32.7 |
| *Income ≥$60,000 (n =68)* | **7.5\*\*** | **92.5\*\*** | **4.5\*** | **95.5\*** | 40.3 | 59.7 | 66.7 | 33.3 |
| *Positive EPDSc*  *(n =82)* | **7.5\*\*\*** | **92.5\*\*\*** | **1.3\*\*\*** | **98.8\*\*\*** | 35.0 | 65.0 | **53.3\*** | **46.7\*** |
| *Negative EPDSc*  *(n = 79)* | **31.7\*\*\*** | **68.4\*\*\*** | **21.8\*\*\*** | **78.2\*\*\*** | 48.1 | 51.9 | **75.4\*** | **24.6\*** |
| *Positive GAD-7d*  *(n =67)* | **6.2\*\*** | **93.9\*\*** | **3.1\*\*** | **96.9\*\*** | **27.7\*\*** | **72.3\*\*** | **50.0\*\*** | **50.0\*\*** |
| *Negative GAD-7d*  *(n =96)* | **28.1\*\*** | **71.9\*\*** | **16.7\*\*** | **83.3\*\*** | **51.0\*\*** | **49.0\*\*** | **75.4\*\*** | **24.6\*\*** |
| *Positive PCL-Ce*  *(n =31)* | **0.0\*\*** | **100.0\*\*** | **0.0\*** | **100.0\*** | 33.3 | 66.7 | **43.5\*** | **56.5\*** |
| *Negative PCL-Ce*  *(n =132)* | **23.7\*\*** | **76.3\*\*** | **13.7\*** | **86.3\*** | 43.5 | 56.5 | **69.2\*** | **30.9\*** |
| a Chi-square analyses were conducted within each characteristic (each like-shaded row). Characteristics and Likert-style responses were collapsed for analysis: “Not at all” versus “Any effect” (i.e., Slightly, Somewhat, Moderately, and To a great degree). Percentages may not add up to 100% due to rounding. Bolded values indicate significance in a Chi-square test.  \*p <0.05 \*\*p<0.01 \*\*\*p<0.001  bCategories of race are not mutually exclusive. Multiracial: participant who identified with more than one race.  c EPDS = Edinburgh Postnatal Depression Scale; positive screen defined as an EPDS≥10. EPDS scores reported in table were those from the participant’s first interview conducted at the time of the pandemic (initial or follow-up). Though all participants scored EPDS≥10 at initial interview, EPDS was not necessarily positive in follow-up interviews.  d GAD-7 = Generalized Anxiety Disorder 7-item scale; positive screen defined as GAD-7≥8  e PCL-C = Post-traumatic stress disorder Checklist-Civilian version; scored using Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) symptom cluster scoring | | | | | | | | |

