

Impact of the COVID-19 pandemic on new parents enrolled in the 'BABY1000' birth cohort study in Sydney, Australia: A mixed-methods study

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Abstract

Objective: The COVID-19 pandemic was, and continues to be, uniquely experienced by women in the perinatal period and their families. Whilst long-term impacts of the pandemic are unknown, exposures in pregnancy and early life have impacts across the life-course and future generations. The objective of this manuscript was to explore how the pregnancy, postpartum and parenting experiences of a subset of participants from the 'BABY1000' cohort in Sydney, Australia, were affected by the COVID-19 pandemic, and explore associations between these experiences and state anxiety.

Methods: Mixed methods were used. Participants were requested to complete an online survey including the State-Trait Anxiety Inventory short form (STAI-6), followed by an invitation to participate in focus group discussions (FGDs).

Results: From September to November 2021, 88 parents completed the survey (mean age 33.5 years, 60% born in Australia, 58% primiparous). Twenty-two parents participated in FGDs. Six themes were identified regarding the experience of parents: (1) Maternal support, (2) Family relationships, (3) Stress and mental health, (4) Healthcare, (5) Family lifestyle and routine, and (6) Long-term impacts. The mean STAI-6 score was 40 (SD 12.3), representing high anxiety. High anxiety was significantly associated with concern regarding COVID-19 and feeling overburdened and lonely.

Conclusions: The COVID-19 pandemic and associated public health orders significantly impacted participants' pregnancy, postpartum and parenting experiences. Whilst these experiences included some unexpected positives, for many, these were outweighed by negative impacts on mental health, social support, health behaviours, and family relationships.

Implications for Public Health: Ongoing longitudinal research is imperative to identify potential long-term effects of the pandemic across the life-course, better support families in the short and long-term, and plan for public health crises in the future.


Key words: COVID-19, pregnancy, birth, postpartum, parenting, maternal mental health

List of Abbreviations

BABY1000, The pilot BABY1000 longitudinal birth cohort study; COVID-19, Coronavirus disease 2019, caused by the SARS-CoV-2 virus; FGD, Focus Group Discussion; GP, General Practitioner; NSW, New South Wales; SARS-CoV-2, Severe Acute Respiratory Syndrome Coronavirus 2; STAI-6, State-Trait Anxiety Inventory 6-item short form; RPAH, Royal Prince Alfred Hospital.

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Background

Pregnancy and postpartum are unique and complex periods of transition for parents and families. New parenthood is both exciting and stressful and requires significant adjustment and support—both for parents as individuals^{1,2} and for co-parents.^{3,4} Subsequent children may also compound these challenges as they adapt to shifting family dynamics.^{5,6} There is also increasing evidence for the “Developmental Origins of Health and Disease”, which suggests that exposures during pregnancy and early life impact physical, cognitive, and emotional development, with outcomes extending throughout childhood, adulthood, and subsequent generations.^{7,8} As such, the importance of supporting families during the “first thousand days” is recognised in public health policies around the world.^{9–13}

The COVID-19 pandemic was, and continues to be, uniquely experienced by women in the perinatal period and their families.¹⁴ In Australia, strict public health measures including national and state border closures, an initial universal “lockdown”, and subsequent short, stringent lockdowns resulted in a reduced number of COVID-19-positive cases and lower mortality rates than in many comparable countries.^{15,16} Advice regarding social distancing (restrictions on the number of people allowed per square metre) was provided at a federal level from March 2020.¹⁷ However, public health orders designed to minimise transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (e.g. mandatory mask-wearing, restrictions on travel away from primary residence, curfews, etc) throughout 2020 and 2021 changed frequently and varied according to location, timing, COVID-19-positive case numbers, and vaccination uptake, when available.¹⁸ Whilst effective in minimising spread of SARS-CoV-2, these social distancing measures also resulted in substantial disruptions to everyday life, with varied effects on family relationships, routines, and functioning.^{19–21}

During the pandemic, Australian healthcare systems also underwent significant and rapid changes to models of care, varying between and within local health districts. With a focus on ensuring physical distancing and minimising non-urgent contact with the healthcare system to minimise disease spread, many patients had procedures rescheduled; appointments cancelled, shortened in duration, reduced in frequency, and/or diverted to telehealth; and restrictions were imposed regarding the presence and involvement of support persons or visitors.^{22,23} These restrictions were particularly variable in maternity care, including antenatal care and education, labour and birth, and postnatal care and support groups—affecting birthing people, partners, and healthcare providers alike.^{24–27} Importantly, pregnant women and mothers of small children emerged as a particularly vulnerable group during the pandemic, both in terms of the physical effects of the disease²⁸ and the negative impact of associated public health measures on their mental health.^{29–31}

Given that they allow for comprehensive data collection over time, longitudinal birth cohort studies help unravel the complex and multidimensional origins of health and disease—including the impacts of COVID-19 on women, children, and families.^{32,33} Using a cohort of women recruited prior to and during the first waves of COVID-19, the existing pilot “BABY1000” longitudinal study was well-placed to explore how the pandemic and associated social restrictions affected a subset of parents in Sydney, Australia. This manuscript seeks to qualitatively present the pregnancy, postpartum, and early parenting experiences of this subset and explore associations between experiences of life during the COVID-19 pandemic and state

anxiety. Recommendations are made to support future research and policy investment for families in similar contexts.

