

## ORIGINAL ARTICLE

# The association between maternal fears about their infant/toddler during the COVID-19 pandemic and depression and anxiety: a birth cohort study

Raquel Wermann Foschiera,<sup>1</sup> Júlia Pustrelo Moro,<sup>2</sup> Fabiana de Abreu Getulino,<sup>2</sup> Marina Xavier Carpena,<sup>3</sup> Francine dos Santos Costa,<sup>4,5</sup> Cauane Blumenberg,<sup>3,4,5,6</sup> Rafaela Costa Martins,<sup>4,6</sup> Thais Martins-Silva,<sup>4,6</sup> Luana Patrícia Marmitt,<sup>7</sup> Alejandra Goicochea,<sup>8</sup> Rodrigo Meucci,<sup>9</sup> Juraci Cesar,<sup>9</sup> Christian Loret de Mola<sup>4,8,9</sup>

<sup>1</sup>Departamento de Psicologia, Universidade Federal do Rio Grande (FURG), Rio Grande, RS, Brazil. <sup>2</sup>Departamento de Medicina, FURG, Rio Grande, RS, Brazil. <sup>3</sup>Programa de Pós-Graduação em Epidemiologia, Universidade Federal de Pelotas (UFPel), Pelotas, RS, Brazil. <sup>4</sup>Grupo de Pesquisa e Inovação em Saúde, FURG, Rio Grande, RS, Brazil. <sup>5</sup>Causale Consultoria, Pelotas, RS, Brazil. <sup>6</sup>Centro de Pesquisas em Desenvolvimento Humano e Violência, UFPel, Pelotas, RS, Brazil. <sup>7</sup>Programa de Pós-Graduação em Biociências e Saúde, Universidade do Oeste de Santa Catarina, Joaçaba, SC, Brazil. <sup>8</sup>Universidad Científica del Sur, Lima, Peru. <sup>9</sup>Programa de Pós-Graduação em Saúde Pública, FURG, Rio Grande, RS, Brazil.

**Objective:** To assess the association between maternal fears about their infant/toddler and depression and anxiety during the COVID-19 pandemic.

**Methods:** In 2019, all mothers who gave birth in hospitals in Rio Grande, RS, Brazil were asked to respond to a standardized questionnaire (baseline). We followed them between May-June 2020 (first follow-up point), August-December 2020 (second follow-up point), and from October 2021 to March 2022 (third follow-up point), and asked them if they were: (1) afraid that their infant/toddler would become infected with COVID or get sick (yes/no), (2) afraid that they would contaminate their own child with COVID, and/or (3) worried about the pandemic's effects on their child's future. At baseline and at all follow-up points, we assessed depressive symptoms using the Edinburgh Postnatal Depression Scale and anxiety symptoms using the Generalized Anxiety Disorder Scale, creating symptom trajectories using group-based trajectory modelling. We used multinomial logistic regression to calculate adjusted relative risk ratios (RRR).

**Results:** A total of 1,296 mothers participated. Worrying about the pandemic's effects on their child's future and the fear of contaminating their own child with COVID-19 increased the risk of raising depressive symptoms to a clinical level (RRR = 4.97, 95%CI 2.32-10.64 and RRR = 3.87, 95%CI 1.58-9.47, respectively) and anxiety to a moderate level (RRR = 2.91, 95%CI 1.69-5.01 and RRR = 1.86, 95%CI 1.03-3.35, respectively).

**Conclusion:** Fear for their children increased maternal depressive and anxiety symptoms during the pandemic.

**Keywords:** COVID-19, mothers, anxiety, depression

## Introduction

Although the first official cases of COVID-19 in Brazil were reported in March 2020, a study found that SARS-CoV-2 had been circulating undetected since at least November 2019.<sup>1</sup> The primary control and prevention measure for the outbreak was social isolation, which had a significant impact on the daily routines and mental health of the population.<sup>2</sup>

Globally, the prevalence of major depressive and anxiety disorders increased an estimated 27.6% and

25.6%, respectively, due to the pandemic.<sup>3</sup> Studies analyzing the psychological impact of social isolation in previous epidemic outbreaks described stress triggers, such as fear of infection, feelings of frustration, financial loss, and the stigma of the disease,<sup>4,5</sup> which affected all age groups in different ways.

