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ORIGINAL ARTICLE

Parenting stress, maternal depression and child mental health in a Melbourne cohort before and during the COVID-19 pandemic

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Aim: This paper aims to examine the maternal and child mental health and parenting outcomes in the context of COVID-19 pandemic conditions using a sample from Melbourne, Australia – a city exposed to one of the longest lockdowns world-wide in response to the pandemic.

Methods: This study utilises observational data from a prospective, pregnancy cohort, Mercy Pregnancy Emotional Wellbeing Study and includes 468 women and their children followed up in Melbourne to 3–4 years postpartum pre-COVID pandemic and compared to those followed up during the COVID-19 pandemic.

Results: When compared to mothers followed up at 3–4 years postpartum pre-pandemic, those followed up during the COVID-19 pandemic showed higher depressive symptoms with a steep incline in their symptom trajectory ($EMM_{difference} = 1.72$, Bonferroni-corrected $P < 0.01$, $d = 0.35$) and had a three times higher risk of scoring 13 or above on the EPDS (aRR = 3.22, Bonferroni-corrected $P < 0.01$). Although this increase was not associated with the variation in the duration of exposure to pandemic conditions, the steep increase in depressive symptoms was more pronounced in those with pre-existing depressive disorders. There was no difference in parenting stress or adjusted childhood mental health symptoms or disorder.

Conclusions: Our findings highlight the vulnerability of those with pre-existing clinical mental health disorders and the need for adequate clinical care for this vulnerable group. Equally, our study indicates the possibility that parenting and early childhood mental health outcomes, at least in the short term, may be resilient.

Key words: childhood mental disorders; COVID-19; depression; pandemic; parenting.

What is already known on this topic

1 International research suggests COVID-19 pandemic has impacts on maternal and child mental health as well as parenting stress.
2 The impact on child mental health from the pandemic is likely to vary across jurisdictions as demonstrated by the inconsistency in reported findings.
3 Melbourne had one of the longest lockdowns during the pandemic.

What this paper adds

1 No difference was found for parenting stress or child health when comparing pre-pandemic and pandemic in Melbourne.
2 Women had steeper depression symptom trajectory in Melbourne's pandemic conditions.
3 Those mothers already vulnerable to mental health disorders were most adversely impacted and the implication on future child outcomes for these families is unknown.

There has been a clear impact of COVID-19 pandemic in Australia, as for many countries around the world, through public health policies including many stressors for families with young children including closures or reduced access to childcare, kindergarten and school closures, reduced post-natal and child health contact and support, limitations in access to family and wider social support as a result of public health orders and lockdowns. This is in addition to concerns about the impact of potential exposure and infection with COVID-19 on their capacity to care for their children, as well as direct impacts on the health of their young children, particularly with the lack of access until recently for those under 12 years to vaccination. What is unknown is whether such stressors will increase the rate of depression in women parenting young children and have deleterious consequences for the mental health of their young children.

It is commonly asserted that Melbourne, Australia had one of the longest COVID lockdowns in the world lasting 262 days. In

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addition, public health orders included curfew, mask wearing inside and outside and only essential movement within a 5 km radius with 1 h outside recreation or exercise per day. There is much interest in the impact of extreme stressful events, such as natural disasters, on maternal mental health, parenting and child outcomes. While many studies have focused on natural disasters such as the Dutch Famine, Project Ice Storm, World Trade Centre attacks and the 2011 Queensland floods,[1–5] a recent rapid review of quarantine identified the mental health implications specifically with these experiences associated with COVID-19 pandemic.[6]

To date, there have been several studies examining both the impacts on child mental health outcomes and maternal mental health during the COVID-19 pandemic. A recent meta-analysis on child mental health identified 12 studies, however highlighted the predominantly low quality and recommended the need for more 'robust research evidence' to inform future practice and recommendations.[7] Specifically, this review only identified cross-sectional studies with no comparison groups and only two focused on primary school age and none on pre-school-aged children. Research that has examined maternal depression has also either utilised a cross-sectional approach[8] or compared women in two separate groups but without necessarily mental health data from prior to the pandemic.[9] Furthermore, understanding the impact of maternal mental health on parenting and parenting stress and its relationship with her infant/child has been unclear with cross-sectional surveys suggesting there may be some concern but with the methodology unable to attribute this to the pandemic whereas comparison study has not found any difference pre and during the pandemic.[9,10] Although not examining maternal depression specifically there have been studies that have examined and found an impact of the pandemic on child maltreatment and harsher parenting practices.[11,12] This research demonstrates the challenges of studying pandemics and gaining data of sufficient quality with the frequent reliance on convenience samples and methods to piece together an understanding of these significant events on early life mental health.