Methods

Participants and recruitment

The BABY1000 pilot study is a prospective longitudinal birth cohort study based in Sydney, Australia, which enrolled parents planning pregnancy or at 12 weeks’ gestation (n = 225), with follow-up of the birthing mother and child extending to the child’s second birthday. Study design, inclusion and exclusion criteria, recruitment, sample size, and data collection, management, and statistical analysis plans have been previously published.³⁴ This manuscript explores the experiences of a subset of participants enrolled in BABY1000.

Study design

This substudy used a mixed-methods design, consisting of an online questionnaire (see [Supplementary Material 1](#)) and focus-group discussions (FGDs), providing both qualitative and quantitative data. All active BABY1000 participants (n = 180) were invited via email in September 2021 to participate in an online questionnaire, which included a request to participate in FGDs. Following the initial email invitation, if questionnaires were not completed, up to two reminder emails were sent two weeks apart. If no response was received after this time, no further contact was made relating to the substudy.

Online questionnaire

The online questionnaire was completed using the Research Electronic Data Capture management software (hosted by the Sydney Local Health District). Research Electronic Data Capture is a secure, web-based software platform designed to support data capture for research studies.³⁵ The questionnaire was divided into three sections:¹ the experience and acceptability of the BABY1000 pilot study,² the effect of the COVID-19 pandemic on participants and their families (including levels of concern; feelings about parenting, family, and social life; changes to routines and health behaviours; and impacts on pregnancy and healthcare access and acceptability) and³ the Spielberg State-Trait Anxiety Inventory 6-item short form (STAI-6).³⁶ This article focusses on the impact of COVID-19 on participants and their families; results regarding study acceptability and feasibility will be reported separately.

Questionnaire prompts were designed specifically for use in this substudy and included a range of closed and open questions. Closed questions used “Yes/No” responses and sliding scales (e.g. “Have you been concerned about the health of your child during the COVID-19 pandemic?” with a corresponding 10-point scale from “not at all concerned” to “extremely concerned”). Open questions allowed participants to provide additional detail (e.g. “If you would like to describe how the COVID-19 pandemic affected your feelings about parenting and/or family life in ways not identified above, please describe”). There were no field limits set for open questions; participants could add as much detail as they liked.

The questionnaire included the STAI-6,³⁶ a short-form of the original 20-point scale³⁷ used to measure state anxiety. Each item of the STAI-6 has four response categories (“not at all”, “somewhat”, “moderately”, and “very much”) corresponding to numerical values,^{1–4} with three of the six prompts negatively scored. Scores are summed to produce a total score ranging from 6–24. To derive sum

scores comparable to the long-form tool, STAI-6 scores were divided by six and multiplied by 20, producing a possible range between 20 and 80.³⁸ Sum scores were then assigned anxiety “categories” in two different ways, as previously described in the literature (including with pregnant women)^{39,40} –(1) as “no or low anxiety” (scores 20–37), “moderate anxiety” (scores 38–44), or “high anxiety” (scores 45–80) and (2) by using a score above 40 as indicative of high anxiety.⁴¹ The latter method was used in examining associations with other variables.

Virtual focus-group discussions

Upon completion of the online questionnaire, participants were invited to contribute to an online FGD. FGDs were hosted online via Zoom Video Communications, Inc. (“Zoom”) in November 2021 and were designed to further explore topics included in the online questionnaire, including the impact of COVID-19 on pregnancy and birth-care plans (if applicable), healthcare access and concerns, family lifestyles and routines, and impacts on social life and support. Participants were incentivised by a “Question and Answer” session on infant and toddler nutrition following the session, hosted by a paediatric dietitian (AMG).

Discussions were audio-recorded and transcribed to allow detailed analysis of qualitative data. Discourse analysis⁴² was used to explore the beliefs, values, and practices of participants. Analysis was completed independently by two researchers (AMG and SS). Any disagreements in coding were resolved by discussion. Themes and associated codes (or subthemes) were generated, capturing the breadth of responses received. The number of comments received in relation to each theme and code and their overall tone (positive, negative, neutral) were also recorded. Across the five FGDs, data saturation was reached for the themes identified.

Statistical analysis

Descriptive analyses were conducted to present demographic data, identify proportions of responses to closed questionnaire prompts, and report the mean score and prevalence of state anxiety in our sample (using the STAI-6) according to pre-defined groups, as outlined earlier. Inferential statistics were conducted using IBM SPSS Statistics (version 28.0, Armonk, NY: IBM Corp), and the level of significance was set at $P \leq 0.05$. Paired t-tests were used to compare the subset ($n = 88$) to active cohort ($n = 180$) in Table 1. Pearson Chi-Square tests were used to compare participants with “high” anxiety scores on the STAI-6 (>40) and¹ the timing of birth (prior to, or after, February 2020),² parity (primiparous versus multiparous),³ medical pregnancy complications (any versus none),⁴ concern relating to COVID-19 for both participants and their child/ren (using Questions 4 and 5 from the online questionnaire [Supplementary Material 1], where participants who reported concern as an 8–10 were considered to have “high” concern, compared to other responses), and⁴ feelings towards parenting, family, and social life (using statements from Question 8 in the online questionnaire that were agreed to by approximately 50% of participants (Table 3)).