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| **Table 2: Unadjusted and adjusted associations of participant characteristics and perceived impact of the COVID-19 pandemic on mental health and access to care.** Participants are individuals in the perinatal period, who previously screened positive on Edinburgh Postnatal Depression Scale (EPDS; positive screen defined as ≥10) and participated in an ongoing randomized control trial (RCT) in Massachusetts – the PRogram In Support of Moms (PRISM, conducted 10/2015-present). This sub-study examined participants with at least one interview between March and September 2020. | | | | | | | | | | | | | | | | |
|  | **Increased depression?** | | | | **Increased anxiety?** | | | | **Ability to get healthcare**? | | | | **Ability to get mental healthcare**? | | | |
|  | ***OR****a* | ***95% CI****b* | ***aOR****c* | ***95% CI****b* | ***OR****a* | ***95% CI****b* | ***aOR****c* | ***95% CI****b* | ***OR****a* | ***95% CI****b* | ***aOR****c* | ***95% CI****b* | ***OR****a* | ***95% CI****b* | ***aOR****c* | ***95% CI****b* |
| *35 and up (n =45)*  *(ref: under 35, n=118)* | 1.26 | 0.69 – 2.30 | 1.23 | 0.63 – 2.39 | 1.05 | 0.56 – 1.98 | 0.93 | 0.47 – 1.83 | 1.39 | 0.74 – 2.61 | 1.32 | 0.65 – 2.66 | 0.95 | 0.42 – 2.13 | 1.63 | 0.63 – 4.21 |
| *Participants of color (n =80)*  *(ref: Non-Hispanic White, n=79)* | 0.63 | 0.36 – 1.10 | 0.55 | 0.28 – 1.06 | 0.68 | 0.38 – 1.19 | 0.58 | 0.30 – 1.11 | 0.97 | 0.55 – 1.71 | 0.78 | 0.40 – 1.52 | 2.03 | 0.95 – 4.34 | **3.25\*** | **1.23 – 8.59** |
| *Income ≥60k (n=68)*  *(ref < 60, n=79)* | **2.31\*\*** | **1.28 –**  **4.17** | **2.33\*** | **1.19 –** **4.57** | **1.96\*** | **1.08 – 3.56** | 1.75 | 0.91 – 3.37 | 1.00 | 0.55 – 1.80 | 0.82 | 0.42 – 1.61 | 0.96 | 0.44 – 2.12 | 1.32 | 0.49 – 3.52 |
| *Positive EPDSd (n=82)*  *(ref = negative EPDS, n=79)* | **3.91\*\*\*** | **2.18 – 7.03** | 1.81 | 0.90 – 3.62 | **2.65\*\*** | **1.49 – 4.71** | 1.62 | 0.80 – 3.27 | **1.96\*** | **1.11** –  **3.48** | 1.56 | 0.77 – 3.16 | **2.96\*\*** | **1.37 – 6.39** | **3.25\*** | **1.15 – 9.17** |
| *Positive GADe (n=67)*  *(ref = negative GAD, n=96)* | **2.77\*\*\*** | **1.56 – 4.90** | 1.96 | 0.96 – 4.02 | **2.60\*\*** | **1.45 – 4.66** | **2.13\*** | **1.01 – 4.49** | **2.66\*\*** | **1.49** –  **4.76** | **2.14\*** | **1.01** – **4.54** | **3.02\*\*** | **1.41** –  **6.47** | 1.94 | 0.68 – 5.54 |
| *Positive PCLf (n=31)*  *(ref = negative PCL, n=132)* | **3.69\*\*\*** | **1.81 – 7.51** | **2.79\*** | **1.09 – 7.13** | **2.34\*** | **1.14 – 4.80** | 1.12 | 0.43 – 2.90 | 1.61 | 0.79 – 3.27 | 1.25 | 0.50 -3.12 | 2.19 | 0.95 – 5.10 | 1.15 | 0.35 – 3.84 |
| a OR = odds ratio from ordinal logistic regression model; bolded values indicate significance in logistic regression: \*p <0.05 \*\*p<0.01 \*\*\*p<0.001  b 95% CI = 95% confidence interval  c aOR = adjusted odds ratio from ordinal logistic model. aOR is adjusted for age, race/ethnicity, income, and positive screeners. Bolded values indicate significance in logistic regression: \*p <0.05 \*\*p<0.01 \*\*\*p<0.001  d EPDS = Edinburgh Postnatal Depression Scale; positive screen defined as an EPDS≥10. EPDS scores reported in table were those from the participant’s first interview conducted at the time of the pandemic (initial or follow-up). Though all participants scored EPDS≥10 at initial interview, EPDS was not necessarily positive in follow-up interviews.  e GAD-7 = Generalized Anxiety Disorder 7-item scale; positive screen defined as GAD-7≥8  f PCL-C = Post-traumatic stress disorder Checklist-Civilian version; scored using Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) symptom cluster scoring | | | | | | | | | | | | | | | | |

**Supplemental Table 1**. **Supplemental Likert-style scale questions related to the COVID-19 pandemic.** Questions were added to existing interviews in an ongoing randomized control trial (RCT) in Massachusetts – the PRogram In Support of Moms (PRISM, conducted 10/2015-present).

The following questions have the following Likert scale as the response options:

0 = Not at all

1 = Slightly

2 = Somewhat

3 = Moderately

4 = To a great degree

1. To what extent has coronavirus affected your income?
2. To what extent has coronavirus affected your ability to get food and supplies to take care of your family and household?
3. To what extent has coronavirus affected the level of support you normally receive from family, friends, and your community?
4. To what extent has coronavirus affected your ability to get the healthcare you need for yourself?
5. To what extent has coronavirus affected your ability to get the healthcare that your baby needs?
6. To what extent has coronavirus increased your feelings of depression?
7. To what extent has coronavirus made you feel more anxious?
8. I frequently spend time thinking about coronavirus and its impact on my life.
9. To what extent has coronavirus impacted your obstetric or post-delivery care?
10. To what extent has coronavirus impacted your pregnancy?
11. To what extent has your mental and emotional well-being been impacted by coronavirus?
12. To what extent has coronavirus interfered with your ability to do things that are enjoyable, meaningful, or in line with your values?
13. To what extent has coronavirus impacted your ability to get mental health care?