Outside of the COVID-19 pandemic, there are studies that have examined similar significant stressful events in communities and the impact on maternal and child mental health. As previously mentioned, these have included those exposed to natural disasters such as floods and ice storms as well as attacks such as 9/11 in New York as well as war and civil unrest.[1,3,13] Past studies have also identified maternal depression as a potential mediator for infant and child outcomes as well as the importance of parenting stress.[14–16] Parenting can be measured in many ways and has many dimensions from the quality of the relationship, interaction style to practical aspects of care.[17] The Parenting Stress Index is a widely used measure of a parent's stress around their child and that relationship and encompasses subscales across parent–child relationship through to parent's own distress and the parent's perception of their child's behaviour.[18] While this is parent report rather than direct observation of parenting, it may provide valuable insights into parenting.

In an existing pregnancy cohort, our study examines maternal mental health and parenting stress trajectories between early pregnancy to 3–4 years of age in a sample who were assessed at a 3- to 4-year-old follow-up prior to the COVID-19 pandemic and compares this to a sample assessed at 3–4 years during the COVID-19 pandemic; both groups were in Victoria. Child mental health outcomes at 3–4 years of age are also examined using both dimensional and categorical measures. It is hypothesised that maternal mental health, parenting stress and child mental health will be worse in women and children who are assessed at the 3- to 4-year-old follow-up during the COVID-19 pandemic compared to those assessed prior to the pandemic.

Methods

Sample and design

This study draws on 468 women and their children from an ongoing, prospective, selected pregnancy cohort where recruitment first began in Melbourne, Victoria in 2012.[19] Women were recruited prior to 20 weeks gestation in pregnancy and followed up during distinct Waves in the third trimester, at birth, at 6 months and 12 months postpartum, and then when the child reached 3–4 years of age. Using only the Melbourne arm of the cohort, this paper uses data collected at recruitment through to 3–4 years postpartum, inclusive. Within this sample, 267 (57.1%) women and their children were followed up and assessed at 3–4 years of age pre-COVID, whereas 201 (42.9%) women and their children were followed up and assessed at 3–4 years of age during the COVID pandemic. The Mercy Health Human Research Ethics Committee approved this study and all participants provided informed written consent.

Measures

COVID-19 pandemic exposure

Since the Australian government imposed a nationwide lockdown, there have been six lockdown events totalling 262 days in Melbourne. During 2020 and 2021, Melbourne recorded over 140 000 COVID-19 cases and more than 2000 deaths from the virus and widespread community transmission of the virus. In this paper, we considered exposure to COVID-19 pandemic conditions as relative to the date of the first recorded case in Australia, 25 January 2020 and until November 2021. COVID-19 pandemic exposure at the time of a follow-up in the cohort was then operationalised as both a binary exposure at each Wave (0 = *before COVID-19*, 1 = *during COVID-19*) and as a pandemic exposure duration variable (i.e. date of follow-up minus 25 January 2020, output unit as weeks).