Daily parenting practices also underwent drastic changes during the pandemic, for which many parents were unprepared. This led to increased concern, worry, and fear, which affected child development and parental mental health.<sup>6</sup> Moreover, studies have shown that

Correspondence: Christian Loret de Mola, Rua Elgar Carlos Hadler, 1814, Bloco 3, apto. 202, CEP 96085-357, Pelotas, RS, Brazil.  
E-mail: chlmz@yahoo.com

Submitted Jul 21 2023, accepted Oct 01 2023.

**How to cite this article:** Foschiera RW, Moro JP, Getulino FA, Carpena MX, Costa FS, Blumenberg C, et al. The association between maternal fears about their infant/toddler during the COVID-19 pandemic and depression and anxiety: a birth cohort study. Braz J Psychiatry. 2023;45:491-497. <http://doi.org/10.47626/1516-4446-2023-3306>

maternal stress negatively affected the temperament of babies born during the pandemic,<sup>7</sup> and maternal physiological stress and pandemic-related worries or fears have been associated with poorer emotional-behavioral health in children.<sup>7,8</sup>

For mothers, thinking about the consequences of COVID-19 was strongly associated with fear, anxiety,<sup>9</sup> and maternal depression.<sup>10</sup> Pandemic-related fears have been associated with increased mental health problems, especially among those with a history of depression.<sup>11</sup> However, it is hypothesized that mothers' fears for their children could also impact their own mental health, especially depression and anxiety symptoms.

As shown in previous studies, maternal depression and anxiety increased exponentially during the first year of the pandemic.<sup>12</sup> These mental health disorders are already public health problems in Brazil, with more than eight million Brazilians suffering from depression, of whom approximately 60% are women.<sup>13,14</sup>

This study investigated the association between 1) maternal worry about the effects of the pandemic on the future of their infant/toddler, 2) fear that their child would become infected with COVID, and maternal depression and anxiety symptoms postpartum (pre-pandemic) and during the pandemic.

## Methods

### Study design and participants

All mothers who gave birth in maternity hospitals in the municipality of Rio Grande, RS, Brazil, between January 1 and December 31, 2019 (pre-pandemic) were invited to answer a standardized questionnaire by trained interviewers. This original study included mothers who had stillbirths, twins, or lived in rural areas of the municipality.

Since our cohort study was designed for long-term follow-up of mothers and their babies and because the inclusion of twins and rural mothers required different follow-up logistics, we included mothers with liveborn singletons who lived in the urban area of the metropolitan region in the 2019 Rio Grande Birth Cohort ( $n = 2,051$ ), using these women as our cohort baseline.

We intended to follow up these mothers on three occasions between 2020 and 2022. The follow-up project was called WebCOVID19, and data were collected through a computer-assisted web interviewing approach. The first two follow-ups were completed in 2020: WebCOVID19-1 occurred between May and June, and WebCOVID19-2 occurred between August and

December. Between October 2021 and May 2022, we completed a third follow-up, WebCOVID19-3 (Figure 1).

Our intention was to follow up these mothers continuously during the pandemic and at key stages of child development. Therefore, our first follow-up point was when children were around 12 months of age, the second was at 18 months, and the third was after 24 months.

A trained team contacted eligible mothers via telephone, WhatsApp, or Facebook, inviting them to respond to a web-based survey through an electronic link produced using REDCap software (Vanderbilt University, Nashville, TN, USA).<sup>15</sup> Mothers who reported no Internet access or difficulty accessing the link or completing the questionnaire received a support call, and, if necessary, were allowed to answer the questionnaire by phone (less than 20% of all interviews). The follow-up rate was 53.6% ( $n=1,100$ ) for WebCOVID19-1, 50.7% ( $n=1,040$ ) for WebCOVID19-2, and 48.4% ( $n=992$ ) for WebCOVID19-3 (Figure 1).

### Variables

#### Outcomes

Depression and anxiety, our two main outcomes, were measured at baseline (pre-pandemic) and at all three follow-up points. Depressive symptoms were assessed using the adapted and validated Brazilian version of the Edinburgh Postnatal Depression Scale (EPDS).<sup>16</sup> This self-report questionnaire consists of 10 items that assesses depressive symptoms in the last week. Each question has four response options on a Likert scale ranging from 0 to 3, according to the presence and intensity of symptoms. In our sample, the internal consistency (Cronbach's alpha) of the EPDS was 0.83 at baseline, 0.88 for WebCOVID19-1, 0.89 for WebCOVID19-2, and 0.91 for WebCOVID19-3.