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| **Supplemental Table 2: Demographics and characteristics of participants (n = 163) included in the study.** Participants are individuals in the perinatal period, who previously screened positive on Edinburgh Postnatal Depression Scale (EPDS; positive screen defined as ≥10) and participated in an ongoing randomized control trial (RCT) in Massachusetts – the PRogram In Support of Moms (PRISM, conducted 10/2015-present). This sub-study examined participants with at least one interview between March and September 2020. | |
| **Characteristic** | **All participants**  (n, %)a |
| **Month of interview (within 2020 calendar year)** |  |
| *March* | 15 (9.2) |
| *April* | 39 (23.9) |
| *May* | 33 (20.2) |
| *June* | 26 (16.0) |
| *July* | 30 (18.4) |
| *August* | 17 (10.4) |
| *September* | 3 (1.8) |
| **Time since initial RCT recruitment (10/2015-present)** |  |
| *Months* ***(mean, SD)*** | 8.5 (6.1) |
| **Age** |  |
| *Age in year* ***(mean, SD)*** | 30.8 (5.8) |
| *Less than 35 years old* | 118 (72.4) |
| *35 years or older* | 45 (27.6) |
| **Education** |  |
| *Grade school/some high school* | 4 (2.5) |
| *High school diploma or GED equivalent* | 39 (23.9) |
| *Some college or 2-year degree* | 48 (29.4) |
| *Bachelor’s degree or higher* | 72 (44.2) |
| **Race/Ethnicity** |  |
| **Participants of color***b* | 80 (50.3) |
| *Black/African American* | *15 (10.6)* |
| *Hispanic/Latinx* | *49 (30.2)* |
| *Asian* | *10 (7.1)* |
| *Multiracial* | *17 (12.0)* |
| **Non-Hispanic White participants** | 79 (49.7) |
| **Payment source** |  |
| *Private health insurance* | 85 (52.1) |
| *Medicaid or MassHealth* | 74 (45.4) |
| *Tricare or other Military healthcare* | 2 (1.2) |
| *No health insurance* | 1 (0.6) |
| **Marital status** |  |
| *Never married* | 41 (25.2) |
| *Divorced/widowed/separated* | 14 (8.6) |
| *Married/living with partner* | 108 (66.3) |
| **Perinatal status** |  |
| *Pregnant* | 50 (30.7) |
| *Postpartum* | 113 (69.3) |
| **Employment** |  |
| *Unemployed* | 47 (28.8) |
| *Employed part-time* | 28 (17.2) |
| *Employed full-time* | 88 (54.0) |
| **Income** |  |
| *Less than $20,000* | 27 (18.4) |
| *$20,000 - $59,999* | 52 (35.4) |
| *$60,000 - $99,999* | 25 (17.0) |
| *More than $100,000* | 43 (29.3) |
| **Living situation** |  |
| *Own apartment or house* | 132 (85.2) |
| *With friends or family* | 23 (14.8) |
| **Depression scores** |  |
| *Negative EPDSc screen* | 79 (49.1) |
| *Positive EPDSc screen (score ≥10)* | 82 (50.9) |
| **Anxiety scores** |  |
| *Negative GAD-7d screen* | 96 (58.9) |
| *Positive GAD-7d screen (score ≥8)* | 67 (41.1) |
| **PTSD scores** |  |
| *Negative PCL-Ce screen* | 132 (81.0) |
| *Positive PCL-Ce screen (score based on meeting DSM-IV cluster criteria)* | 31 (19.0) |
| ***Participant or family member has contracted COVID-19*** |  |
| *Yesf* | 11 (9.4) |
| ***Obstetric visits since the COVID-19 pandemic began*** |  |
| *Agree that their obstetric practice has* ***changed prenatal care*** *g* | 62 (80.5) |
| *If prenatal care has changed, have had a* ***phone visit*** | 33 (67.4) |
| *If prenatal care has changed, have had a* ***video conference visit*** | 12 (24.5) |
| ***Has COVID-19g…*** |  |
| *… affected your income?* | 100 (62.1) |
| *… affected your ability to get food/supplies to care for your family/household?* | 95 (59.0) |
| *… affected your level of support from family, friends, and your community?* | 131 (81.4) |
| *… impacted your pregnancy?f* | 35 (29.9) |
| *… affected your ability to get the healthcare you need for yourself?* | 94 (58.4) |
| *… affected your ability to get the healthcare that your baby needs?* | 35 (36.5) |
| *… impacted your obstetric or post-delivery care?f* | 47 (40.2) |
| *… impacted your ability to get mental healthcare?f* | 42 (35.9) |
| *… increased your feelings of depression?* | 130 (80.8) |
| *… increased your feelings of anxiety?* | 142 (88.8) |
| *… increased the time thinking about it and its impact on my life.f* | 96 (79.3) |
| *… impacted your mental and emotional well-being?f* | 100 (85.5) |
| *… interfered with your ability to do things that are enjoyable/meaningful/that you value?f* | 109 (94.0) |
| a Scores represent data from the time of the COVID-19 interview assessment. Percentages may not add up to 100% due to rounding. Numbers are reported as n (%), unless otherwise indicated.  b Specificcategories of participants of color are not mutually exclusive. Multiracial: participant who identified with more than one race/ethnicity.  c EPDS = Edinburgh Postnatal Depression Scale; positive screen defined as an EPDS≥10. EPDS scores reported in table were those from the participant’s first interview conducted at the time of the pandemic (initial or follow-up). Though all participants scored EPDS≥10 at initial interview, EPDS was not necessarily positive in follow-up interviews.  d GAD-7 = Generalized Anxiety Disorder 7-item scale; positive screen defined as GAD-7≥8  e PCL-C = Post-traumatic stress disorder Checklist-Civilian version; scored using Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) symptom cluster scoring  f These questions were added in April (n = 117); these questions were added in May (n=77).  g Likert-style responses were collapsed for analysis, “Any effect” is reported here (i.e., Answered with any of the following: Slightly, Somewhat, Moderately, and To a great degree). | | |