Ethics

BABY1000 obtained ethical approval from [Blinded details]. This substudy received additional ethics approval to include questions relating to the impact of the COVID-19 pandemic. All participants who agreed to complete the questionnaire were advised of substudy procedures, benefits, voluntary participation, confidentiality, and

complaints processes. Whilst there were no anticipated harms of participating, relevant support information and services were also signposted, alongside the suggestion to speak with a health professional if participants felt distressed by sharing their experiences. Parents were required to indicate that they had read and understood this information before providing consent.

Results

Of the 180 BABY1000 pilot study participants invited, 88 (49%) completed the online questionnaire between September and November 2021. Demographic characteristics of participants are shown in Table 1. The mean age was 33.5 (standard deviation: 3.8) years. Most participants were primiparous (58%), born in Australia (60%), and identified as being of European background (65%). Approximately half (52%) of participating parents birthed their child prior to the COVID-19 pandemic in Australia. Participants were not significantly different to the “active” cohort who were not involved in the substudy in relation to any demographic characteristic (Table 1). From the 88 participants who completed the questionnaire, 35 (40%) consented to participate in FGDs. Due to scheduling and availability, of those who consented, 22 (25%) parents participated in FGDs.

COVID-19 exposure and concern

At the time of questionnaire administration, no participants or their immediate families had contracted COVID-19 since the beginning of the pandemic. Seven (8%) participants had family members or friends living in Australia who had previously contracted COVID-19, increasing to 26 (30%) for family and friends living overseas. When asked to assess the extent of concern felt about their child/children contracting COVID-19 on a scale from 0–10 (“not at all concerned” to “extremely concerned”), the median score was 7 (interquartile range: 3, range: 0–10), decreasing slightly to a median of 6 (interquartile range: 4, range: 0–10) when asked about contracting the virus themselves.

STAI-6

Responses to each STAI-6 prompt are summarised in Table 2. Of the 87 participants who completed the STAI-6, 39 (45%) scored as having “no or low” anxiety (scores 20–37), 17 (20%) as having “moderate” anxiety (scores: 38–44), and 31 (36%) as having “high” anxiety (scores 45–80). The mean score was 40 (standard deviation: 12.3), with scores ranging from 20–70. Thirty-nine participants (45%) had scores above 40. In our sample of 86 participants, high STAI-6 scores (>40) were not associated with parity ($\chi^2 = 0.85$; $df = 1$; $P = 0.36$), or timing of birth ($\chi^2 = 0.8$; $df = 1$; $P = 0.43$) but were significantly associated with having at least one medical pregnancy complication ($\chi^2 = 7.0$; $df = 1$; $P = 0.008$) and high levels of concern regarding COVID-19, both on an individual level ($\chi^2 = 3.6$; $df = 1$; $P = 0.05$) and for their children ($\chi^2 = 6.8$; $df = 1$; $P = 0.009$). High STAI-6 scores were also associated with feeling burdened by responsibilities ($\chi^2 = 5.2$, $df = 1$; $P = 0.022$), concerned about child development and social skills ($\chi^2 = 3.7$; $df = 1$; $P = 0.05$), and lonelier than before the pandemic ($\chi^2 = 11.7$; $df = 1$; $P < 0.001$).

Questionnaire and focus-group discussion themes

Six themes were identified regarding the experience of parents during the pandemic (% of comments relating to the theme, with some comments reflecting multiple themes): (1) maternal support (or lack thereof) (39%), (2) family relationships (31%), (3) stress and

Table 1: Demographic characteristics of participants.

Category ^a	Active cohort (N = 180) N (%)	Non-participating active cohort (N = 92) N (%)	Participating sub-sample (N = 88) N (%)	P value ^b
Age (years) at study entry				
Mean age (SD)	33.3 (4.2)	33.1 (4.7)	33.5 (3.8)	NS
20–29	23 (12.8)	11 (12.0)	12 (13.6)	
30–34	99 (55.0)	52 (56.5)	47 (53.4)	
35–39	45 (25.0)	23 (25.0)	22 (25.0)	
≥40	13 (7.2)	6 (6.5)	7 (8.0)	
Ethnicity				
European	103 (57.2)	46 (50.0)	57 (64.8)	NS
South Asian	18 (10.0)	13 (14.1)	5 (5.7)	
East Asian	23 (12.8)	14 (15.2)	9 (10.2)	
South East Asian	11 (6.1)	5 (5.4)	6 (6.8)	
Middle Eastern	4 (2.2)	2 (2.2)	2 (2.3)	
African	1 (0.6)	0 (0.0)	1 (1.1)	
Pacific Islander	4 (2.2)	3 (3.3)	1 (1.1)	
Other	12 (6.7)	6 (6.5)	6 (6.8)	
Missing ethnicity data	4 (2.2)	3 (3.3)	1 (1.1)	
Born in Australia				
Yes	96 (53.3)	43 (46.7)	53 (60.2)	NS
No	84 (46.7)	49 (53.3)	35 (39.8)	
Education – highest qualification				
Postgraduate Doctorate degree	12 (6.7)	5 (5.4)	7 (8.0)	NS
Postgraduate Master's degree	34 (18.9)	15 (16.3)	19 (21.6)	
Undergraduate degree	72 (40.0)	39 (42.2)	33 (37.5)	
Non-university vocational training	20 (11.1)	10 (10.9)	10 (11.4)	
High school completion	5 (2.8)	2 (2.2)	3 (3.4)	
Less than high school completion	2 (1.1)	1 (1.1)	1 (1.1)	
Missing education data	35 (19.4)	20 (21.7)	15 (17.0)	
Previous live births				
0	104 (57.8)	53 (57.6)	51 (58.0)	NS
1	65 (36.1)	35 (38.0)	30 (34.1)	
2	8 (4.4)	2 (2.2)	6 (6.8)	
≥3	3 (1.7)	2 (2.2)	1 (1.1)	
Medical pregnancy complications				
None recorded	133 (73.9)	65 (70.7)	68 (77.3)	NS
Gestational diabetes	31 (17.2)	16 (17.4)	15 (17.0)	
Hypertensive disorders of pregnancy	5 (2.8)	3 (3.3)	2 (2.2)	
Other	11 (6.1)	8 (8.7)	3 (3.4)	
Timing of birth				
June 2018–end of January 2020 ^c	101 (56.1)	55 (59.8)	46 (52)	NS
February 2020–July 2021	79 (43.9)	37 (40.2)	42 (48)	

