

Psychosocial experiences of postnatal women during the COVID-19 pandemic. A UK-wide study of prevalence rates and risk factors for clinically relevant depression and anxiety.

## **Abstract**

### *Background*

When the vulnerabilities of the postnatal period are combined with the impact of the COVID-19 pandemic, psychosocial outcomes are likely to be affected. Specifically, we aim to: a) explore the psychosocial experiences of women in the early postnatal period; b) describe prevalence rates of clinically-relevant maternal anxiety and depression; and c) explore whether psychosocial change occurring as a result of COVID-19 is predictive of clinically-relevant maternal anxiety and depression.

### *Methods*

A sample of UK mothers (N=614) with infants aged between birth and twelve weeks were recruited via convenience sampling. A cross-sectional survey design was utilised which comprised demographics, COVID-19 specific questions, and a battery of validated psychosocial measures, including the EPDS and STAI-S which were used to collect prevalence rates of clinically relevant depression and anxiety respectively. Data collection coincided with the UK government's initial mandated "lockdown" restrictions and the introduction of social distancing measures in 2020.

### *Findings*

Descriptive findings from the overall sample indicate that a high percentage of mothers self-reported psychological and social changes as a result of the introduction of social distancing measures. For women who reported the presence of psychosocial change, these changes were perceived negatively. Whilst seventy women (11.4%) reported a current clinical diagnosis of

depression, two hundred and sixty-four women (43%) reported a score of  $\geq 13$  on the EPDS, indicating clinically relevant depression. Whilst one hundred and thirteen women (18.4%) reported a current clinical diagnosis of anxiety, three hundred and seventy-three women (61%) reported a score of  $\geq 40$  on STAI-S, indicating clinically relevant anxiety. After accounting for current clinical diagnoses of depression or anxiety, and demographic factors known to influence mental health, only perceived psychological change occurring as a result of the introduction of social distancing measures predicted unique variance in the risk of clinically relevant maternal depression (30%) and anxiety (33%).

### *Interpretation*

To our knowledge, this is the first national study to examine the psychosocial experiences of postnatal women during the COVID-19 pandemic in the UK. Prevalence rates of clinically relevant maternal depression and anxiety were extremely high when compared to both self-reported current diagnoses of depression and anxiety, and pre-pandemic prevalence studies. Perceived psychological changes occurring as a result of the introduction of social distancing measures predicted unique variance in the risk for clinically relevant maternal depression and anxiety. This study provides vital information for clinicians, funders, policy makers, and researchers to inform the immediate next steps in perinatal care, policy, and research during COVID-19 and future health crises.

### *Funding*

No funding was received for this study.

**Psychosocial experiences of postnatal women during the COVID-19 pandemic. A UK-wide study of prevalence rates and risk factors for clinically relevant depression and anxiety.**

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**Declarations:**

*Availability of Data:* All data are part of the common dataset for The PRenancy And Motherhood during COVID-19 Study [The PRAM Study]. Applications to use these data in research are to be made formally by writing to the study's Chief Investigator: Dr. V. Fallon, University of Liverpool, [V.Fallon@liverpool.ac.uk](mailto:V.Fallon@liverpool.ac.uk). All subsequent publications must state affiliation to The PRAM Study.

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15 psychosocial measures, including the EPDS and STAI-S which were used to collect prevalence  
16 rates of clinically relevant depression and anxiety respectively. Data collection coincided with  
17 the UK government's initial mandated "lockdown" restrictions and the introduction of social  
18 distancing measures [in 2020](#).

#### 19 *Findings*

20 Descriptive findings from the overall sample indicate that a high percentage of mothers self-  
21 reported psychological and social changes as a result of the introduction of social distancing  
22 measures. For women who reported the presence of psychosocial change, these changes were  
23 perceived negatively. Whilst seventy women (11.4%) reported a current clinical diagnosis of

24 depression, two hundred and sixty-four women (43%) reported a score of  $\geq 13$  on the EPDS,  
25 indicating clinically relevant depression. Whilst one hundred and thirteen women (18.4%)  
26 reported a current clinical diagnosis of anxiety, three hundred and seventy-three women (61%)  
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34 postnatal women during the COVID-19 pandemic in the UK. Prevalence rates of clinically  
35 relevant maternal depression and anxiety were extremely high when compared to both self-  
36 reported current diagnoses of depression and anxiety, and pre-pandemic prevalence studies.  
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38 measures predicted unique variance in the risk for clinically relevant maternal depression and  
39 anxiety. This study provides vital information for clinicians, funders, policy makers, and  
40 researchers to inform the immediate next steps in perinatal care, policy, and research during  
41 COVID-19 and future health crises.

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44

## 45 **Introduction**

46 As of 23<sup>rd</sup> March 2020, UK government restrictions were introduced to reduce the spread of  
47 the Coronavirus (SARS-CoV-2) or COVID-19. Key measures included requiring people to  
48 stay at home, widespread closure of businesses and venues, and prohibition of all gatherings  
49 of more than two people in public.<sup>1</sup> The COVID-19 pandemic poses health risks to the whole  
50 population, but clinical risks for perinatal populations have so far only been classified in terms  
51 of the physical impact of getting the infection.<sup>2</sup> However, clinical risks are likely to extend  
52 beyond this given the effect of lockdown measures on psychological state and social  
53 interaction. Whilst most empirical studies are concerned with the impact of COVID-19  
54 infection on direct pregnancy outcomes and vertical transmission,<sup>3</sup> very few have considered  
55 the immediate risks of the pandemic on psychological and social experiences in the early  
56 postnatal period, and no published data from the UK is currently available.

57 The early postnatal period is already a period of heightened vulnerability to poor  
58 psychosocial outcomes. Emmanuel and St. John's concept analysis of 25 studies states that  
59 becoming a mother encompasses several psychosocial challenges which are consistent with  
60 other, more recent, empirical research.<sup>4</sup> These include taking on a new maternal identity; body  
61 changes and functioning; increased demands and challenges; and navigating new social roles,  
62 including relationships with partners, healthcare professionals, and wider family.<sup>5,6</sup> Maternal  
63 mental health is particularly important to consider, given that anxiety and depression are known  
64 to be more prevalent around childbearing age.<sup>7</sup> It is estimated that as many as one in five  
65 women in a high-income country will develop a mental health related concern following the  
66 birth of their infant.<sup>8</sup> Similarly, suicide is the leading cause of death in mothers of young  
67 infants.<sup>9,10</sup> The impact of poor maternal mental health is associated with short- and long-term  
68 risks for the affected mothers' overall health, functioning, quality of life, and social

69 engagement. Maternal distress has also been consistently linked to a range of adverse  
70 developmental, somatic, and psychological outcomes in the infant.<sup>11-13</sup>