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| **Supplemental Table 3a: Association of Barriers to Access to Care Evaluation (BACE) scores with COVID-19-pandemic-related impacts related to access to care.** Results are shown for participants in the perinatal period, who previously screened positive on Edinburgh Postnatal Depression Scale (EPDS; positive screen defined as ≥10) and participated in an ongoing randomized control trial (RCT) in Massachusetts – the PRogram In Support of Moms (PRISM, conducted 10/2015-present). This sub-study examined participants with at least one interview between March and September 2020. | | | | | |
|  | **BACE raw score** | **t-statistic** | **p-value** | **Correlation with BACE** | **p-value** |
| ***Impact on access to healthcare*** | - | - | - | **0.37** | **<0.001** |
| *Any (n=92)* | 0.54 | -4.77 | **<0.001** | - | - |
| *None (n=67)* | 0.24 | - | - |
| ***Impact on access to neonatal care*** | - | - | - | **0.34** | **0.001** |
| *Any (n=35)* | 0.58 | -2.51 | **0.016** | - | - |
| *None (n=60)* | 0.32 | - | - |
| ***Impact on access to obstetric care*** | - | - | - | **0.26** | **0.006** |
| *Any (n=46)* | 0.54 | -2.27 | **0.025** | - | - |
| *None (n=69)* | 0.34 | - | - |
| ***Impact on access to mental healthcare*** | - | - | - | **0.47** | **<0.001** |
| *Any (n=40)* | 0.70 | -4.43 | **<0.001** | - | - |
| *None (n=75)* | 0.28 | - | - |
| |  |  |  |  | | --- | --- | --- | --- | | **Supplemental Table 3b:**  **Association of BACE scores with race/ethnicity in participants that reported perceived COVID-19 pandemic-related impacts in access to care.** | | | | |  | **BACE raw score** | **t-statistic** | **p-value** | | ***Impact on access to healthcare*** | | | | | *Participants of color (n=43)* | 0.69 | -2.48 | **0.016** | | *Non-Hispanic White participants (n=45)* | 0.42 | | ***Impact on access to neonatal care*** | | | | | *Participants of color (n=22)* | 0.68 | -1.07 | 0.293 | | *Non-Hispanic White participants (n=11)* | 0.47 | | ***Impact on access to obstetric care*** | | | | | *Participants of color (n=26)* | 0.68 | -2.27 | **0.029** | | *Non-Hispanic White participants (n=19)* | 0.38 | | ***Impact on access to mental healthcare*** | | | | | *Participants of color (n=22)* | 0.89 | -2.62 | **0.014** | | *Non-Hispanic White participants (n=16)* | 0.48 | | The Barriers to Access to Care Evaluation (BACE) instrumental subscale measures non-stigma related barriers to care (e.g., transportation problems to appointments). BACE scores are an average of the response values across the 8 items in the sub-scale, with answers ranging from 0 (not at all) to 3 (a lot). In this table, t-tests measure the difference between raw BACE scores across dichotomized outcomes at the time of sub-study interview, where the outcome responses were dichotomized into “not at all” versus all other options (Slightly, Somewhat, Moderately, and To a great degree. Correlations measure the degree of relationship between the raw BACE scores and all ordinal outcome responses. | | | | | | | | | |