To assess anxiety symptoms, we used the Generalized Anxiety Disorder (GAD-7) scale, a 7-item self-report instrument that provides a brief assessment of anxiety in the last 2 weeks, reflecting general anxiety symptoms described in DSM-5.<sup>17</sup> Response options are on a Likert scale from 0 to 3 points. The factorial structure, reliability, and psychometric parameters of the Brazilian Portuguese version were verified by Moreno et al.<sup>18</sup> in 2016. In our sample, the internal consistency (Cronbach's alpha) of the GAD-7 was 0.84 at baseline, 0.92 for WebCOVID19-1, 0.90 for WebCOVID19-2, and 0.90 for WebCOVID19-3.

We used group-based trajectory model to determine trajectories for depression and anxiety based on maximum likelihood estimation. The group-based trajectory



**Figure 1** Flowchart of 2019 Rio Grande Birth Cohort recruitment and follow-up.

model is a type of longitudinal finite mixture model designed to identify groups of individuals following similar developmental trajectories.<sup>19</sup> This approach assumes that a population is composed of distinct groups defined by similar changes over time. Our trajectories represent the changes in the total raw score of each scale over time, creating groups of mothers with similar patterns of change.

Even when dichotomized depression and anxiety scores were not analyzed, cut-off points were used to define and name the resulting trajectories. For the EPDS, a score of 13 (sensitivity 59.5%; specificity 88.4%) was considered depression (clinical symptoms), as proposed by Santos et al.,<sup>16</sup> while for the GAD-7 a score of 10 was considered moderate symptoms and a score of 15 was considered severe anxiety.<sup>20</sup>

### Exposure

The main exposure variables in this study were maternal fear that their child would become infected with the COVID-19 virus and worry about the pandemic's consequences on their child's future. To assess these variables, the mothers answered yes or no to the following statements about their thinking the last 7 days:

- i) I have been afraid that my baby will be infected with COVID or get sick.
- ii) I have been afraid that I will contaminate my baby with COVID.
- iii) I have been worried about the effects of the pandemic on my baby's future.

The responses to these statements were collected at both 2020 follow-up points. If the mother responded positively at least once to a statement, we considered it a positive case.

### Covariables

The mothers were asked about their concerns for themselves or other family members: "I have been afraid that I would become infected with COVID or get sick" and "I have been afraid that other household members would become infected with COVID" (yes/no).

These questions were asked at two follow-up points (WebCOVID19-1 and WebCOVID19-2), and if the mother responded positively at least once, we considered it a positive case.

We also used the following baseline measures as covariates: maternal age (classified as < 20, 20 to 24, 25 to 34, or  $\geq$  35 years), race (Black, White, or mixed), maternal education (< 4, 4-8, 9-11, or  $\geq$  12 years), total family income (in BRL), which was classified as multiples of the federal minimum wage (< 1, 1 to < 2, 2 to < 3,  $\geq$  3), whether the mother lived with a partner (yes, no), and the number household members (< 3, 3 to 4, or  $\geq$  5).

### Statistical analysis

For the descriptive analysis, we calculated absolute and relative frequencies, as well as mean scores and SD. We used Fisher's exact test for univariate analysis, and

multinomial (polytomous) logistic regression to calculate relative risk ratios with corresponding 95%CI, since all mental health trajectories were polytomous. We adjusted all regression models for covariates, in which maternal age, education, family income, and number of household members were used as continuous variables. The analyses were performed in Stata 16.1 (StataCorp, College Station, TX, USA).

In the adjusted models, due to substantial follow-up losses, propensity score analysis was performed, using inverse probability weighted estimation based on the baseline sociodemographic characteristics. We used this variable to weight our final analysis and report appropriate p-values for multinomial regression results. Therefore, underrepresented mothers in the cohort would have a higher weight in the analysis. We did this to minimize the possibility of selection bias. We fitted a logistic regression model with non-response during the pandemic as the outcome and baseline covariates as predictors of non-response. Variables that were independently associated with non-response in univariate analyses were included in this logistic regression (age, education, income, living with a partner, and self-reported race). We ran a different model for each non-response inverse probability weight variable. We assessed model fit using the Hosmer-Lemeshow test, which showed no indication of poor fit in the missingness models ( $p > 0.20$ ). After fitting the regression models, we predicted the values of the final regressions and used the Stata *propwt* command to generate inverse probability weight variables.