^a“Active cohort” reflects those who were continuing in the study at the birth of their child; “Nonparticipating active cohort” includes those who were invited but did not consent to sub-study involvement; “Sub-sample” refers to those participants who completed the online survey.

^bPaired t-tests (between active cohort and sub-study cohort) assuming unequal variances used to calculate P-values for age (continuous variable). Chi-squared test used to determine P-values (between nonparticipating active cohort and participating substudy cohorts) for remaining categories (all categorical variables—European versus other ethnicities; born in Australia versus elsewhere; university-level education versus below; primiparous versus multiparous; no medical complications in pregnancy versus any complication; timing of birth of child involved in BABY1000 study—pre-COVID-19 versus during COVID-19).

^cThe COVID-19 pandemic in Australia was determined to affect BABY1000 participants from February 2020, with the first cases in Sydney reported on January 25, 2020. Abbreviation: SD = standard deviation.

mental health (26%), (4) healthcare (26%), (5) family lifestyles and routines (23%), and (6) long-term impacts (10%). **Figure 1** shows these themes and their associations schematically and **Supplementary Material 2** tables salient quotes per theme.

Maternal stress, mental health, and perceived social support during the COVID-19 pandemic

Concerns regarding a lack of support for mothers and maternal stress or mental health were amongst the most noted themes across free-

text comments in the questionnaire and in FGDs. Participants reported feeling “*highly stressed*”, others reported the pandemic as being “*traumatic*”, and several acknowledged diagnoses of postpartum anxiety and/or depression believed to have been associated with measures imposed to prevent COVID-19 spread (**Supplementary Material 2**). Almost half (47%) of participating parents reported feeling “*lonelier than before*” during the pandemic. Participants reflected on the grief of “*missing out*” on what they had imagined for their birth and/or postpartum experience, including

Table 2: Responses to STAI-6 prompts (n = 87).

	Not at all (1) N (%)	Somewhat (2) N (%)	Moderately (3) N (%)	Very much (4) N (%)	Median (IQR)
I feel calm	2 (2.3)	27 (31.0)	37 (42.5)	21 (24.1)	3 (1)
I am tense	31 (35.6)	33 (37.9)	16 (18.4)	7 (8.0)	2 (2)
I am upset	53 (60.9)	24 (27.6)	8 (9.2)	2 (2.3)	1 (1)
I am relaxed	11 (12.8)	30 (34.9)	35 (40.7)	10 (11.6)	3 (1)
I feel content	1 (1.1)	27 (31.0)	34 (39.1)	25 (28.7)	3 (2)
I am worried	24 (27.6)	47 (54.0)	11 (12.6)	5 (5.7)	2 (1)

Abbreviation: IQR = interquartile range; STAI-6 = State-Trait Anxiety Inventory 6-item short form.

involvement of loved ones and wider community members in supporting their transition to parenthood and as important figures in their children's lives, citing they felt "isolated" and were unable to access a "village" of support. Concerns about contracting COVID-19 were also distressing for some, e.g. "I got a lot of anxiety ... I'd go through stages of just thinking, you know, "we're going to get COVID and all die", which was completely, you know, extreme kind of thinking".

Impacts of the pandemic on parenting, family, and social life

Impacts of the COVID-19 pandemic on participants' feelings about parenting, family, and social life are summarised in Table 3 and Supplementary Material 2. More than half of participants who responded to the questionnaire felt burdened by additional responsibilities in the home ("There was a lot of frustration..."), concerns about their family's health, and the challenge of maintaining positive relationships between family members, including partners, siblings and parent-child interactions ("You've really got no patience left, and I feel sad that I spent so many days being grumpy at her"). Several participants also reflected on the grief of missed opportunities and experiences with loved ones who would otherwise have been present and an important part of usual family life, e.g. "I think the

saddest part is that extended family still hasn't met the kids... That is probably the top, the hardest thing for me now".

Despite these negative feelings, 36% of participants also felt "more grateful than before" in relation to their experience of the pandemic in Australia, and many felt that working-from-home arrangements afforded an opportunity to strengthen family relationships in ways that would not otherwise have been possible—"...to have that time together as a family and to have both of us home it just made such a huge difference. It was so good that she got to spend so much time with them when they were little, really getting to know them and bonding in a way that she didn't have the opportunity to with our first".

The COVID-19 pandemic also had varied impacts on the family lifestyles of BABY1000 participants, as shown in Table 4 and Supplementary Material 2. Whilst screen time increased for many, and time spent socialising and engaging in hobbies and family activities was less for most families, impacts on diet and physical activity were mixed. This was mirrored in FGDs, e.g. some participants reported that physical activity was easier to accommodate ("We are very consistent with exercising, and I think COVID only gave us more time to do it") whilst others reported the opposite experience ("...much less exercise... we didn't even walk that much. We are afraid to go outside because of COVID").