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| **Supplemental Table 4a: Impact of COVID-19 pandemic on access to care and mental health by participant sociodemographic and clinical characteristics.a Sensitivity analysis for Table 1 - outcomes dichotomized “minor effect” (not at all, slightly, somewhat) vs. “major effect” (moderately, to a great degree)** Participants are individuals in the perinatal period, who previously screened positive on Edinburgh Postnatal Depression Scale (EPDS; positive screen defined as ≥10) and participated in an ongoing randomized control trial (RCT) in Massachusetts – the PRogram In Support of Moms (PRISM, conducted 10/2015-present). This sub-study examined participants with at least one interview between March and September 2020. | | | | | | | | |
|  | **Has the pandemic increased your depression?** | | **Has the pandemic increased your anxiety?** | | **Has the pandemic affected your ability to get healthcare**? | | Has the pandemic affected **your ability to get mental healthcare**? | |
|  | ***Minor effect (%)*** | ***Major effect (%)*** | ***Minor effect (%)*** | ***Major effect (%)*** | ***Minor effect (%)*** | ***Major effect (%)*** | ***Minor effect (%)*** | ***Major effect (%)*** |
| *All participants*  *(n =163)* | 62.7 | 37.3 | 39.4 | 60.6 | 77.0 | 23.0 | 87.2 | 12.8 |
| *>35 years (n =45)* | 64.4 | 35.6 | 43.2 | 56.8 | 6**4.4\*** | **35.6\*** | 83.3 | 16.7 |
| *< 35 years (n =118)* | 62.1 | 37.9 | 37.9 | 62.1 | **81.9\*** | **18.1\*** | 88.9 | 11.1 |
| *College education*  *(n =72)* | 59.2 | 40.9 | **23.9\*\*\*** | **76.1\*\*\*** | 80.3 | 19.7 | 86.8 | 13.2 |
| *Less than college education (n =91)* | 65.6 | 34.4 | **51.7\*\*\*** | **48.3\*\*\*** | 74.4 | 25.6 | 87.5 | 12.5 |
| *Participants of colorb (n=80)* | 69.6 | 30.4 | 46.2 | 53.9 | 78.5 | 21.5 | 82.1 | 17.9 |
| *Non-Hispanic White participants (n =79)* | 56.4 | 43.6 | 33.3 | 66.7 | 76.9 | 23.1 | 93.1 | 6.9 |
| *Public insurance*  *(n =74)* | 56.3 | 43.7 | **48.6\*** | **51.4\*** | 76.7 | 23.3 | 92.5 | 7.6 |
| *Private insurance*  *(n =88)* | 69.9 | 30.1 | **31.0\*** | **69.0\*** | 77.0 | 23.0 | 82.5 | 17.5 |
| *Married/Partnered*  *(n =108)* | 61.3 | 38.7 | 34.0 | 66.0 | 77.4 | 22.6 | 84.9 | 15.1 |
| *Unmarried/No partner (n =55)* | 65.5 | 34.6 | 50.0 | 50.0 | 76.4 | 23.6 | 90.9 | 9.1 |
| *Income <$60,000 (n =79)* | **70.5\*** | **29.5\*** | **50.7\*\*** | **49.4\*\*** | 76.9 | 23.1 | 87.3 | 12.7 |
| *Income ≥$60,000 (n =68)* | **52.2\*** | **47.8\*** | **28.4\*\*** | **71.6\*\*** | 76.1 | 23.9 | 88.2 | 11.8 |
| *Positive EPDSc*  *(n =82)* | **46.3\*\*\*** | **53.8\*\*\*** | **27.5\*\*** | **72.5\*\*** | 71.3 | 28.8 | 81.7 | 18.3 |
| *Negative EPDSc*  *(n = 79)* | **79.8\*\*\*** | **20.3\*\*\*** | **56.6\*\*** | **47.4\*\*** | 83.5 | 16.5 | 93.0 | 7.0 |
| *Positive GAD-7d*  *(n =67)* | **52.3\*** | **47.7\*** | **26.6\*\*** | **73.4\*\*** | 69.2 | 30.8 | 84.6 | 15.4 |
| *Negative GAD-7d*  *(n =96)* | **69.8\*** | **30.2\*** | **47.9\*\*** | **52.1\*\*** | 82.3 | 17.7 | 89.2 | 10.8 |
| *Positive PCL-Ce*  *(n =31)* | **36.7\*\*** | **63,3\*\*** | **20.7\*** | **79.3\*** | 66.7 | 33.3 | 87.0 | 13.0 |
| *Negative PCL-Ce*  *(n =132)* | **68.7\*\*** | **31.3\*\*** | **43.5\*** | **56.5\*** | 79.4 | 20.6 | 87.2 | 12.8 |
| a Chi-square analyses were conducted within each characteristic (each like-shaded row). Characteristics and Likert-style responses were collapsed for analysis: “Major effects” (i.e., Moderately, To a great degree) versus “Minor effects” (i.e., Not at all, Slightly, Somewhat). Percentages may not add up to 100% due to rounding. Bolded values indicate significance in a Chi-square test:  \*p <0.05 \*\*p<0.01 \*\*\*p<0.001  bCategories of race are not mutually exclusive. Multiracial: participant who identified with more than one race.  c EPDS = Edinburgh Postnatal Depression Scale; positive screen defined as an EPDS≥10. EPDS scores reported in table were those from the participant’s first interview conducted at the time of the pandemic (initial or follow-up). Though all participants scored EPDS≥10 at initial interview, EPDS was not necessarily positive in follow-up interviews.  d GAD-7 = Generalized Anxiety Disorder 7-item scale; positive screen defined as GAD-7≥8  e PCL-C = Post-traumatic stress disorder Checklist-Civilian version; scored using Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) symptom cluster scoring | | | | | | | | |