Maternal depression, depressive symptoms and stress outcomes

At recruitment and 6 months postpartum, the Structured Clinical Interview for DSM-IV (SCID-IV) was administered.[20] The Edinburgh Postnatal Depression Scale (EPDS) was administered at recruitment, third trimester, 6 and 12 months postpartum and 3–4 years postpartum.[21] The EPDS has 10 items and a response scale of 0–3. Summed EPDS range between 0 and 30 and the internal consistency (Cronbach's alpha) of EPDS items across all Waves ranged between 0.85 and 0.92. In addition to the sum of EPDS items, we also dichotomised the sample at each Wave based on an EPDS cut-off score of ≥13, which has been used as a screener to denote the possibility of depression with high sensitivity and specificity.[22]

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Table 1 Sample socio-demographic and other key characteristics for women by exposure to COVID-19 pandemic conditions at 3–4 years ($N = 468$)

	3- to 4-Year follow-up before COVID-19 ($n = 267$)	3- to 4-Year follow-up during COVID-19 ($n = 201$)	
	n (%†)	*n* (%†)	$\chi 2$ *p* value
Oceania/European ethnicity (missing = 2)	230 (86.8)	178 (88.6)	0.568
Nulliparous	243 (91.0)	143 (71.1)	<0.001
University education (missing = 3)	176 (66.7)	150 (74.6)	0.063
Full-time, Part-time and casual employment (missing = 14)	237 (92.9)	176 (88.4)	0.097
Married, *de facto*, or otherwise stable relationship (missing = 24)	240 (96.0)	192 (99.0)	0.056
Current depressive disorder at recruitment	59 (22.1)	27 (13.4)	0.017
	M (SD)	M (SD)	*F p* value
Maternal age at recruitment	31.30 (4.71)	32.88 (4.41)	<0.001

† Valid percentage due to missing.

At six and 12 months postpartum, and again at 3–4 years old, stress due to the roles of parenting was assessed using the fourth edition Parenting Stress Index, Short-form.[23] The 36-item PSI-4-SF divides into three subscales (Difficult Child, Parent Distress, and Parent–child Dysfunctional Interactions) and provides percentiles for comparison across studies. Due to strong concurrent associations between the Parent Distress subscale and the EPDS, we used only the Parent–Child Dysfunctional Interactions and Difficult Child subscale percentile scores.

At each time point, the sum of endorsed stressful life events was assessed using the Stressful Life Events Scale.[24] The scale lists 24 common and pregnancy-specific life events, yielding a sum score ranging between 0 and 24.

Child socioemotional and mental health outcomes

Child Behaviour Checklist (CBCL) for ages 1.5–5 was collected using maternal report at 3–4 years old.[25] The CBCL 1.5–5 is a 99-item multidimensional behaviour problem scales, which produces raw scores, standardised t-scores and percentiles. For this study, we use the *t*-scores for the Internalising and Externalising Problem scores.

Childhood mental health disorders were assessed during Wave 6 at 3–4 years old using the Preschool Age Psychiatric Assessment (PAPA), which is a structured diagnostic interview for 3–8 years of age administered to the mothers of the children and takes approximately 1 h to administer. The PAPA draws on DSM-V-based symptoms to generate DSM-V diagnoses. Our research

Table 2 Unadjusted comparisons by COVID-19 exposure of maternal and child outcomes at 3–4 years ($N = 468$)

Outcome	3- to 4-Year follow-up before COVID-19 ($n = 267$)	3- to 4-Year follow-up during COVID-19 ($n = 201$)	*p* Value
Maternal			
EPDS (M, SD)	6.15 (4.64)	7.91 (5.16)	0.001
EPDS ≥13 (*n*, %)	21 (10.7)	24 (18.6)	0.044
PSI Parent–Child Dysfunctional Interaction (M, SD)	38.59 (24.09)	39.12 (23.04)	0.846
PSI Difficult Child (M, SD)	44.67 (27.28)	43.46 (27.29)	0.699
Child			
CBCL Internalising (M, SD)	48.35 (10.25)	46.19 (9.75)	0.081
CBCL Externalising (M, SD)	47.49 (10.32)	47.71 (9.25)	0.857
PAPA Anxiety Disorder (*n*, %)	78 (40.0)	56 (37.8)	0.684
PAPA Depressive Disorder (*n*, %)	9 (4.6)	2 (1.4)	0.123†
PAPA Behavioural Disorder (ODD, CD) (*n*, %)	4 (2.0)	9 (5.7)	0.060
PAPA ADHD (*n*, %)	21 (10.8)	7 (4.7)	0.043

ADHD, attention-deficit/hyperactivity disorder; CBCL, Child Behaviour Checklist; EPDS, Edinburgh Postnatal Depression Scale; PAPA, Preschool Age Psychiatric Assessment. † Fisher's exact test due to expected cell counts less than 5 or Welch's Robust F test due to heterogeneous group variances.