71         When the vulnerabilities of the postnatal period are combined with the impact of the  
72 COVID-19 pandemic, psychosocial outcomes are likely to be affected further.<sup>14</sup> Key  
73 psychosocial stressors include an inconsistent organisational response to COVID-19 in  
74 postnatal care and reduced in-person access to health and support services;<sup>15</sup> reduced social  
75 support from wider family and friends;<sup>16</sup> absence of birth partners and visitors after birth;<sup>11</sup> and  
76 restrictions to mother-infant contact and infant feeding care.<sup>17</sup> A recent review of the  
77 psychological impact of quarantine found adverse psychological effects including post-  
78 traumatic stress symptoms, confusion, and anger.<sup>18</sup> Furthermore, the COVID-19 pandemic is  
79 anticipated to decrease access to mental health services and psychological or pharmacological  
80 treatment, which is likely to impact further on mental health.<sup>19</sup>

81         To date, only two empirical studies have been published specifically examining the  
82 psychological impact of COVID-19 on mothers.<sup>19,20</sup> A non-concurrent case-control study of  
83 mothers who gave birth in a COVID-19 ‘hotspot’ area in North Eastern Italy found that the  
84 COVID-19 study group (n=91) had significantly higher mean postnatal depression scores  
85 compared with a control group outside of the pandemic.<sup>20</sup> Another Canadian cross-sectional  
86 survey study of mothers of children from birth to eight years old (N=642) found clinically  
87 relevant depression and anxiety was indicated in 44% and 30% of mothers during quarantine  
88 measures, respectively.<sup>19</sup> However, neither of these studies asked questions to examine  
89 whether, and how much, self-reported psychosocial outcomes have changed as a direct result  
90 of COVID-19. This means the psychological states reported by participants cannot be directly  
91 attributed to the pandemic.

92 This rapid-response cross-sectional online survey study aims to explore the  
93 psychosocial experiences of UK women in the early postnatal period (birth to twelve weeks  
94 postpartum) during initial government “lockdown” restrictions in the COVID-19 pandemic.  
95 Data was collected between 16<sup>th</sup> April and 15<sup>th</sup> May 2020 which coincided with the UK  
96 government’s mandated guidance. Specifically, we aim to: a) describe prevalence rates of  
97 clinically-relevant maternal anxiety and depression; and b) explore whether psychosocial  
98 change occurring as a result of COVID-19 is predictive of clinically-relevant maternal anxiety  
99 and depression.

## 100 **Method**

### 101 *Participants and recruitment*

102 A sample of UK mothers with infants aged between birth and twelve weeks were recruited via  
103 convenience sampling to complete an on-line survey. Participants were recruited through social  
104 media platforms (e.g. [Twitter](#), [Facebook](#), [Instagram](#)) via an advertisement (not paid or targeted)  
105 providing a link to the Qualtrics survey platform. Participant inclusion criteria were: Over 18  
106 years of age, UK-resident, English-speaking, and with a baby of 0-3 months. All data were  
107 collected from participants between 16<sup>th</sup> April and 15<sup>th</sup> May 2020 which coincided with the  
108 UK government’s initial mandated “lockdown” restrictions and the introduction of social  
109 distancing measures.<sup>1</sup>

### 110 *Design and Procedure*

111 A cross-sectional survey design was used. Prior to participation, an electronic information  
112 sheet and consent form were provided with a tick-box to confirm consent. At the end of the  
113 survey, participants were provided with a full electronic debrief with signposting to relevant  
114 support information, and were entered into a £25 prize draw.

### 115 *The Survey*



116 A screening question was first asked to ascertain whether the participant was mother to a baby  
117 aged between birth and twelve weeks. Maternal-related demographic questions were asked at  
118 the beginning of the survey and specific questions were also asked on the incidence of COVID-  
119 19 in the mother and any family members (Table 1). This was followed by infant-related  
120 demographic questions (Table 2).

### 121 *Validated psychological measures*

#### 122 Edinburgh Postnatal Depression Scale (EPDS)<sup>21</sup>

123 The EPDS is a 10-item self-report questionnaire administered to screen for depressive  
124 symptoms in the postnatal period. It is the most widely used screening scale for postnatal  
125 depression. Higher scores indicate higher levels of depression. A clinical cut-off score of  $\geq 13$   
126 identifies scores consistent with major depressive disorder, although the self-report measure  
127 does not replace a clinical diagnosis.<sup>21</sup> In the current study, the scale had excellent reliability  
128 (McDonald's  $\omega = 0.90$ ).

#### 129 State Trait Anxiety Inventory – State Scale (STAI-S)<sup>22</sup>

130 The STAI-S is a self-report measure designed to capture levels of general anxiety. It contains  
131 20 items to measure situational (state) anxiety. Higher scores indicate higher levels of anxiety.  
132 A cut-off score of  $\geq 40$  on the STAI administered early in the postpartum period is  
133 recommended to detect clinically relevant symptoms of anxiety.<sup>23</sup> Reliability for the measure  
134 was excellent (McDonald's  $\omega = 0.96$ )

#### 135 Postpartum Specific Anxiety Scale - Crisis Research Short Form (PSAS-RSF-C)<sup>24</sup>

136 The PSAS<sup>25</sup> is a 51-item validated measure of postpartum specific anxiety designed to capture  
137 the frequency of maternal and infant focused anxieties experienced during the past  
138 week. Higher scores indicate higher levels of anxiety. For the purposes of this study, the top

139 three factor loading items from each factor of the original measure were used as a 12-item short  
140 form to minimise participant burden. The scale had good reliability (McDonald's  $\omega = 0.83$ ).

141 Parenting Sense of Competence Scale (PSOC)<sup>26</sup>

142 The PSOC is a commonly used measure of parental self- efficacy, with 7-items and 2-  
143 subscales. Each item is rated on a 6-point Likert scale scored as 1 = "Strongly Disagree" and 6  
144 = "Strongly Agree". A higher score indicates a higher parenting sense of competency.  
145 Reliability in the current study was good (McDonald's  $\omega = 0.89$ ).

146 *Validated social measures*

147 Relationship Questionnaire (RQ)<sup>27</sup>

148 The RQ is comprised of 12-items on a four-point Likert scale, ranging from 1 ("Never") to 4  
149 ("Always"). This questionnaire assesses both the positive and negative dimensions of partner  
150 relationships. The higher the RQ total score, the better the couple relationship, as assessed by  
151 the participant. The scale had good reliability (McDonald's  $\omega = 0.89$ ).

152 Multidimensional Scale of Perceived Social Support (MSPSS)<sup>28</sup>

153 The MSPSS is a brief questionnaire designed to measure perceptions of informal support from  
154 three sources: family, friends, and a significant other. The scale is comprised of a total of 12-  
155 items, with 4-items for each subscale. Higher scores indicate higher levels of social support.  
156 Reliability in the current study was excellent (McDonald's  $\omega = 0.93$ ).