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| **Supplemental Table 4b: Impact of COVID-19 pandemic on access to care and mental health by participant sociodemographic and clinical characteristics.a  Sensitivity analysis for Table 1 - outcomes were treated as continuous variables (rather than categorical).** Participants are individuals in the perinatal period, who previously screened positive on Edinburgh Postnatal Depression Scale (EPDS; positive screen defined as ≥10) and participated in an ongoing randomized control trial (RCT) in Massachusetts – the PRogram In Support of Moms (PRISM, conducted 10/2015-present). This sub-study examined participants with at least one interview between March and September 2020. | | | | |
|  | **Has the pandemic increased your depression?** | **Has the pandemic increased your anxiety?** | **Has the pandemic affected your ability to get healthcare**? | Has the pandemic affected **your ability to get mental healthcare**? |
|  | ***Correlation*** | ***Correlation*** | ***Correlation*** | ***Correlation*** |
| *Age* | **0.20\*\*** | **0.18\*** | 0.10 | -0.04 |
| *> 35 years (n =118)* | 0.06 | 0.00 | 0.09 | 0.03 |
| *Education* | **0.17\*** | **0.23\*\*** | -0.04 | -0.04 |
| *College education*  *(n =72)* | **0.16\*** | **0.25\*\*** | -0.05 | -0.06 |
| *Participants of colorb (n=80)* | -0.13 | -0.12 | -0.02 | 0.18 |
| *Public insurance*  *(n =74)* | **-0.18\*** | **-0.16\*** | -0.01 | -0.08 |
| *Married/Partnered*  *(n =108)* | 0.10 | **0.18\*** | -0.04 | 0.06 |
| *Income* | **0.24\*\*** | **0.22\*\*** | -0.05 | -0.08 |
| *Income ≥$60,000 (n =68)* | **0.23\*\*** | **0.20\*** | -0.01 | -0.03 |
| *EPDS score* | **0.44\*\*\*** | **0.41\*\*\*** | **0.28\*\*\*** | **0.31\*\*\*** |
| *Positive EPDSc*  *(n =82)* | **0.36\*\*\*** | **0.29\*\*\*** | **0.18\*** | **0.026\*\*** |
| *GAD score* | **0.45\*\*\*** | **0.41\*\*\*** | **0.29\*\*\*** | **0.26\*\*** |
| *Positive GAD-7d*  *(n =67)* | **0.27\*\*\*** | **0.27\*\*\*** | **0.25\*\*** | **0.22\*** |
| *PCL-C score* | **0.42\*\*\*** | **0.28\*\*\*** | **0.19\*** | **0.21\*** |
| *Positive PCL-Ce*  *(n =31)* | **0.29\*\*\*** | **0.21\*\*** | 0.10 | 0.10 |
| a Correlation analyses were conducted within each characteristic (each like-shaded row). Characteristics and Likert-style responses were treated as continuous for analysis. Bolded values indicate a significant correlation: \*p <0.05 \*\*p<0.01 \*\*\*p<0.001  bCategories of race are not mutually exclusive. Multiracial: participant who identified with more than one race.  c EPDS = Edinburgh Postnatal Depression Scale; positive screen defined as an EPDS≥10. EPDS scores reported in table were those from the participant’s first interview conducted at the time of the pandemic (initial or follow-up). Though all participants scored EPDS≥10 at initial interview, EPDS was not necessarily positive in follow-up interviews.  d GAD-7 = Generalized Anxiety Disorder 7-item scale; positive screen defined as GAD-7≥8  e PCL-C = Post-traumatic stress disorder Checklist-Civilian version; scored using Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) symptom cluster scoring | | | | |