To create the trajectories, we used the Stata *trajectories* command. CNORM distribution was used in the analyses. The best-fit model was selected according to Bayesian information criteria, Akaike's information criterion, and entropy (classification accuracy by averaging the posterior probabilities after individuals were assigned to their most likely class, with values closer to 1 indicating greater precision). The probability that mothers belonged to the trajectory in which they were included was also considered (posterior probability). If a mother was missing values in one or two follow-up points, the model would include her in the trajectory best fitted for her posterior probability.

### Ethics statement

This study was approved by the Universidade Federal do Rio Grande ethics committee (protocol 15724819.6.0000.5324). All participants provided written informed consent online before the questionnaire was applied; their anonymity was assured and they were informed of the possible risks of participating in the study. Potential participants who did not accept the terms were not included in the study and did not respond to the questionnaire.

### Results

In total, 63.2% of the original sample (n=1,296) had valid information for the main exposure variables and 70.2% had information for depression and anxiety trajectories

(n=1,440). In 2019, most of the mothers were between 25 and 34 years old (45.9%). Most self-reported their race as White (78.9%), 77% had  $\geq 9$  years of education, and 28.6% had  $\geq 12$  years. The income of most families was  $< 3$  times the federal minimum wage (62%), and in 45.3% it was  $< 2$  (Table 1). In general, more than 90% of the mothers were afraid their child would become infected

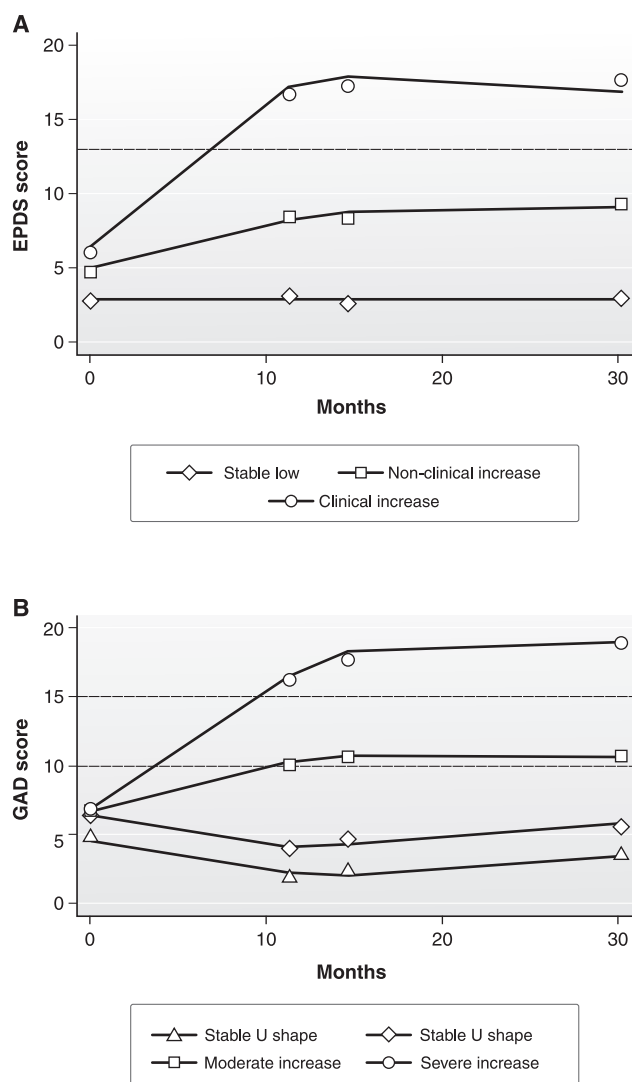
with COVID-19, that they would contaminate their child with COVID, or were worried about the effects of the pandemic on the child's future.