157 The Short Assessment of Patient Satisfaction (SAPS)<sup>29</sup>

158 The SAPS is a short, reliable, and valid 7-item scale which can be used to assess patient  
159 satisfaction with their care. It assesses the core domains of patient satisfaction which include  
160 provision of care , explanation of treatment results, clinician engagement and care, participation

161 in medical decision making, and satisfaction with hospital/clinic care. Reliability in the current  
162 study was good (McDonald's  $\omega = 0.88$ ).

163 Mother to Infant Bonding Scale (MIBS)<sup>30</sup>

164 The MIBS was designed with the intention of screening the general postpartum population. It  
165 is a brief, 8-item measure of mother-infant bond with established criterion and construct  
166 validity. Higher scores indicate worse mother-infant bonding. Reliability in the current study  
167 was good (McDonald's  $\omega = 0.79$ ).

168 *COVID-19 specific items*

169 At the end of each validated measure, two COVID-19-specific items were asked. The first  
170 asked "Have your feelings of [psychological or social variable] changed since the introduction  
171 of social distancing measures?" with "Yes", "No", and "Prefer Not To Say" response  
172 options. For those that indicated "Yes" to the first question, a second question was displayed  
173 which asked: "Please state how much this has changed since the introduction of social  
174 distancing measures" on a 10-point Likert-Scale with zero as neutral from "I feel much less"  
175 [psychological or social variable] "I feel much more" [psychological or social variable]".

176

177 *Statistical analyses*

178 Descriptive analyses for the demographic, psychological, social, and COVID-19-specific  
179 measures were conducted (Table 1, 2 and 3). Means were then compared to data published by  
180 members of the authorship team from research conducted before the COVID-19 pandemic,  
181 which used matched recruitment methods and had similar sample characteristics.<sup>31</sup> *The study  
182 selected was conducted in 2016, recruited postpartum mothers of infants between birth and six  
183 months (N=800) online and administered the EPDS and STAI-S alongside a battery of*

184 measures.<sup>31</sup> Independent two-sample t-tests were conducted to examine whether the current  
185 sample had significantly different depression (EPDS) and anxiety (STAI-S) means to the  
186 selected pre-pandemic study.<sup>31</sup> Descriptive analyses were then conducted to identify  
187 prevalence rates of depression (EPDS) and anxiety (STAI-S). Depressive and anxious  
188 symptoms above and below cut-off scores on each measure were recoded into dichotomous  
189 measures indicating clinically relevant levels. The prevalence of clinically relevant depression  
190 and anxiety was then compared to meta-analytic prevalence reviews of postpartum depression  
191 and anxiety.<sup>32,33</sup> Bivariate correlations were conducted to identify relationships between  
192 variables to inform inferential analyses. Binomial hierarchical logistic regression models were  
193 then built to examine whether a change (yes/no) in psychosocial experiences as a result of the  
194 introduction of social distancing measures affected risk for clinically relevant, maternal  
195 depression and anxiety. Self-reported, current, clinical diagnoses of anxiety and depression  
196 were controlled for in Block 1 of the regression; socio-demographic predictors were included  
197 in Block 2; and psychosocial changes occurring as a result of the introduction of social  
198 distancing measures were added in Block 3.

## 199 **Results**

### 200 *Participants*

201 Mothers with infants aged between birth and twelve weeks (N=614) consented to take part in  
202 the survey, with a 100% of those who consented, completing the survey. Maternal age ranged  
203 between 18 and 46 years (M = 30.88, SD = 5.06) and infant age ranged between birth and  
204 twelve weeks (M = 7.00, SD = 3.64). Women were predominantly white (96%), married (57%),  
205 university educated (61%), and professionals (42%). Forty-two women believed they had  
206 COVID-19 symptoms (7%), with one of these women having been tested. Additionally, 107  
207 women believed a family member had COVID-19 (17%), with ten of these women reporting

208 their family member had been tested. Finally, 200 women reported that their birth experience  
209 had been affected by the introduction of social distancing measures (33%).

210

211 **<Insert Table 1 and 2>**

212

### 213 *Psychosocial experiences during COVID-19*

214 Descriptive statistics for the psychological measures (EPDS; STAI-S; PSAS-RSF-C; PSOC)  
215 and social measures (RQ; MSSPS; SAPS; MIBS) can be found in Table 3. There was a  
216 significant difference in the EPDS scores in the current study (M= 11.56, SD= 5.90) compared  
217 to the EPDS scores in the pre-pandemic study selected (M= 9.13, SD= 5.72);  $t(1393) = 7.77$   
218  $p < .001$ . There was also a significant difference in the STAI-S scores in the current study (M=  
219 45.26, SD= 13.69) compared to the STAI-S scores in the pre-pandemic study selected (M=  
220 37.69, SD= 13.45) ;  $t(1296) = 10.04$ ,  $p < .001$ .

### 221 *COVID-19 specific changes in psychosocial experiences*

222 Participants reported whether a change in psychological state had occurred as a direct  
223 result of social distancing measures; 376 (62%) of women indicated their feelings of depression  
224 had changed; 535 (87%) of women reported their feelings of anxiety had changed; 388 (63%)  
225 of women indicated their feelings of motherhood-related anxiety had changed and 297 (48%)  
226 of women felt their feelings towards parenting competence had changed. Of those who  
227 indicated change occurred, it was felt their levels of depression (M = 2.67; SD = 1.79), anxiety  
228 (M=2.31; SD = 1.97), and motherhood-related anxiety (M = 2.88; SD = 1.78) had increased;  
229 whilst reporting feeling less confident in their parenting skills (M= 2.05; 1.90). Women then  
230 reported whether a change in their social environment had occurred as a direct result of ‘social  
231 distancing’; 262 (45%) reported a change in their relationship with their partner; 341 (56%)  
232 reported a change in social support; 229 (38%) reported a change in satisfaction towards

233 healthcare; and 118 (19%) reported a change in how they felt towards their baby. Of those  
234 who indicated change occurred, it was reported their relationship with their partner (M= 1.13;  
235 SD = 2.36), levels of social support (M= 3.36; SD = 2.06), satisfaction towards their healthcare  
236 (M = 2.17; SD = 2.48), and feelings towards their baby (M = 1.70; SD = 2.31), had all changed  
237 negatively as a result of social distancing measures (see Figures 1 and 2).