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team has undertaken training with Duke University, Developmental Epidemiology and this study administered the electronic eMeasures that utilises computer algorithms using DSM-5 criteria for mental disorders.[26] Both the test–retest reliability and the inter–rater reliability have been established.[26,27] The childhood disorders assessed by the PAPA and included in this paper are depressive disorders (major depression, dysthymia), anxiety disorders (generalised anxiety disorder, social phobia, specific phobias, panic disorders and separation anxiety disorder), behavioural disorders (oppositional defiance disorder and conduct disorder) and attention-deficit/hyperactivity disorders.

Other covariates

At recruitment, maternal age, parity, ethnicity, education and employment and other socio-demographic data were collected.

Statistical analyses

We first provide descriptive statistics for the sample and compare socio-demographic characteristics between those who completed the 3- to 4-year-old follow-up pre-COVID-19 and those during COVID pandemic conditions. Unadjusted differences for the 3- to 4-year outcomes by COVID-19 exposure are then provided. Using a series of adjusted models, we compare COVID-19 pandemic exposure on maternal (linear and generalised linear mixed models) and child (general and generalised linear models) outcomes. For maternal outcomes, we include in the models all occasions of repeat measurement, where appropriate. In all models, binary COVID-19 pandemic exposure is used as the focal predictor to address the hypothesis and the model-estimated margins (estimated marginal means (EMMs) and marginal probabilities) for COVID-19 pandemic exposure groups are presented graphically for all outcomes, with pairwise comparisons between groups at each Wave conducted using a Bonferroni-corrected *P* values (0.05 divided by the number of outcomes). Covariates included for adjustment are listed for each model. Where significantly worse outcomes are found in the modelling due to COVID-19 exposure at the time of the outcome, we test predictors of the variation in the outcome only in a sub-sample who completed the Wave during the COVID-19 pandemic.