Table 3: Impact of the COVID-19 pandemic on feelings about parenting, family, and social life, as measured by online questionnaire (total n = 87). Statements are presented in descending order of agreement.

	Yes N (%)	No N (%)
Burdened by additional responsibilities in the home/family ^a	47 (54)	40 (46)
More concerned about my immediate family's health *	45 (52)	42 (48)
More concerned about my extended family's health *	45 (52)	42 (48)
More concerned about my child's development and social skills ^a	42 (48)	45 (52)
Lonelier than before ^a	41 (46)	47 (53)
More grateful than before	31 (36)	56 (64)
More connected to my family	26 (30)	61 (70)
More concerned about my family's financial situation	20 (23)	67 (77)
More confident in my capabilities as a parent	13 (15)	74 (85)
More connected to my community/neighbourhood	12 (14)	75 (86)
More connected to my friends	3 (3)	84 (97)

STAI-6 = State-Trait Anxiety Inventory 6-item short form.

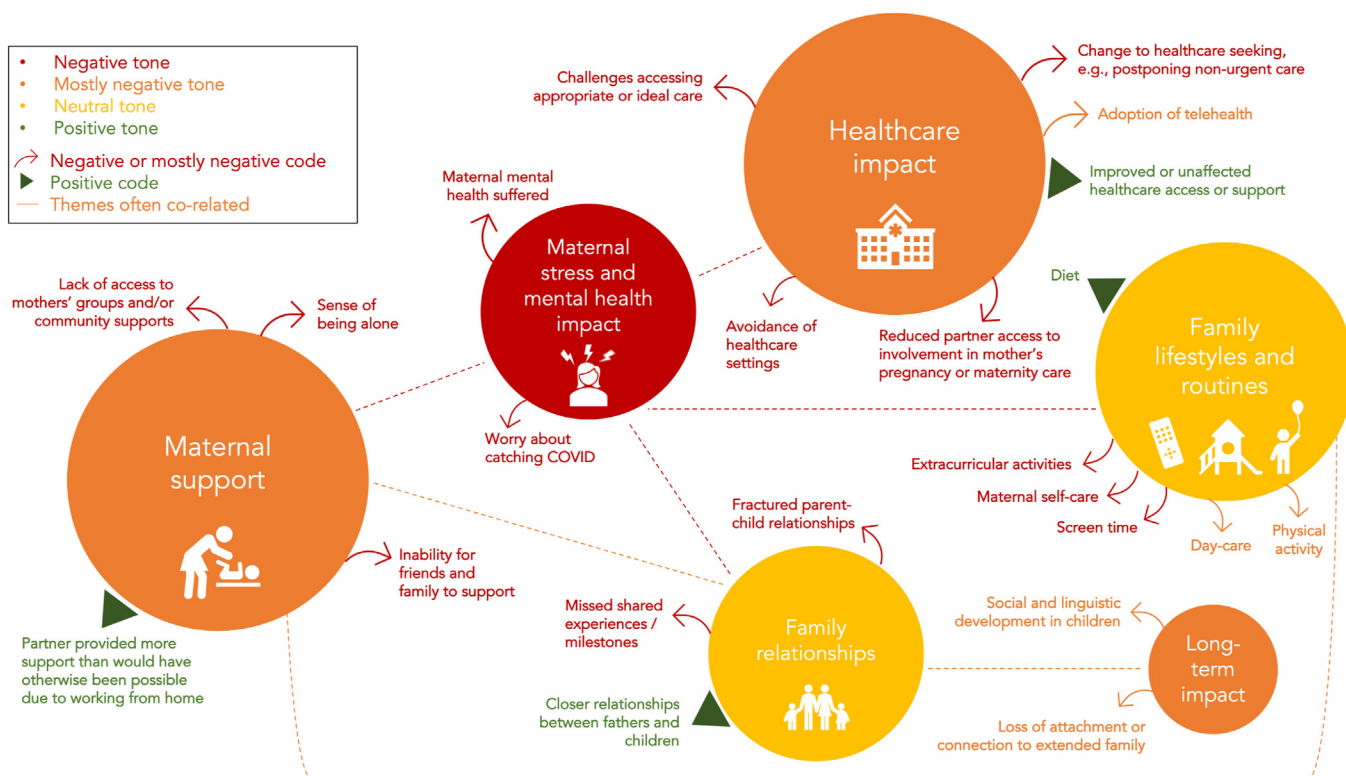
^aAssociated with a STAI-6-converted sum score >40 (P < 0.001).

Altered access and acceptability of healthcare during the COVID-19 pandemic

The impact of the COVID-19 pandemic on participants' healthcare access and satisfaction in relation to pregnancy, birth, and their children is shown in Table 5 and Supplementary Material 2. Of the 42 participants who gave birth after February 2020, 39 (93%) had their maternity care affected by COVID-19 in some way (including cancellation, transition to telehealth, changed model of care and/or health providers, and/or restrictions involving support people). Within this, the most frequent impacts included changes to telehealth (22%) and appointment cancellations (20%). Almost half of participants' access to parent support groups ("Mother's groups") was affected by social restrictions, and more than a third of participating parents felt the pandemic negatively impacted their access to general practitioners and/or other health professionals.