238

239 **<Insert Table 3 and Figures 1 and 2>**

240

#### 241 *Prevalence of Maternal Depression*

242 Seventy women (11.4%) reported a current clinical diagnosis of depression, although  
243 two hundred and sixty-four women (43%) reported a score of  $\geq 13$  on the EPDS which indicates  
244 clinically relevant depression (see Figure 3). Mean EPDS scores for those who reported a  
245 score of  $\geq 13$  were M = 17.15 (SD = 3.45). Mean scores for those who did not meet the clinical  
246 cut-off were M = 7.33 (SD = 3.25). Prevalence of clinically relevant maternal depression in  
247 the current study compared to pre-pandemic population prevalence rates can be seen in Figure  
248 4.<sup>32</sup>

249

#### 250 *Prevalence of Maternal Anxiety*

251 One hundred and thirteen women (18.4%) reported a current clinical diagnosis of  
252 anxiety, although three hundred and seventy-three women (61%) reported a score of  $\geq 40$  on  
253 STAI-S indicating clinically relevant anxiety (See Figure 3). Mean STAI-S scores for those  
254 who reported a score of  $\geq 40$  were M = 54.25 (SD = 8.98). Mean scores for those who did not  
255 meet the clinical cut- off were M = 33.31 (SD = 5.80). Prevalence of clinically relevant  
256 maternal anxiety in the current study compared to pre-pandemic population prevalence rates  
257 can be seen in Figure 4.<sup>33</sup>

258

259

<Insert Figure 3 and 4>

260

261 *Hierarchical binary logistic regression examining sociodemographic factors and psychosocial*  
262 *change as a result of the introduction of social distancing measures as risk factors for clinically*  
263 *relevant maternal depression.*

264 The final regression model significantly predicted clinically relevant depression (EPDS scores  
265  $\geq 13$ ), correctly identifying 76.1% of cases: Cox and Snell  $R^2 = .32$ , Nagelkerke  $R^2 = .43$ ,  $p <$   
266  $.001$ . Presence of a current clinical diagnosis of depression and anxiety in step 1 explained  
267 approximately 8% (Cox and Snell) and 10% (Nagelkerke) of the variance in risk of clinically  
268 relevant depression. Socio-demographic predictors in step 2 (maternal age; occupation;  
269 education; and percentage of formula milk used) explained an additional 1% (Cox and Snell)  
270 and 3% (Nagelkerke) of the variance. Only increased use of formula milk was significantly  
271 associated with risk of clinically relevant depression (AOR: 1.08; 95% CI: 1.01 - 1.16). In step  
272 3, the psychosocial change variables explained an additional 23% (Cox and Snell) and 30%  
273 (Nagelkerke) of the variance. Presence of change in feelings of depression (AOR: 0.15; 95%  
274 CI: 0.09 - 0.26), motherhood specific anxiety (AOR: 0.43; 95% CI: 0.25 - 0.73), and parenting  
275 competence (AOR: 0.51; 95% CI: 0.32 - 0.81) as a result of the introduction of social distancing  
276 measures, were all significantly associated with risk of clinically relevant depression.

277

278 *Hierarchical binary logistic regression examining sociodemographic factors and psychosocial*  
279 *change as a result of COVID-19 'lockdown' as risk factors for clinically relevant maternal*  
280 *anxiety.*

281 The final regression model significantly predicted clinically relevant anxiety (STAI scores  $\geq$   
282 40), correctly identifying 77.7% of cases: Cox and Snell  $R^2 = .33$ , Nagelkerke  $R^2 = .44$ ,  $p <$   
283  $.001$ . Presence of a current clinical diagnosis of depression and anxiety in step 1 explained  
284 approximately 7% (Cox and Snell) and 9% (Nagelkerke) of the variance in risk of clinically  
285 relevant anxiety. Sociodemographic predictors in step 2 (maternal age; occupation; education;  
286 and infant age) explained an additional 2% (Cox and Snell) and 2% (Nagelkerke) of the  
287 variance. Only older infant age was significantly associated with risk of clinically relevant  
288 anxiety (AOR: 1.05; 95% CI: 1.01 - 1.11). In step 3, the psychosocial change variables  
289 explained an additional 24% (Cox and Snell) and 33% (Nagelkerke) of the variance. Presence  
290 of change in feelings of depression (AOR: 0.18; 95% CI: 0.11 - 0.27), anxiety (AOR: 0.32 95%  
291 CI: 0.15 - 0.68), motherhood specific anxiety (AOR: 0.49; 95% CI: 0.30 - 0.81), and parenting  
292 competence (AOR: 0.59; 95% CI: 0.37 - 0.95) as a result of the introduction of social distancing  
293 measures were all significantly associated with risk of clinically relevant anxiety.

294 <Insert Table 4>

295

## 296 Discussion

297 This study first aimed to explore the psychosocial experiences of UK women in the early  
298 postnatal period (birth to twelve weeks postpartum) during initial government ‘lockdown’  
299 restrictions in the COVID-19 pandemic. Descriptive findings from the overall sample indicated  
300 a high percentage of mothers self-reported psychological and social changes as a result of the  
301 introduction of social distancing measures. Notably, the proportion of change in state anxiety  
302 was particularly high (87%) which likely reflects widespread situational concern about the  
303 immediate COVID-19 pandemic and associated social distancing measures. A recent editorial  
304 by WHO Director General, Tedros Adhanom Ghebreyesus stated: “*fear from the virus is*  
305 *spreading even faster than the virus itself*” (p1).<sup>34</sup> Common state anxieties specific to early



306 motherhood may be around increased fear of the potential risk of infection or vertical  
307 transmission, restrictions in access to routine reproductive and maternity care, or separation  
308 from families and caregivers and wider networks of support.<sup>34, 35</sup>

309 For women who reported presence of psychosocial change, these changes were  
310 perceived negatively. In particular, women felt much less socially supported. Informal support  
311 from partner, family, and friends is highly influential to women's experiences of early  
312 motherhood.<sup>36</sup> During the pandemic, social support was severely limited due to the restrictions  
313 that have been put into place to reduce the risk of transmission of COVID-19.<sup>37</sup> A recent review  
314 of reviews demonstrated significant associations between social isolation, loneliness and  
315 poorer mental health outcomes, such as depression.<sup>36</sup>

316 The second aim of this study was to describe prevalence rates of clinically-relevant  
317 maternal depression and anxiety. In this study, 43% of participants exceeded the cut-off for  
318 clinically relevant depression and 61% exceeded the cut-off for clinically relevant anxiety.  
319 When compared to those who disclosed a current, clinical diagnosis of depression (11.4%) or  
320 anxiety (18.4%), there is a large proportion of women who meet clinically relevant criteria but  
321 who have not received a formal diagnosis indicating a large prevalence-diagnosis gap.  
322 Similarly, when compared to the prevalence of clinically relevant depression and anxiety using  
323 the same measures in pre-pandemic cohorts (16%<sup>32</sup> and 14.6%<sup>33</sup> respectively), the rates within  
324 our study during the pandemic were far higher. Furthermore, decreased access to diagnosis and  
325 psychological or pharmacological treatment during the pandemic is likely to further exacerbate  
326 poor mental health.<sup>19</sup> It is well established that poor maternal mental health is associated with  
327 numerous detrimental outcomes for mother and infant.<sup>9-13</sup> Together, these findings indicate an  
328 acute public health issue which requires urgent attention and intervention to improve the mental  
329 health of this population and associated outcomes. This reinforces the requirement for