The trajectories are presented in Figure 2. For depression, we found that the best fitting model created three trajectories for depressive symptoms: i) stable low (25.9%); ii) non-clinical increase (50.7%); and iii) clinical

**Table 1** Description of sociodemographic characteristics, maternal fears, and mental health trajectories in the 2019 Rio Grande Birth Cohort, Brazil

Variables	
Maternal age (years)	
< 20	148 (11.4)
20-24	336 (25.9)
25-34	595 (45.9)
$\geq 35$	217 (16.8)
Self-reported race	
White	1,023 (78.9)
Mixed	180 (13.9)
Black	93 (7.2)
Maternal education (years)	
< 4	22 (1.7)
4-8	270 (20.8)
9-11	633 (48.8)
$\geq 12$	371 (28.6)
Family income (in multiples of the federal minimum wage)	
< 1	132 (10.6)
1 to < 2	432 (34.7)
2 to < 3	345 (27.8)
$\geq 3$	335 (26.9)
Lives with a partner	
No	169 (13.0)
Yes	1,127 (87.0)
Number of household residents	
< 3	41 (5.5)
3 to 4	542 (72.7)
$\geq 5$	163 (21.9)
Mother afraid that her child would become infected with COVID or get sick	
No	49 (3.8)
Yes	1,247 (96.2)
Mother worried about the pandemic's effects on her child's future	
No	123 (9.6)
Yes	1,156 (90.4)
Mother afraid of contaminating her child with COVID	
No	1,078.3)
Yes	11,8391.7)
Mother afraid that she or her family members would become infected with COVID	
No	68 (5.2)
Yes	1,277 (94.8)
Depression trajectories	
Stable low	368 (25.9)
Non-clinical increase	721 (50.7)
Clinical increase	333 (23.4)
Anxiety trajectories	
Stable U shape	827 (57.4)
Moderate increase	529 (36.8)
Severe increase	84 (5.8)

Data presented as n (%).  
COVID = coronavirus disease.



**Figure 2** Depression and anxiety trajectories of mothers in the 2019 Rio Grande Birth Cohort. A) Depression symptoms were assessed using the Edinburgh Postnatal Depression Scale (EPDS). B) Anxiety symptoms assessed using the Generalized Anxiety Disorder scale (GAD-7). Months refer to the age of babies born in 2019.

increase (23.4%). The first refers to mothers with a low initial EPDS score that remained low throughout the pandemic; the second refers to those whose symptoms increased but did not reach the EPDS cut-off score of 13; and the third group refers to those whose scores increased above this threshold.

Figure 2 also shows the trajectories for anxiety symptoms. The best-fitting model resulted in four trajectories. There were two trajectories in which symptoms decreased and increased, creating a broad U shape, but since we considered the trajectories very similar, we decided to merge them for further analysis. The trajectories were designated as: i) stable U shape (57.4%); ii) moderate increase, in which mothers with increased symptoms reached the GAD-7 threshold for moderate anxiety (36.7%); and iii) severe increase (5.8%),

consisting of mothers whose symptoms rose above the severe anxiety threshold ( $GAD-7 \geq 15$ ).

As shown in Table 2, maternal fear of contaminating her infant with COVID increased the risk of being in the non-clinical increase depression trajectory by 2.15 times (95%CI 1.23-3.75), the risk of being in the clinical increase depression trajectory by 3.87 times (95%CI 1.58-9.47), and the risk of being in the moderate increase anxiety trajectory by 1.86 times (95%CI 1.03-3.35). Similarly, maternal worry about the pandemic's effect on her child's future increased her risk of being in the non-clinical increase depression trajectory by 1.95 times (95% CI 1.25-3.05), the risk of being in the clinical increase depression trajectory by 4.97 times (95%CI 2.32-10.64), and the risk of being in the moderate increase anxiety trajectory by 2.91 times (95%CI 1.69-5.01).

## Discussion

In our sample of mothers, fear of contaminating their child with COVID and worry about the pandemic's effects on the child's future were associated with increased depression and anxiety. Maternal fears had a major effect on clinical symptoms of depression. This was especially true for mothers afraid of contaminating their child with COVID. These same fears and worries also raised the risk that anxiety symptoms would increase to a moderate level. However, we found no association with severe anxiety symptoms. This might be explained by the fact that few ( $< 5$ ) mothers had severe anxiety. Thus, in the regression models, after adjusting for other variables, any association was lost because due to the small sample size. Nevertheless, as shown in Table S1 (available as online-only supplementary material), the results of Fisher's exact test did suggest an association.

Even when fears were only reported in the first two follow-up points, their effects could be seen afterwards, which is why we included depression and anxiety measures after measuring exposure. The depression and anxiety trajectories represent the most likely grouping of maternal symptom trajectories from baseline until vaccines were applied (2021-2022). Even at this point, symptoms did not subside but continued at the same level, and fear was associated with increased symptoms during the initial months and a subsequent plateau.