In FGDs, some participants reflected on how birth preparation courses usually delivered by hospitals were not available ("I think at the time they were transitioning to offering them online, but they hadn't quite organised that yet, so we were sort of in this "limbo zone" with no face to face and the virtual ones weren't available... so we didn't end up doing any birth courses...") or were only offered online, which was not always desirable and/or accessible. Others reflected on how the

Figure 1: Schema highlighting the six primary themes (circles) and associated codes (denoted by arrows for negative or mixed responses, and wedges for positive responses). The size of the circles depicts the number of comments made relating to that theme, including survey and focus-group discussion responses. Colours represent the overall tone of the theme: red (negative), orange (mostly negative), yellow (mixed) and green (positive). Dashed lines represent themes often described in relation to each other.



experience of being in hospital after the birth of their child was different from what they had imagined because of COVID-19 regulations, e.g. “I wasn't able to have any visitors during my 5 days in hospital for the twins' birth, not even my toddler son”. Many parents commented on how seeking face-to-face healthcare after the birth of their child was avoided unless “absolutely necessary” and/or was suboptimal to usual care (“...your child isn't properly evaluated ... I even went to the hospital when I didn't trust what the telehealth doctors were telling me.”), whereas others felt the transition to telehealth as an option was helpful and practical, especially for parents of young children.

Long-term impacts on children and families

Some participants were concerned about the long-term impacts of social measures designed to stop the spread of COVID-19 on their children's social and language development, relationships with family members, and family planning (Supplementary Material 2). Parents reported noticing differences in social behaviours of children born during the pandemic compared to their older children or others they had observed prior to the pandemic and questioned whether these were innate personality differences or a consequence of social isolation—“... I'm like, are you just a shy kid, or is this because of COVID?” Some parents also worried that relationships with extended

Table 4: Impact of the COVID-19 pandemic on the family lifestyles of BABY1000 participants, as measured by online questionnaire (total n = 85).

	Less N (%)	No change N (%)	More N (%)
Physical activity “We were less/more active”	40 (47)	24 (28)	21 (25)
Diet “We were eating less/more healthily”	24 (28)	41 (48)	20 (24)
Screen time “We were spending less/more time watching television or using computers”	6 (7)	26 (31)	53 (62)
Social life “We were spending less/more time socialising (virtually or in person)”	76 (89)	5 (6)	4 (5)
Hobbies and family activities “We were spending less/more time engaging in hobbies or activities outside the home”	77 (91)	3 (4)	5 (6)

Table 5: Impact of the COVID-19 pandemic on health care and access, as measured by online questionnaire (total n = 87). Statements are presented in descending order of agreement.

	Yes N (%)	No N (%)
Pregnancy and birth care plans		
Some of my antenatal appointments were cancelled	17 (20)	70 (80)
Some of my antenatal appointments were delivered via the phone or video	19 (22)	68 (78)
I was not able to have important people with me as I birthed my baby	10 (11)	77 (89)
I could not access the information and/or support I needed during pregnancy	8 (9)	79 (91)
I needed to change health care providers	3 (3)	84 (97)
I needed to change my birth model of care (hospital, birth centre, home)	1 (1)	86 (99)
Healthcare access		
Parent support groups	39 (45)	48 (55)
GP for yourself or your child	32 (37)	55 (63)
Other allied health professional	29 (33)	58 (67)
Child and family health nurse	20 (23)	67 (77)
Another medical specialist/s	12 (14)	75 (86)
Lactation consultant	5 (6)	82 (94)
Sleep consultant	0 (0)	87 (100)

Abbreviation: GP = general practitioner.

family members would suffer as lockdowns and/or border closures prevented face-to-face contact—“*I think it's going to be then difficult to actually build that connection, when we do finally see each other in person... they're strangers to them, they just don't have that connection at all...*” Others reported that the challenges caused by the pandemic were such that their family plans had been altered—“*I will not have another baby—the pandemic and isolation has been too hard*”.

Discussion and future directions

This substudy of the pilot BABY1000 longitudinal birth cohort study sought to explore how the pregnancy, postpartum, and parenting experiences of a cohort of parents in Sydney, Australia, were impacted by the COVID-19 pandemic and examine associations between these experiences and state anxiety, as measured by the STAI-6. Participants reported their experiences during the “second wave” of the pandemic in Australia in 2021, following lockdowns in 2020 and 2021, alongside possible additional home isolation due to exposure to contacts with COVID-19, according to public health mandates at the time.

In our sample, more than half of parents scored as having “moderate” or “high” anxiety at the time of measurement on the STAI-6, though the mean was slightly less than what was reported by others using the STAI long form in Poland,⁴³ Greece,⁴⁴ Turkey,⁴⁵ Italy,⁴⁶ and in a multi-national online cohort;⁴⁷ perhaps owing to the lower prevalence, and therefore risk, of COVID-19 in Australia relative to most other countries. STAI-6 scores were not significantly different depending on parity or timing of birth; likely reflecting the different, though similarly impactful, stressors of giving birth and raising young children during pandemic situations. STAI-6 sum scores over 40 were, however, associated with high concern regarding impacts of COVID-19 on child development and feelings of increased loneliness and being overburdened by responsibilities in the home, which, to our knowledge, have not been previously reported.