330 continued, comprehensive long-term monitoring of maternal mental health and maternal and  
331 infant psychosocial outcomes following the pandemic.<sup>38</sup>

332 The final aim of this study was to explore whether psychosocial change occurring as a  
333 result of the introduction of social distancing measures was predictive of clinically-relevant  
334 maternal depression and anxiety. After accounting for current clinical diagnoses of depression  
335 or anxiety, and demographic factors known to influence mental health, only perceived  
336 psychological change occurring as a result of the introduction of social distancing measures  
337 predicted unique variance in the risk of clinically relevant maternal depression (30%) and  
338 anxiety (33%). Interestingly, perceived social changes occurring as a result of the introduction  
339 of social distancing measures were not associated with increased risk. This suggests that it is  
340 perceived psychological changes occurring as a result of the pandemic which have acted as  
341 major stressors on maternal mental health and corroborates global work in this area.<sup>19,20</sup> We  
342 should therefore focus efforts on improving and maintaining access to perinatal mental health  
343 care services during this, and similar crises.<sup>38</sup>

344 Due to the rapid development of COVID-19, this study was cross sectional in nature  
345 and all comparisons to pre-pandemic data were obtained using already published cohorts,  
346 therefore precluding causality. Longitudinal research is essential in understanding the longer-  
347 term impact of the pandemic on maternal mental health and how this may affect maternal and  
348 infant outcomes. Another limitation of this study is its usage of an online convenience sample  
349 which, although adequately powered, lacked sampling control. As such, women were  
350 predominantly white, married, primiparous, educated to a tertiary level, and in a professional  
351 occupation. **This may affect comparability of prevalence with the pre-pandemic meta-analytic**  
352 **reviews selected.** With the SARS-CoV-2 coronavirus having a disproportionate effect on  
353 Black, Asian, and Minority Ethnic [BAME] communities, as well as those living with social  
354 complexity and/or deprivation,<sup>39</sup> it is vital to replicate this study in ethnically and socio-

355 economically diverse populations. Finally, it is acknowledged that a proportion of data (14%)  
356 were collected very shortly after birth (i.e. zero – two weeks postpartum). As a consequence,  
357 some of these data may be influenced by factors such as transitory ‘baby blues’,  
358 negative/challenging birth experiences, or natural adaption to the challenges of new  
359 motherhood.

360

### 361 **Conclusions and Implications**

362 This study provides a nationwide snapshot of psychosocial experiences in early motherhood  
363 during the COVID-19 pandemic in the UK and offers valuable, first insights into how  
364 psychosocial experiences have changed in relation to the introduction of social distancing  
365 measures. To date, this study is the only one to report the prevalence rates of clinically relevant  
366 maternal depression and anxiety in the UK during the pandemic. Furthermore, we offer unique  
367 insight into the predictors of clinically relevant maternal mental health, whilst accounting for  
368 pre-existing mental health diagnoses and sociodemographic confounders. This study provides  
369 vital information for clinicians, funders, policy makers, and researchers, to inform the  
370 immediate next steps in perinatal research, policy, and care during this, and future health crises.  
371 For policy makers and clinicians tasked with the provision and delivery of postnatal care, we  
372 echo previous calls for “proactive, multidisciplinary, integrated”<sup>11</sup> approaches. For funders  
373 and researchers, there is a need for longitudinal research to address the acute and longer-term  
374 consequences of the pandemic on maternal mental health. From there, development and  
375 evaluation of psychosocial interventions to target poor mental health outcomes at different  
376 stages of the pandemic are required.<sup>40</sup> These must be developed with in-built flexibility to  
377 enhance applicability to future health crises. With consideration to our results we recommend  
378 that during the COVID-19 pandemic and future health crises, mental and physical health in  
379 postnatal populations is provided parity of esteem.

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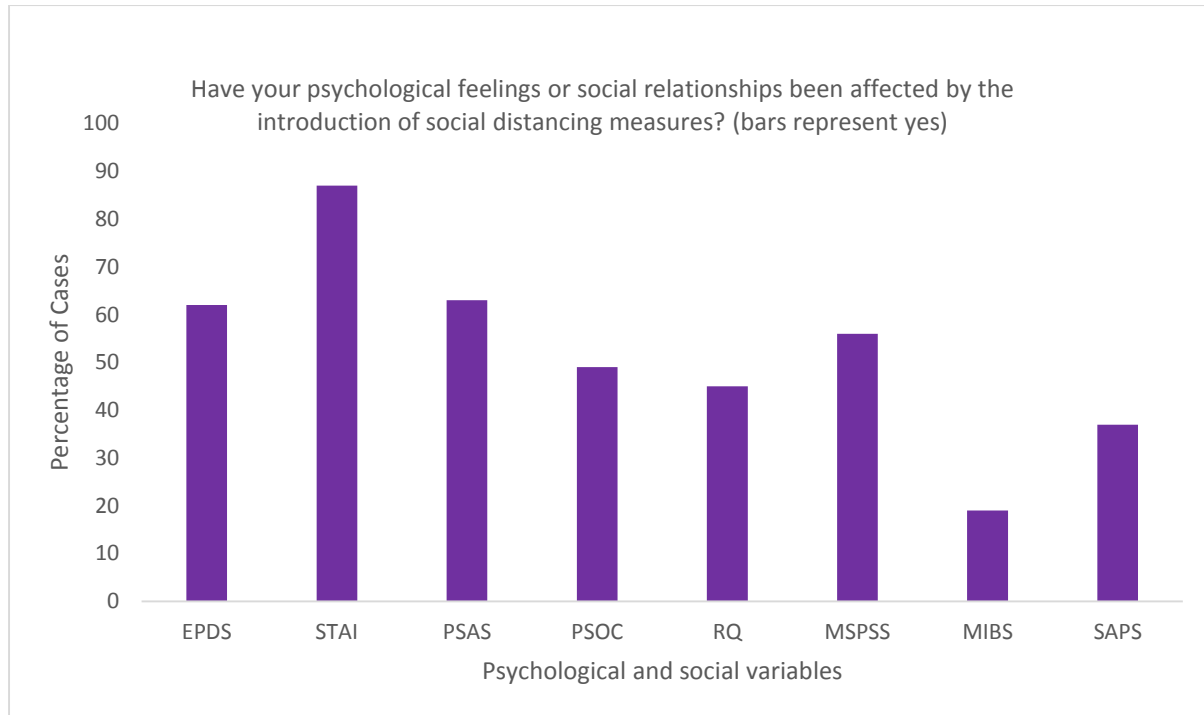


Figure 1: Percentage of women who felt their psychological state and social relationships had been affected by the introduction of social distancing measures