Our findings align with those of a cross-sectional study of perinatal women in Qatar during the pandemic: their main concern was not for themselves but for others.<sup>21</sup> In our sample, maternal fear was specifically focused on the child. In Italy, Ravaldi et al.<sup>22</sup> found that pregnant women were more aware of the health of their family members, partner, and infant than their own. A Polish study found that women with a previous psychiatric diagnosis had a higher risk of developing anxiety, post-traumatic stress disorder, and postpartum depression.<sup>23</sup> Similar results were found in the USA, where pregnant and postpartum women with a high level of concern for their families had higher levels of anxiety, depression, and post-traumatic stress disorder.<sup>24</sup> Studies from Ethiopia, India, and Vietnam have also reported an association between maternal mental distress and stressful family events.<sup>25</sup>

**Table 2** Adjusted analysis of the association between maternal fears/worries and depression and anxiety trajectories before and during the COVID-19 pandemic in mothers belonging to the 2019 Rio Grande Birth Cohort, Brazil

Maternal fears/worries	Depression trajectories <sup>†</sup>		Anxiety trajectories <sup>‡</sup>	
	Non-clinic increase	Clinic increase	Moderate increase	Severe increase
That the child would become infected with COVID-19 or get sick	1.21 (0.47-3.10)	1.20 (0.23-6.15)	1.91 (0.60-5.99)	0.53 (0.06-5.09)
That she would contaminate the child with COVID-19	2.15 (1.23-3.75)	3.87 (1.58-9.47)	1.86 (1.03-3.35)	3.01 (0.56-16.14)
That the pandemic would affect the child's future	1.95 (1.25-3.05)	4.97 (2.32-10.64)	2.91 (1.69-5.01)	1.89 (0.65-5.44)

Data presented as RRR (95%CI).

All models were adjusted for perinatal family income, maternal education, age, race, maternal cohabitation with a partner, maternal fear/worry about her child, and maternal fear that she or about other family members would become infected with COVID.

RRR = relative risk ratio.

<sup>†</sup> Reference category for the outcome: depression trajectory stable low.

<sup>‡</sup> Reference category of the outcome: anxiety trajectory stable U shape.

During the pandemic, fear of becoming infected with COVID was the main concern of the Brazilian population in general.<sup>26</sup> It should be noted that the numerous concerns triggered during the COVID-19 pandemic led to general changes in parental relationships and behaviors while in isolation with their children, making them, especially female caregivers, more susceptible to anxiety<sup>27,28</sup> and depression.<sup>29</sup>

Findings from studies during the pandemic suggest that mothers, who are usually the primary caregivers, sacrificed their well-being to meet their children's needs.<sup>30</sup> According to Russell et al.,<sup>30</sup> overwhelming feelings in the caregiver directly predict higher levels of GAD. A U.S. study found that although mothers recognize the importance of good physical and mental health, motherhood involves barriers to effective self-care, even before the pandemic.<sup>31</sup> Poor self-rated health was associated with both anxiety and depression symptoms in pregnant women at the beginning of the pandemic.<sup>32</sup>

It is important to recognize the limitations of this study. Follow-up losses reached > 50% in WebCOVID19-3. This response rate is similar to that of most online cohort studies.<sup>33</sup> However, to overcome this problem we used the group-based trajectory model, which can model trajectories, despite missing values, based on the probability of belonging to a trajectory, which increased our sample size, allowing us to analyze data from 63% of eligible mothers. However, even with these numbers, we could have suffered from selection bias, which is why we performed a weighted analysis, using a propensity score calculated with inverse probability weighting to predict the likelihood of dropouts in the cohort. In addition, as shown in Table S1 (available as online-only supplementary material), in some cases < 5 mothers did not report the specific fear but still had the outcome, making it likely that there was no association between maternal fear that the child would be contaminated and depression/anxiety trajectories or unlikely that any association with severe anxiety symptoms could be explained due to the lack of statistical power.