Whilst there was a far lower prevalence of COVID-19 in Australia than in other high-income countries,¹⁵ as indicated by our sample, qualitative feedback from our questionnaires and FGDs indicated that

the unprecedented circumstances presented by the pandemic still influenced the mental health, family lifestyles, social support, and experiences of healthcare of women and families. Whilst some felt the pandemic facilitated positive changes, including strengthened family relationships, enhanced capacity for exercise, and increased flexibility in accessing healthcare, feelings of grief, frustration, and, at times, overwhelming stress were predominately discussed when parents reflected on their experience.

The pandemic impacted the self-reported mental health of many participants, and this was often attributed to a perceived lack of social support

The perinatal period is a time of increased risk for mental illness,⁴⁸ particularly when additional vulnerabilities are present, e.g. poor social support, low socioeconomic status, history of mental illness, pregnancy complications, and other stresses.^{49,50} The COVID-19 pandemic compounded pre-existing vulnerabilities and was associated with exacerbated mental health difficulties or onset of mental illness in pregnant or postpartum women.^{51,52} In our sample, a lack of social support for families and comments relating to feelings of stress or poor mental health represented 39% and 26% of all comments, respectively. Although self-reported, several participants in our cohort discussed diagnoses of mental health illnesses they believed to be associated with the pandemic, and many described what they felt was a highly stressful, and often unsupported, period of their lives. These findings are important, since stresses may continue to affect parents and children—especially for families with additional vulnerabilities—and may impact future generations.⁵³

Our results also indicated that COVID-19 containment measures including social isolation were associated with feelings of grief in “missing out” on expected experiences and support from family, friends, and the wider community during the perinatal period and an increased sense of loneliness. Importantly, our study also showed a highly significant association between state anxiety (as measured by STAI-6 scores) and loneliness. Feelings of loneliness during the pandemic were similarly reported by women in a large cross-national

study⁵⁴ and in separate reports from other countries including Canada,⁵⁵ the UK,⁵⁶ and Italy.⁵⁷ Loneliness has previously been associated with depressive and anxiety symptoms in pregnant and postpartum women during the COVID-19 pandemic,⁵⁸ but, as has been consistently reported prior to the pandemic and across other populations,⁵⁹ perceived social support is protective against mental ill-health.^{52,60} Since social support is an important determinant of wellbeing during pregnancy and early postpartum and can buffer the effects of maternal stress on infant neurodevelopment,⁶¹ investment in protecting the mental health of parents (particularly for those most vulnerable) by strengthening systems of social support or proposing innovative and acceptable alternatives is imperative.

Impacts of COVID-19 restrictions on family functioning and relationships were mixed

The COVID-19 pandemic was described as a “perfect storm” that affected all aspects of family life;⁶² however, increased time together at home during the pandemic has also been described as a “blessing”, “relief”, and an opportunity to “bond”.^{19,55,63} In the immediate postpartum period, restrictions on visitors in hospital and at home were reflected to have strengthened bonds between immediate family members, supported breastfeeding initiation, and improved capacity to recover from childbirth without “hosting” visitors.^{64,65} COVID-19 restrictions often spearheaded new routines and traditions, including exercising outdoors, cooking, completing puzzles, and playing games. For others, their experience of the COVID-19 pandemic was associated largely with less health-promoting behaviours. Screen time in particular was almost universally reported to have increased in both adults and children,⁶⁶ and time engaging in physical activity reduced.^{67,68} Since established lifestyle habits in early life are difficult to change, public health initiatives should focus on the family unit and wider community in order to support physical activity and associated health benefits for children and families now and into the future.⁶⁷

Participants in our study and others¹⁹ reported a sense of loss and instability due to altered usual family routines and activities as a result of COVID-19 restrictions, including both “formal” domains (e.g. employment, education, childcare, religious traditions, and extracurricular activities) and “informally” (e.g. family celebrations and holidays, and closures of playgrounds and other public spaces). For many parents (disproportionately women in heterosexual relationships), these changes also meant that time spent on unpaid labour in the home increased dramatically.^{69,70} More than half of our participants felt burdened by additional responsibilities at home during the pandemic, and this was associated with “high” state anxiety. Another Australian study of working parents reported that the pandemic was associated with worsened satisfaction with work–family balance and shared household responsibilities.⁷¹ For families experiencing additional difficulties including socioeconomic disadvantage, financial insecurity, and pre-existing mental health concerns, impacts of the pandemic on family wellbeing and relationships were often exacerbated.^{20,72}

Notably, some BABY1000 participants reported that the challenges caused by the pandemic and impacts on their families altered plans to have further children. These decisions have considerable effects on families, communities, and populations. The “Families in Australia Survey” (2021) found that close to one-fifth of women under 40 years of age altered intentions to have a first or additional child as a consequence

of COVID-19, though only 5% of women indicated this intention to not have further children.⁷³ Ongoing research is required to understand the longer-term impacts of the pandemic on families, including decisions regarding family planning, in Australia and elsewhere.