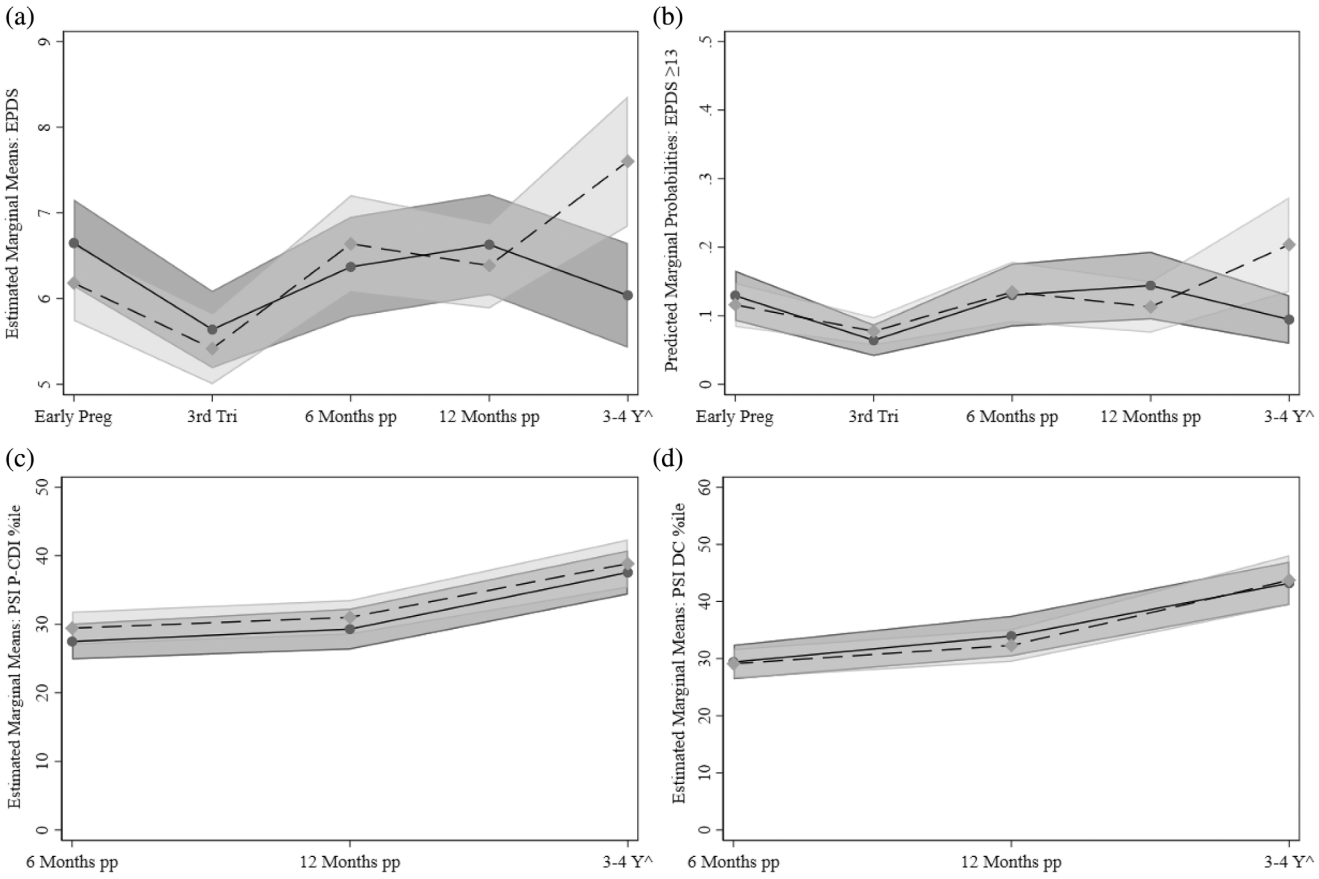


Fig. 1 Model-estimated maternal outcomes for (a) EPDS, (b) EPDS ≥13, (c) PSI P-CDI and (d) PSI DC by exposure to COVID-19 pandemic conditions exclusively at 3–4 years. Estimates in (a) and (b) are adjusted for the following covariates: depressive disorder at recruitment, maternal age, parity, university education and sum of time-varying stressful life events. Estimates in (c) and (d) are adjusted for the following covariates: depressive disorder at recruitment, maternal age, parity, university education, and time-varying EPDS and sum of stressful life events. Shaded area displays the 95% CI around point estimates. ^Denotes Wave when exposure to COVID-19 pandemic conditions occurred. EPDS, Edinburgh Postnatal Depression Scale; PAPA, Preschool Age Psychiatric Assessment. (—●—) Before COVID-19 and (--◆--) During COVID-19.

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Specifically, we examine number of weeks exposed to COVID-19 pandemic conditions, maternal age, a depressive disorder and parity at recruitment, and concurrent parenting stress (both P-CDI and DC). All analyses were conducted using Stata 16.[28]

Results

Sample characteristics

Table 1 compares socio-demographic characteristics of this cohort sample by exposure to COVID-19 pandemic conditions at the time of the 3- to 4-year-old follow-up. At recruitment, women in this sample were mostly in a relationship, of Oceanic/European background, employed, and university educated. A greater proportion of women who completed the 3- to 4-year-old follow-up prior to the COVID-19 pandemic, compared to during the pandemic, were nulliparous and met criteria for a depressive disorder. As this is a selected cohort with targeted recruitment of women with current and past depressive disorder, the prevalence of depression in early pregnancy (18.4%) is greater than what has been estimated in the Australian population (approximately 10%). As previously reported,[19] women in this cohort are, on average, older than the Australian perinatal population but were comparable across other demographics.