On the other hand, this is the only population-based birth cohort to have been undertaken in Brazil or similar regions before and during the pandemic. Even with its

limitations, this is the only source of evidence we have to assess these problems during this unique period. Our objective was to evaluate the association between these mothers' fears about COVID-19 infection and their child's future and changes in maternal depression and anxiety symptoms before and during the pandemic. Mothers who were fearful for their child had a higher risk of increased depressive and anxiety symptoms during the pandemic. This reaffirms the relevance of mental health care for this population, since mental well-being is fundamental, directly affecting the quality of life of mothers and their infants. It should be noted that the increase in depression and anxiety symptoms was overwhelming during the pandemic. Our final follow-up was in 2021-2022, after a vaccine had been developed, when social isolation measures began to relax, cases of COVID began to decline, and things started changing for the better. Nevertheless, the mothers' mental health symptoms did not abate, which suggests that they could have long-lasting effects. Thus, our study reinforces the importance of monitoring maternal mental health, so that depressive and anxiety symptoms do not become a long-term consequence of the pandemic.

### Acknowledgements

This study was funded by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq; grant 433426/2018-7) and Secretaria Municipal de Saúde de Rio Grande. The study was conducted in a graduate program supported by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES; finance code 001).

### Disclosure

The authors report no conflicts of interest.

### References

- Fongaro G, Stoco PH, Souza DSM, Grisard EC, Magri ME, Rogovski P, et al. The presence of SARS-CoV-2 RNA in human sewage in Santa Catarina, Brazil, November 2019. *Sci Total Environ.* 2021; 778:146198.