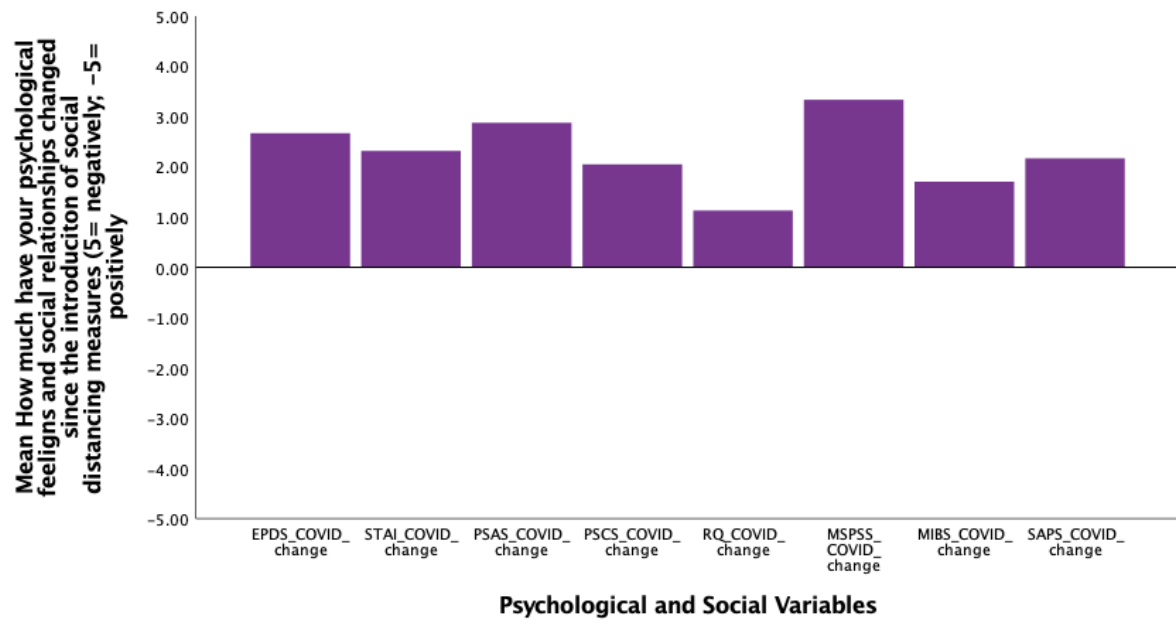


Figure 2: Level of psychological and social change occurring as a result of the introduction of social distancing measures

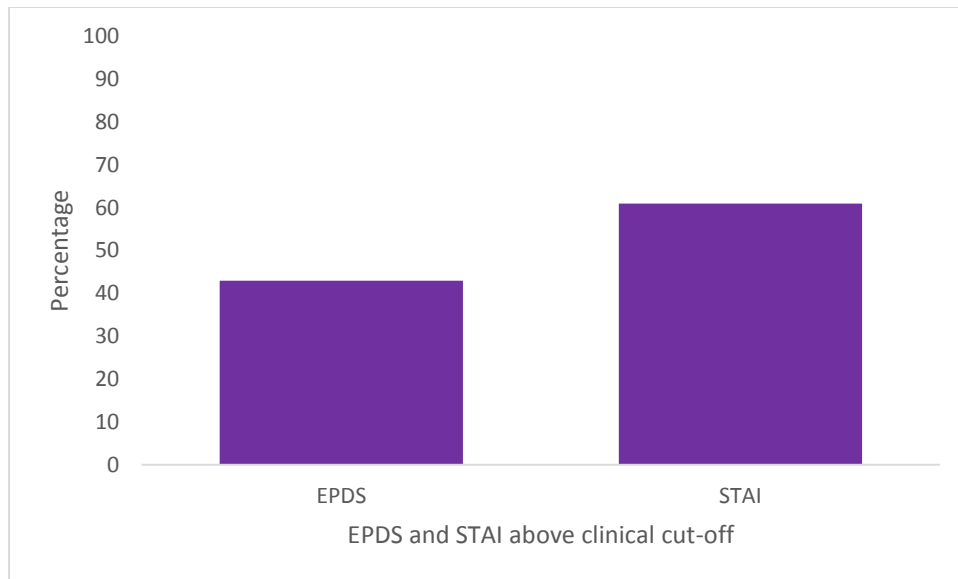


Figure 3: Percentage of mothers scoring above the clinical cut-off on the EPDS (13 and above) and the STAI (40 and above)

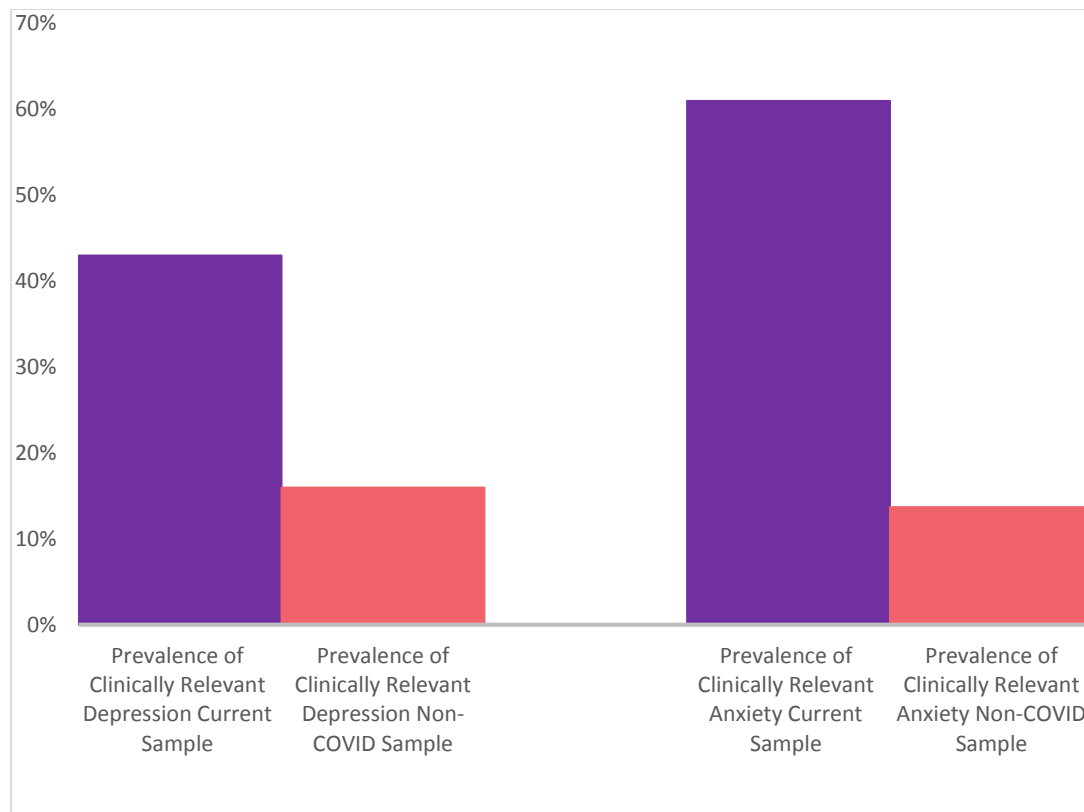


Figure 4: Prevalence of clinically relevant depression and anxiety compared to pre-pandemic prevalence [meta-analytic reviews](#) \*†

\*Depression prevalence (EPDS) compared to a meta-analytic review of 16 studies (N= 49,446) examining national postpartum depression prevalence in the UK (EPDS; prevalence estimate used = 16%, Hahn-Holbrook, Cornwell-Hinrichs & Anaya, 2018)

†Anxiety prevalence (predominately STAI-S) compared to a meta-analytic review of 34 studies from high-income countries (N=143,134; 4 UK studies) (STAI-S; prevalence estimate used = 13.7% Dennis, Falah-Hassani, & Shiri, 2017).