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| **Supplemental Table 5: Unadjusted and adjusted associations of participant characteristics and perceived impact of the COVID-19 pandemic on mental health and access to care. Sensitivity analysis for Table 2 - outcomes were treated as continuous variables (rather than categorical) and linear regressions were used.** Participants are individuals in the perinatal period, who previously screened positive on Edinburgh Postnatal Depression Scale (EPDS; positive screen defined as ≥10) and participated in an ongoing randomized control trial (RCT) in Massachusetts – the PRogram In Support of Moms (PRISM, conducted 10/2015-present). This sub-study examined participants with at least one interview between March and September 2020. | | | | | | | | | | | | | | | | |
|  | **Increased depression?** | | | | **Increased anxiety?** | | | | **Ability to get healthcare**? | | | | **Ability to get mental healthcare**? | | | |
|  | ***Beta coeffa*** | ***95% CI****b* | ***Beta coeffc*** | ***95% CI****b* | ***Beta coeffa*** | ***95% CI****b* | ***Beta coeffc*** | ***95% CI****b* | ***Beta coeffa*** | ***95% CI****b* | ***Beta coeffc*** | ***95% CI****b* | ***Beta coeffa*** | ***95% CI****b* | ***Beta coeffc*** | ***95% CI****b* |
| *35 and up (n =45)*  *(ref: under 35, n=118)* | 0.17 | -0.31 – 0.66 | 0.08 | -0.40 – 0.55 | 0.00 | -0.49 – 0.50 | -0.10 | -0.61 – 0.41 | 0.29 | -0.20 – 0.77 | 0.21 | -0.29 – 0.71 | 0.08 | -0.43 – 0.59 | 0.26 | -0.24 – 0.76 |
| *Participants of color (n =80)*  *(ref: Non-Hispanic White, n=79)* | -0.37 | -0.81 – 0.07 | -0.41 | -0.88 – 0.06 | -0.33 | -0.78 – 0.11 | -0.39 | -0.88 – 0.11 | -0.04 | -0.48 – 0.39 | -0.22 | -0.71 – 0.27 | 0.45 | -0.01 – 0.91 | **0.64\*** | **0.13 – 1.15** |
| *Income ≥60k (n=68)*  *(ref < 60, n=79)* | **0.64\*\*** | **0.19 –**  **1.09** | **0.56\*** | **0.09 –** **1.03** | **0.56\*** | **0.10 – 1.02** | 0.43 | -0.07 – 0.93 | -0.02 | -0.48 – 0.44 | -0.22 | -0.71 – 0.28 | -0.08 | -0.56 – 0.41 | 0.07 | -0.45 – 0.58 |
| *Positive EPDSd (n=82)*  *(ref = negative EPDS, n=79)* | **1.01\*\*\*** | **0.60 – 1.42** | 0.40 | -0.09 – 0.90 | **0.82\*\*\*** | **0.40 – 1.25** | 0.39 | -0.13 – 0.92 | **0.50\*** | **0.07** –  **0.93** | 0.36 | -0.16 – 0.87 | **0.66\*\*** | **0.21 – 1.11** | **0.65\*** | **0.12 – 1.19** |
| *Positive GADe (n=67)*  *(ref = negative GAD, n=96)* | **0.78\*\*\*** | **0.35 – 1.21** | 0.41 | -0.12 – 0.93 | **0.76\*\*** | **0.33 – 1.19** | 0.53 | -0.02 – 1.07 | **0.70\*\*** | **0.27** –  **1.13** | 0.51 | -0.03 – 1.06 | **0.57\*** | **0.11** –  **1.03** | 0.26 | -0.30 – 0.81 |
| *Positive PCLf (n=31)*  *(ref = negative PCL, n=132)* | **1.04\*\*\*** | **0.50 – 1.58** | **0.79\*** | **0.12 – 1.46** | **0.77\*\*** | **0.21 – 1.33** | 0.25 | -0.47 – 0.96 | 0.36 | -0.19 – 0.92 | 0.16 | -0.54 -0.87 | 0.33 | -0.26 – 0.92 | -0.01 | -0.73 – 0.72 |
| a Beta coeff= Beta coefficients from linear regression models; bolded values indicate significance in regression: \*p <0.05 \*\*p<0.01 \*\*\*p<0.001  b 95% CI = 95% confidence interval  c  Beta coeff = Beta coefficients from multivariate linear regression models, adjusted for age, race/ethnicity, income, and positive screeners.  d EPDS = Edinburgh Postnatal Depression Scale; positive screen defined as an EPDS≥10. EPDS scores reported in table were those from the participant’s first interview conducted at the time of the pandemic (initial or follow-up). Though all participants scored EPDS≥10 at initial interview, EPDS was not necessarily positive in follow-up interviews.  e GAD-7 = Generalized Anxiety Disorder 7-item scale; positive screen defined as GAD-7≥8  f PCL-C = Post-traumatic stress disorder Checklist-Civilian version; scored using Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) symptom cluster scoring | | | | | | | | | | | | | | | | |