Maternal and child outcomes before and during COVID-19

Table 2 displays the unadjusted comparisons for maternal and child outcomes at the 3- to 4-year-old follow-up by COVID-19 pandemic exposure. Figure 1 displays model-estimated maternal outcomes for EPDS (i), EPDS ≥13 (ii), PSI P-CDI (iii), and PSI DC (iv) by COVID-19 pandemic exposure at 3- to 4-year-old follow-up adjusted for covariates. During the perinatal period, Melbourne women's EPDS scores are comparable; however, at 3–4 years, a sharp increase was observed in those who were exposed to the pandemic at follow-up, which was significantly higher than those who were not (yet) exposed to COVID-19 ($EMM_{difference} = 1.72$, $P = 0.001$, corrected $P < 0.01$, $d = 0.35$). This pattern was reflected in the likelihood of scoring ≥13 on the EPDS, where women exposed to the COVID-19 pandemic at 3–4 years were at a 3.22 ($P = 0.001$, corrected $P < 0.01$) times higher risk of scoring 13 or above compared to women who were not exposed to the COVID-19 pandemic at 3–4 years. In exposed Melbourne women higher EPDS scores and higher probabilities of scoring ≥13 were found only to be associated with a depressive disorder at recruitment (P's < 0.001), and not with duration of exposure to COVID-19 pandemic conditions. For parenting stress, however, there were no increased P-CDI and DC scores associated with exposure to the COVID-19 pandemic at 3–4 years.

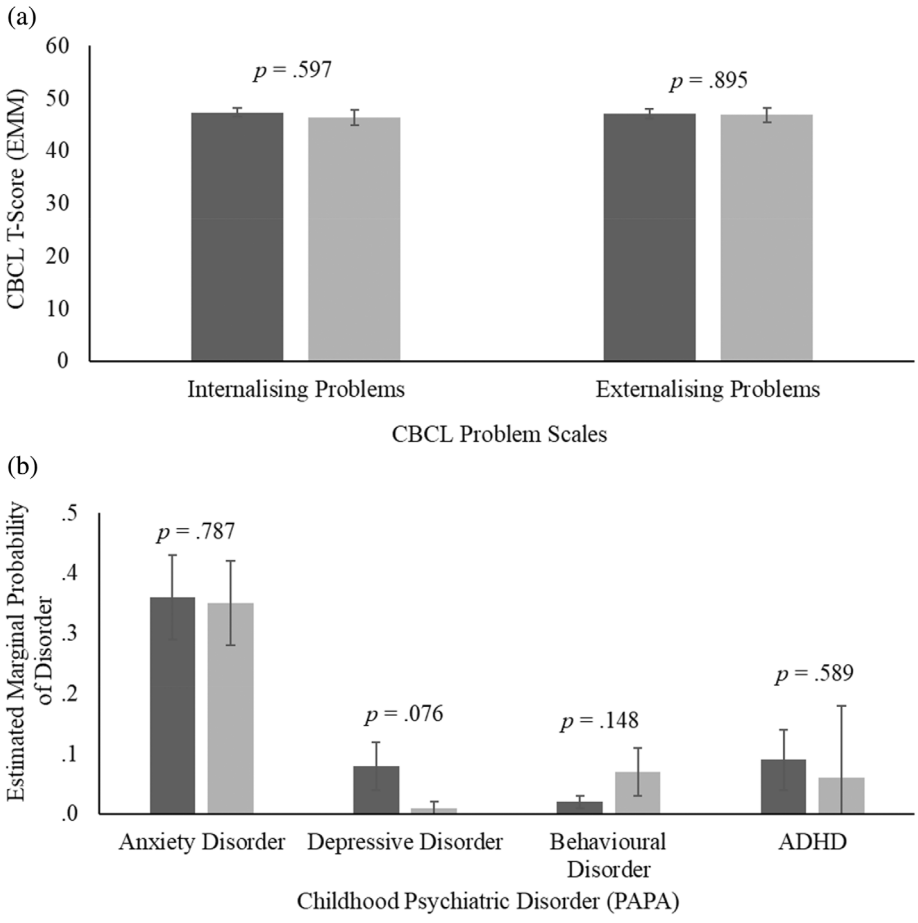


Fig. 2 Model-estimated maternal outcomes for (a) CBCL problem scores and the (b) psychiatric disorders by exposure to COVID-19 pandemic conditions at 3–4 years. Estimates are adjusted for the following covariates: depressive disorder at recruitment, parity, university education, employment and infant age at assessment and sex. Error bars display standard error around point estimates. CBCL, Child Behaviour Checklist. (■) Before COVID-19 and (■) During COVID-19.