Table 1: Maternal and COVID-19 Characteristics (N= 614)

Maternal Characteristic	Value	Current Diagnosis of Depression (N/%)	
Maternal age (mean years $\pm$ SD)	30.9 (5.1)	Yes	70 (11.4)
Ethnicity (N/%)		No	542 (88.3)
White	589 (95.9)	Prefer not to say	2 (0.3)
Pakistani	2 (0.3)	Current Diagnosis of PTSD (N/%)	
Black African	2 (0.3)	Yes	24 (3.9)
Chinese	1 (0.2)	No	586 (95.4)
Indian	5 (0.8)	Prefer not to say	4 (0.7)
Other	13 (2.1)		
Prefer not to say	2 (0.3)		
Marital Status (N/%)		COVID-19 Characteristic	
Married	350 (57.0)	Suspected COVID (N%)	
Co-habiting	231 (37.6)	Yes	42 (2.4)
Single	30 (4.9)	No	572 (97.6)
Separated/Divorced/Widowed	3 (0.6)	Tested for COVID (N%)	
Occupation (N/%)		Yes	1 (2.4)
Managers, Directors and Senior Officials	55 (9.0)	No	41 (97.6)
Professionals	258 (42.0)	Family member suspected COVID (N%)	
Associate Professionals and Technical	16 (2.6)	Yes	107 (17.4)
Administrative and Secretarial	62 (10.1)	No	507 (82.6)
Skilled Trade	18 (2.9)	Family member tested for COVID (N%)	
Caring, Leisure and Other Service	78 (12.7)	Yes	10 (9.3)
Sales and Customer Service	57 (9.3)	No	97 (90.7)
Process, Plant and Machine Operatives	1 (0.2)	Birth experience affected by COVID (N%)	
Elementary	7 (1.1)	Yes	200 (32.6)
Not in Paid Occupation	62 (10.1)	No	489 (67.4)
Education Attainment (N/%)			
Postgraduate education	150 (24.4)		
Undergraduate education	248 (40.4)		
A-Levels or college equivalent	132 (21.5)		
GCSEs or secondary school equivalent	66 (10.7)		
No qualifications	5 (0.8)		
Other qualification	13 (2.1)		
Living Status (N/%)			
Own property	397 (64.7)		
Rent privately	130 (21.2)		
Rent from local authority	53 (8.6)		
Live with parents	28 (4.6)		
Other	6 (1.0)		
Household Size (inc. participant) (N/%)			
2 people	29 (4.7)		
3 people	262 (42.7)		
4 people	225 (36.6)		
5 people	67 (10.9)		
6 or more people	31 (5.0)		
Current Diagnosis of Anxiety (N/%)			
Yes	113 (18.4)		
No	499 (81.3)		
Prefer not to say	2 (0.3)		

Table 2: Infant characteristics (N= 614)

Infant Characteristic	Value
Infant age (mean weeks $\pm$ SD)	7.0 (3.6)
Birth order (N/%)	
1 <sup>st</sup>	299 (38.6)
2 <sup>nd</sup>	237 (8.5)
3 <sup>rd</sup>	52 (2.4)
4 <sup>th</sup>	15 (2.5)
5 <sup>th</sup> and after	2 (0.3)
Timing of birth (N/%)	
Premature (<37 weeks)	45 (7.4)
Early Term (>37<39 weeks)	119 (19.4)
Full Term (>39<41 weeks)	320 (52.1)
Late Term (>41<42 weeks)	127 (20.7)
Post Term (>42 weeks)	3 (0.5)
Multiple birth (N/%)	
Yes	7 (1.1)
No	607 (98.9)
Mode of delivery (N/%)	
Vaginal (without medical intervention)	316 (51.5)
Elective caesarean section	113 (18.4)
Emergency caesarean section	112 (18.2)
Vaginal birth (assisted delivery)	73 (11.9)
Feeding initiation after birth (N/%)	
Exclusively breastfeeding (100%)	424 (69.1)
Predominantly breastmilk (over 80%) with a little formula milk (20%)	56 (9.1)
Mainly breastmilk (50-80%) with some formula milk	10 (1.6)
A combination of both breastmilk (50%) and formula milk (50%)	30 (4.9)
Mainly formula milk (50-80%) with some breastmilk	9 (1.5)
Predominantly formula milk (over 80%) with a little breastmilk (20%)	17 (2.9)
Exclusively formula feeding (100%)	68 (11.1)
Current feeding method (N/%)	
Exclusively breastfeeding (100%)	340 (55.4)
Predominantly breastmilk (over 80%) with a little formula milk (20%)	61 (9.9)
Mainly breastmilk (50-80%) with some formula milk	19 (3.81)
A combination of both breastmilk (50%) and formula milk (50%)	15 (2.4)
Mainly formula milk (50-80%) with some breastmilk	20 (3.3)
Predominantly formula milk (over 80%) with a little breastmilk (20%)	12 (2.0)
Exclusively formula feeding (100%)	147 (23.9)

Table 3: Descriptive statistics, statistical comparisons of means with pre-pandemic studies, and COVID-19 specific change

Psychological Variable	Current Study Mean (SD)	Study comparison mean/SD	Independent two sample t-test and p value
EPDS	11.56 (5.90)	9.13 (5.72) Fallon, Halford, Harrold, & Bennett (2019)	7.77; $p < .001$
STAI-S	45.26 (13.69)	37.70 ( $\pm 13.45$ ) Fallon, Silverio, Halford, Bennett & Harrold (2019)	10.04, $p < .001$
PSAS-S	24.79 (6.19)		
PSOC	69.72 (12.13)		
Social Variable			
RQ	36.07 (5.81)		
MSPSS	67.91 (13.36)		
MIBS	3.52 (3.77)		
SAPS	19.44 (5.71)		
COVID-19 specific change	(N/% change occurred = (yes)	How was change experienced (mean/SD; -5 positive change to +5 negative change)	
EPDS	376 (62)	2.67 (1.79)	
STAI	535 (87)	2.31 (1.97)	
PSAS	388 (63)	2.88 (1.78)	
PSOC	297 (49)	2.05 (1.90)	
RQ	262 (45)	1.13 (2.36)	
MSPSS	341 (56)	3.36 (2.06)	
MIBS	118 (19)	1.70 (2.31)	
SAPS	229 (37)	2.17 (2.48)	



**Table 4** Hierarchical Logistic Regression examining sociodemographic factors and psychosocial change as a result of the introduction of social distancing measures as risk factors for clinically relevant maternal depression and anxiety.