- 2 Thombs BD, Kwakkenbos L, Carrier ME, Bourgeault A, Tao L, Harb S, et al. Protocol for a partially nested randomised controlled trial to evaluate the effectiveness of the scleroderma patient-centered intervention network COVID-19 home-isolation activities together (SPIN-CHAT) program to reduce anxiety among at-risk scleroderma patients. *J Psychosom Res.* 2020;135:110132.
- 3 Santomauro DF, Herrera AMM, Shadid J, Zheng P, Ashbaugh C, Pigott DM, et al. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *Lancet.* 2021;398:1700-12.
- 4 Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet.* 2020;395:912-20.
- 5 Barros MBA, Lima MG, Malta DC, Szwarcwald CL, Azevedo RCS, Romero D, et al. Relato de tristeza/depressão, nervosismo/ansiedade e problemas de sono na população adulta brasileira durante a pandemia de COVID-19. *Epidemiol Serv Saude.* 2020;29:e2020427.
- 6 Penna AL, Aquino CM, Pinheiro MSN, Nascimento RLF, Farias-Antúnez S, Araújo DABS, et al. Impact of the COVID-19 pandemic on maternal mental health, early childhood development, and parental practices: a global scoping review. *BMC Public Health.* 2023;23:388.
- 7 López-Morales H, Trudo RG, del-Valle MV, Canet-Juric L, Biota M, Andrés ML, et al. The pandemics babies: effects of maternal stress on temperament of babies gestated and born during the pandemic. 2022 Nov 19. [Epub ahead of print].
- 8 Perry NB, Donzella B, Troy MF, Barnes AJ. Mother and child hair cortisol during the COVID-19 pandemic: Associations among physiological stress, pandemic-related behaviors, and child emotional-behavioral health. *Psychoneuroendocrinology.* 2022;137:105656.
- 9 Machado MMT, Rocha HAL, Castro MC, Sampaio EGM, Oliveira FA, Silva JPF, et al. COVID-19 and mental health of pregnant women in Ceará, Brazil. *Rev Saude Publica.* 2021;55:37.
- 10 Gluska H, Shiffman N, Mayer Y, Elyasyan L, Elia N, Daher R, et al. Maternal fear of COVID-19 and prevalence of postnatal depression symptoms, risk and protective factors. *J Psychiatr Res.* 2022;148:214-9.
- 11 Bauer AE, Quintivano J, Krohn H, Sullivan PF, Meltzer-Brody S. The longitudinal effects of stress and fear on psychiatric symptoms in mothers during the COVID-19 pandemic. *Arch Womens Ment Health.* 2022;25:1067-78.
- 12 Mola CL, Martins-Silva T, Carpena MX, Del-Ponte B, Blumenberg C, Martins RC, et al. Maternal mental health before and during the COVID-19 pandemic in the 2019 Rio Grande birth cohort. *Braz J Psychiatry.* 2021;43:402-6.
- 13 James SL, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet.* 2018;392:1789-858.
- 14 Rehm J, Shield KD. Global burden of disease and the impact of mental and addictive disorders. *Curr Psychiatry Rep.* 2019;21:10.
- 15 Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)-A metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform.* 2009;42:377-81.
- 16 Santos IS, Matijasevich A, Tavares BF, Barros AJD, Picinini Botelho I, Lapolli C, et al. Validation of the Edinburgh Postnatal Depression Scale (EPDS) in a sample of mothers from the 2004 Pelotas Birth Cohort Study. *Cad Saude Publica.* 2007;21:2577-88.
- 17 Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med.* 2006;166:1092-7.
- 18 Moreno AL, DeSousa DA, Souza AMFLP, Manfro GG, Salum GA, Koller SH, et al. Factor structure, reliability, and item parameters of the Brazilian-Portuguese version of the GAD-7 questionnaire. *Trends Psychol.* 2016;24:367-76.
- 19 Nagin DS. Group-based trajectory modeling: an overview. *Ann Nutr Metab.* 2014;65:205-10.
- 20 Löwe B, Decker O, Müller S, Brähler E, Schellberg D, Herzog W, et al. Validation and standardization of the generalized anxiety disorder screener (GAD-7) in the general population. *Med Care.* 2008;46:266-74.
- 21 Farrell T, Reagu S, Mohan S, Elmidany R, Qaddoura F, Ahmed EE, et al. Impact of the COVID-19 pandemic on the perinatal mental health of women. *J Perinat Med.* 2020;48:971-6.
- 22 Ravaldi C, Ricca V, Wilson A, Homer C, Vannacci A, Riecher-Rössler A. Previous psychopathology predicted severe COVID-19 concern, anxiety, and PTSD symptoms in pregnant women during "lockdown" in Italy. *Arch Womens Ment Health.* 2020;23:783-6.
- 23 Baran J, Leszczak J, Baran R, Biesiadecka A, Weres A, Czenczek-Lewandowska E, et al. Prenatal and postnatal anxiety and depression in mothers during the covid-19 pandemic. *J Clin Med.* 2021;10:3193.
- 24 Kinser PA, Jallo N, Amstadter AB, Thacker LR, Jones E, Moyer S, et al. Depression, anxiety, resilience, and coping: the experience of pregnant and new mothers during the first few months of the Covid-19 pandemic. *J Womens Health.* 2021;30:654-64.
- 25 Gausman J, Austin SB, Subramanian SV, Langer A. Adversity, social capital, and mental distress among mothers of small children: a cross-sectional study in three low and middle-income countries. *PLoS One.* 2020;15:e0228435.
- 26 Schmidt B, Crepaldi MA, Bolze SDA, Neiva-Silva L, Demenech LM. Mental health and psychological interventions during the new coronavirus pandemic (COVID-19). *Estud Psicol.* 2020;37:e200063.
- 27 Russell BS, Hutchison M, Park CL, Fendrich M, Finkelstein-Fox L. Short-term impacts of COVID-19 on family caregivers: Emotion regulation, coping, and mental health. *J Clin Psychol.* 2022;78:357-74.
- 28 Wade M, Prime H, Johnson D, May SS, Jenkins JM, Browne DT. The disparate impact of COVID-19 on the mental health of female and male caregivers. *Soc Sci Med.* 2021;275:113801.
- 29 Panda PK, Gupta J, Chowdhury SR, Kumar R, Meena AK, Madaan P, et al. Psychological and behavioral impact of lockdown and quarantine measures for Covid-19 pandemic on children, adolescents and caregivers: a systematic review and meta-analysis. *J Trop Pediatr.* 2021;67:fmaa122.
- 30 Russell BS, Hutchison M, Tambling R, Tomkunas AJ, Horton AL. Initial challenges of caregiving during Covid-19: caregiver burden, mental health, and the parent-child relationship. *Child Psychiatry Hum Dev.* 2020;51:671-82.
- 31 Barkin JL, Wisner KL. The role of maternal self-care in new motherhood. *Midwifery.* 2013;29:1050-5.
- 32 Maharlouei N, Keshavarz P, Salemi N, Lankarani KB. Depression and anxiety among pregnant mothers in the initial stage of the Coronavirus Disease (COVID-19) pandemic in the southwest of Iran. *Reprod Health.* 2021;18:111.
- 33 Blumenberg C, Barros AJD. Response rate differences between web and alternative data collection methods for public health research: a systematic review of the literature. *Int J Public Health.* 2018;63:765-73.