Acceptability of changes to healthcare varied according to individual and family preferences

The COVID-19 pandemic was a catalyst for numerous changes to health service models of care at a rapid pace and scale, both in Australia and globally. Whilst not new, the rapid adoption of “telehealth” models of care during the pandemic, together with cancelled or condensed appointments, represented substantial changes to usual care. These changes to healthcare access and delivery led to uncertainty and disruption for some participants in the BABY1000 pilot study, as has been described by other studies in women receiving maternity care in Australia and globally.^{24,74}

Although the cancellation of appointments or significant changes in pregnancy care delivery affected less than a quarter of participants, physical distancing requirements, scaling back of services provided, and limitations on the presence of support people during antenatal scans, appointments, and/or in hospital settings after birth were frequently raised by participants as difficult to understand, accept, and adapt to. Whilst Australian women strongly prefer to receive trusted information from healthcare professionals relating to preconception and pregnancy health,⁷⁵ many in our sample felt they needed to access information elsewhere and advocate for their maternity care choices. Whilst maternity care could not be “delayed”, the impact of changes to usual care during pregnancy, childbirth, and postpartum during the pandemic is particularly important since the experience of birthing mothers, alongside their partners and families, can have substantial physical and mental health implications both at the time and for many years afterwards.^{76–78}

Parents in our substudy also reflected on barriers to seeking and/or accessing healthcare for themselves and/or their children during the COVID-19 pandemic. Pre-existing barriers affecting postnatal care⁷⁹ were amplified and participants in our study and in other studies^{80–82} reported actively avoiding or being highly anxious when attending healthcare settings for fear of contracting COVID-19. Whilst telemedicine was often viewed as helpful in offering greater flexibility around other commitments and overcoming challenges in accessing care, especially with children, many parents felt telehealth was suboptimal compared to usual care. The mixed experiences and reflections reported in our study and in other studies²⁷ highlight the importance of sensitive, flexible, and family-centred care to meet the preferences, needs, and values of individual families, where possible.

Parents were concerned about long-term impacts of the pandemic on children and families

Whilst there is considerable variability depending on geography, the COVID-19 pandemic and associated changes to children’s lives around the world had both immediate and likely longer-term impacts on children’s health and development,^{83–85} and relationships, with extended family and friends.^{19,86} Participants in our substudy and other Australian research¹⁹ reported concerns relating to potential long-term negative effects of social isolation on their children’s social and linguistic development. Similar concerns were described by parents who contributed to the “Babies in Lockdown” report in the

United Kingdom,⁵⁶ where high parental stress, an inability to socialise with other babies and children, a lack of structured early education, and restricted access to health professionals were feared to delay access to early intervention and/or impact social development. Participants in our study and in other studies^{19,86} also felt that online communication was a necessary but inferior replacement to face-to-face contact when establishing and/or maintaining relationships with extended family members. Ongoing research will be required to examine these concerns and their possible outcomes on families in the short and long term.

Limitations

Whilst it provides valuable insight into the experience of families in Sydney during the COVID-19 pandemic, this substudy was not without limitations. BABY1000 participants generally had healthy pregnancies, were more highly educated and slightly older than national birthing population data.⁸⁷ The small sample size of this substudy enabled in-depth data collection; however, it was not large or diverse enough to stratify results according to potential vulnerabilities. It is widely acknowledged that socioeconomic status and ethnicity are inextricably related to access to social support and healthcare and mental health outcomes.⁸⁸ These disparities were also likely to have been compounded during the COVID-19 pandemic.⁸⁹ Alongside these lower sociodemographic “risks” and owing to Australia’s universal healthcare structure and high COVID-19 containment measures (and therefore relatively low case numbers), generalisability of results to other populations—especially those from diverse social, economic, cultural, and language backgrounds—may be limited. Furthermore, our STAI-6 results represent a snapshot of feelings of anxiety at the time and may have differed substantially if administered at a different time during the pandemic and/or in women exposed to different lockdown requirements. Finally, whilst one father was involved in FGDs, our results do not specifically explore impacts of COVID-19 on caregivers aside from the birthing parent. Previous research has highlighted the negative impacts of the pandemic on partners and support persons receiving maternity care in Australia,²⁵ though further research is needed.

Conclusion

This substudy from the BABY1000 pilot study contributes to the growing literature suggesting that the COVID-19 pandemic and associated public health measures altered, often significantly, the pregnancy, postpartum, and parenting experiences of families. Participant anxiety, as measured by the STAI-6, was highly associated with concern regarding COVID-19 and feeling overburdened and lonely. Whilst the experiences described by participants included some unexpected positives, for many, these were outweighed by negative impacts on mental health, social support, health behaviours, and family relationships. These impacts may have long-term effects on individuals, families, and populations and should be considered when evaluating results from BABY1000 and other family research conducted across the pandemic. Ongoing longitudinal research is imperative to identify potential long-term effects of the pandemic across the life-course (and how these may be modified by other biological, environmental, and social factors), better support families in the short and long term, and plan for public health crises in the future.

Author contributions

AG is the project leader for the BABY1000 study and was involved in study concept and design, funding, implementation and dissemination. AMG designed the substudy online questionnaire and FGD questions, facilitated questionnaire delivery and online FGDs, supported wider study data collection, and draughted this manuscript. SS provided support with qualitative data interpretation and analysis. NK cowrote the pilot BABY1000 study protocol and was responsible for participant recruitment and data collection. All authors read and approved the final manuscript for publication.

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Ethical statement

The BABY1000 pilot obtained ethical approval from Sydney Local Health District (Royal Prince Alfred Hospital zone) Review Committee (protocol no. X170019). This substudy received additional ethics approval to include questions relating to the impact of the COVID-19 pandemic to an online survey and to add focus group discussions. All parents who agreed to participate were provided a detailed information sheet and provided written consent beforehand.

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Conflicts of interest

All authors declare that they have no competing interests.

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Appendix A Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.anzjph.2024.100127>.