<b>Clinically relevant depression<sup>1</sup></b>									
Variables	B(SE)	Step 1		B(SE)	Step 2		B(SE)	Step 3	
		OR	95% CI		OR	95% CI		OR	95% CI
<i>Step 1</i>									
Current diagnosis of depression (yes/no)	<b>-1.24 (.37)</b>	<b>0.29</b>	<b>0.14-0.60</b>	<b>-1.19 (.38)</b>	<b>0.30</b>	<b>0.15-0.63</b>	<b>-1.04 (.44)</b>	<b>0.35</b>	<b>0.15-0.83</b>
Current diagnosis of anxiety (yes/no)	<b>-0.82 (.27)</b>	<b>0.44</b>	<b>0.26-0.75</b>	<b>-0.73 (.28)</b>	<b>0.48</b>	<b>0.28-0.84</b>	-0.45 (.33)	0.63	0.33-1.22
<i>Step 2</i>									
Maternal age				.00 (.02)	1.00	0.96-1.04	-.01 (.02)	0.99	0.95-1.04
Occupation				.03 (.04)	1.03	0.95-1.11	.04 (.05)	1.04	0.95-1.14
Education				.11 (.10)	1.16	0.92-1.35	.07 (.11)	1.08	0.86-1.33
% of formula milk used				<b>.08 (.04)</b>	<b>1.08</b>	<b>1.01-1.16</b>	<b>.11 (.04)</b>	<b>1.12</b>	<b>1.03-1.21</b>
<i>Step 3*</i>									
Change in depression (absent/present)							<b>-1.87 (.26)</b>	<b>0.15</b>	<b>0.09-0.26</b>
Change in anxiety (absent/present)							.20 (.42)	1.22	0.53-2.82
Change in postpartum specific anxiety (absent/present)							<b>-0.84 (.27)</b>	<b>0.43</b>	<b>0.25-0.73</b>
Change in parenting competence (absent/present)							<b>-0.67 (.23)</b>	<b>0.51</b>	<b>0.32-0.81</b>
Change in relationship quality (absent/present)							-0.36 (.22)	0.70	0.45-1.08
Change in social support (absent/present)							-0.11 (.24)	0.90	0.56-1.43

Change in satisfaction with care (absent/present)								-0.23 (.23)	0.70	0.46-1.08
Change in mother to infant bonding (absent/present)								-0.30 (.28)	0.74	0.43-1.28

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### Clinically relevant anxiety<sup>2</sup>

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#### Step 1

Current diagnosis of anxiety (yes/no)	<b>-1.17 (.32)</b>	<b>0.31</b>	<b>0.14-0.60</b>	<b>-0.11 (.33)</b>	<b>0.34</b>	<b>0.18-0.64</b>	<b>-0.84 (.39)</b>	<b>0.43</b>	<b>0.20-0.93</b>
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Current diagnosis of depression (yes/no)	<b>-0.87 (.44)</b>	<b>0.41</b>	<b>0.17-0.97</b>	-0.80 (.45)	0.45	0.19-1.07	-0.64 (.54)	0.53	0.18-1.52
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#### Step 2

Maternal age (years)				-0.01 (.02)	0.99	0.95-1.03	-0.02 (.02)	0.98	0.93-1.03
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Occupation				.02 (.04)	1.02	0.95-1.10	.05 (.05)	1.05	0.96-1.16
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Education				.12 (.10)	1.13	0.93-1.36	.09 (.12)	1.09	0.87-1.37
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Infant age (in weeks)				.05 (.03)	1.05	1.00-1.10	.04 (.03)	1.04	0.98-1.11
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#### Step 3\*

Change in anxiety (absent/present)								<b>-1.16 (.39)</b>	<b>0.32</b>	<b>0.15-0.68</b>
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Change in depression (absent/present)								<b>-1.74 (.23)</b>	<b>0.18</b>	<b>0.11-0.27</b>
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Change in postpartum specific anxiety (absent/present)								<b>-0.70 (.25)</b>	<b>0.49</b>	<b>0.30-0.81</b>
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Change in parenting competence (absent/present)								<b>-0.52 (.24)</b>	<b>0.59</b>	<b>0.37-0.95</b>
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Change in relationship quality (absent/present)								-0.13 (.23)	0.88	0.56-1.39
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Change in social support (absent/present)								-0.04 (.24)	0.96	0.60-1.52
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Change in satisfaction with care (absent/present)	-0.38 (.24)	0.69	0.43-1.09
Change in mother to infant bonding (absent/present)	.13 (.31)	1.14	0.62-2.08

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<sup>1.</sup> *Note for depression analyses.*  $R^2$  (block 3) = .32 (Cox & Snell); .43 (Nagelkerke). Step 1 block  $\chi^2 = 44.80$ ,  $df = 2$ ,  $p < .001$ . Step 2 block  $\chi^2 = 9.33$ ,  $df = 4$ ,  $p = .05$ . Step 3 block  $\chi^2 = 159.78$ ,  $df = 8$ ,  $p < .001$ . SE = Standard Error. CI = confidence interval. Significant ( $p < .05$ ) odds ratios (OR) are indicated in bold. Current diagnosis coded as 1=yes and 2=no; Presence of change coded as 0=absent and 1=present.

<sup>2.</sup> *Note for anxiety analyses.*  $R^2$  (block 3) = .33 (Cox & Snell); .43 (Nagelkerke). Step 1 block  $\chi^2 = 38.66$ ,  $df = 2$ ,  $p < .001$ . Step 2 block  $\chi^2 = 8.31$ ,  $df = 4$ ,  $p = .08$ . Step 3 block  $\chi^2 = 174.64$ ,  $df = 8$ ,  $p < .001$ . SE = Standard Error. CI = confidence interval. Significant ( $p < .05$ ) odds ratios (OR) are indicated in bold. Current diagnosis coded as 1=yes and 2=no; Presence of change coded as 0=absent and 1=present.

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Psychosocial experiences of postnatal women during the COVID-19 pandemic. A UK-wide study of prevalence rates and risk factors for clinically relevant depression and anxiety.

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*Data Interpretation: All authors*

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*All authors critically revised the manuscript and agreed to its publication.*

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