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Together, these results suggest that first, an increase in maternal depressive symptoms, but not stress specifically related to parenting, was associated with COVID-19 at 3–4 years. Second, the risk to poorer mental health during the COVID-19 pandemic was specifically for women with a history of a depressive disorder. For children (Fig. 2), there were no differences in problem behaviour scores (i.e. CBCL; Fig. 2a) or the probability of a mental health disorder (i.e. Fig. 2b) between those who were exposed to the pandemic at the 3- to 4-year-old follow-up compared to non-exposed children.

Discussion

This study found at 3–4 years postpartum that those women exposed to the pandemic in Melbourne, experiencing one of the longest lockdowns world-wide, did have elevated depressive symptoms with a steep incline in their trajectory and this was even more pronounced in those with pre-existing clinical depressive disorders. However, despite the significant restrictions in access to childcare and pre-school, family and other supports as well as the lengthy lockdown, we did not find differences in parenting stress or adjusted childhood mental health symptoms or disorder.

While infection rates during this period in Melbourne were not as high as in the USA, UK or many other countries world-wide, families were significantly restricted with lockdowns lasting 262 days during the peak of the pandemic. Public health orders included a range of additional restrictions. Households were not permitted to mingle and hence access to grandparents and wider family was significantly limited. In this context, it is not surprising that trajectories for depressive symptoms particularly in those with a history of previous depressive disorder were elevated compared to a similar group of women assessed before the pandemic but who did also include those with a previous depressive disorder. In a previous study of adolescents, pre-existing adverse experiences exacerbated poorer outcomes.[29] Given the robust nature of the measures and design that included the ability to adjust for previous depressive disorders and trajectories that included symptoms predating the pandemic, we found evidence that those mothers vulnerable to depression were impacted on their mental health through exposure to the significant pandemic related stresses such as those emerging in Melbourne. In contrast, it is reassuring that in a cohort previously reported as a high risk for child mental disorders, we did not find differences for children's mental health in those exposed to these pandemic conditions compared to those who were not.[30] Of note parenting stress did not differ and it may be that while women experienced a decline in their mental health, there were clearly compensatory aspects that were protective for their parenting and their children. For example, increased paternal involvement in child care has been reported as a protective factor in a Chinese sample.[11] Furthermore, the pandemic might show a 'silver lining' of opportunities for increased self-care, connecting with friends and family albeit online and enjoying time with children, as well as protective effects on child mental health of a predictable home environment during the pandemic.[8,31]

While our study has many strengths including the robust measurement, study design and analysis of findings are limitations. We are unable to report on mental health outcomes for those exposed to COVID-19 infection and this remains an important area for equally robust prospective research given the reports of long-term impacts from this illness. In addition, given the age of children at follow-up, we were unable to examine education and learning loss associated with lockdowns and we did not measure sedentary behaviour. We also continue to use the EPDS to measure maternal depressive symptoms at 4 years postpartum, the advantage is the capacity to model these symptoms over time with repeat measurement; however, the limitation is that the EPDS is rarely used outside of the perinatal period.

Conclusion

Our findings highlight both the risks and also potential resilience associated with the COVID-19 pandemic. It is important to note the particular vulnerability of those with pre-existing clinical mental health disorders. Adequate support and access to ongoing clinical assessment and treatment might be advisable for this vulnerable group who are particularly impacted by the pandemic. In addition, our findings would support the consideration of screening parents for depression and anxiety where children are being assessed for mental health disorders if screening measures with sufficient sensitivity and specificity are available. What is unknown from our findings is whether the impact we identified on women with pre-exisiting depression will in turn have any implications, beyond the pandemic, for longer term child mental health and/or parenting stress outcomes. Equally our study may suggest the potential for resilience in parenting and child mental health outcomes, which allows for cautious optimism.

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