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| **Supplemental Table 6a: Association of Barriers to Access to Care Evaluation (BACE) scores with COVID-19-pandemic-related impacts related to access to care. Sensitivity analysis for Supplemental Table 3a - outcomes dichotomized “minor effect” (not at all, slightly, somewhat) vs. “major effect” (moderately, to a great degree).** Results are shown for participants in the perinatal period, who previously screened positive on Edinburgh Postnatal Depression Scale (EPDS; positive screen defined as ≥10) and participated in an ongoing randomized control trial (RCT) in Massachusetts – the PRogram In Support of Moms (PRISM, conducted 10/2015-present). This sub-study examined participants with at least one interview between March and September 2020. | | | | | |
|  | **BACE raw score** | **t-statistic** | **p-value** | **Correlation with BACE** | **p-value** |
| ***Impact on access to healthcare*** | - | - | - | **0.37** | **<0.001** |
| *Major effect (n=37)* | 0.66 | -2.93 | **0.005** | - | - |
| *Minor effect (n=122)* | 0.34 | - | - |
| ***Impact on access to neonatal care*** | - | - | - | **0.34** | **0.001** |
| *Major effect (n=9)* | 0.81 | -1.54 | 0.160 | - | - |
| *Minor effect (n=86)* | 0.37 | - | - |
| ***Impact on access to obstetric care*** | - | - | - | **0.26** | **0.006** |
| *Major effect (n=21)* | 0.66 | -2.15 | **0.041** | - | - |
| *Minor effect (n=94)* | 0.37 | - | - |
| ***Impact on access to mental healthcare*** | - | - | - | **0.47** | **<0.001** |
| *Major effect (n=14)* | 0.89 | -2.61 | **0.021** | - | - |
| *Minor effect (n=101)* | 0.36 | - | - |
| |  |  |  |  | | --- | --- | --- | --- | | **Supplemental Table 6b:**  **Association of BACE scores with race/ethnicity in participants that reported a major effect of the COVID-19 pandemic-related impacts in access to care.**  **Sensitivity analysis for Supplemental Table 3b - outcomes dichotomized “minor effect” (not at all, slightly, somewhat) vs. “major effect” (moderately, to a great degree).** | | | | |  | **BACE raw score** | **t-statistic** | **p-value** | | ***Major impact on access to healthcare*** | | | | | *Participants of color (n=17)* | 0.84 | -1.47 | 0.155 | | *Non-Hispanic White participants (n=18)* | 0.52 | | ***Major impact on access to neonatal care*** | | | | | *Participants of color (n=9)* | 1.11 | -1.67 | 0.131 | | *Non-Hispanic White participants (n=4)* | 0.63 | | ***Major impact on access to obstetric care*** | | | | | *Participants of color (n=13)* | 0.76 | -0.85 | 0.407 | | *Non-Hispanic White participants (n=7)* | 0.57 | | ***Major impact on access to mental healthcare*** | | | | | *Participants of color (n=5)* | 1.10 | -0.83 | 0.439 | | *Non-Hispanic White participants (n=3)* | 0.58 | | The Barriers to Access to Care Evaluation (BACE) instrumental subscale measures non-stigma related barriers to care (e.g., transportation problems to appointments). BACE scores are an average of the response values across the 8 items in the sub-scale, with answers ranging from 0 (not at all) to 3 (a lot). In this table, t-tests measure the difference between raw BACE scores across dichotomized outcomes at the time of sub-study interview, where the outcome responses were dichotomized into “minor effect” (not at all, slightly, somewhat) vs. “major effect” (moderately, to a great degree). Correlations measure the degree of relationship between the raw BACE scores and all ordinal outcome responses. | | | | | | | | | |