



Association of continuity of carer and women's experiences of maternity care during the COVID-19 pandemic: A cross-sectional survey

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ABSTRACT

Background: Recent research highlights the impact of the COVID-19 pandemic on maternity services, although none to date have analysed the association between continuity of carer and how women felt about the changes to pregnancy care and birth plans.

Aim: To describe pregnant women's self-reported changes to their planned pregnancy care and associations between continuity of carer and how women feel about changes to their planned care.

Methods: A cross-sectional online survey of pregnant women aged over 18 years in their final trimester of pregnancy in Australia.

Findings: 1668 women completed the survey. Most women reported at least one change to pregnancy care and birthing plans. Women receiving full continuity of carer were more likely to rate the changes to care as neutral/positive ($p < .001$) when compared with women who received partial or no continuity.

Discussion: Pregnant women experienced many changes to their planned pregnancy and birth care during the COVID-19 pandemic. Women who received full continuity of carer experienced fewer changes to care and were more likely to feel neutral/positive about the changes than women who did not receive full continuity of carer.

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Background

The World Health Organization declared a global COVID-19 pandemic in March 2020, resulting in widespread changes in the way health care is provided (World Health Organization, 2020).

Internationally, the pandemic greatly altered public health-care measures including access and delivery of health services (Ness et al., 2021; Ortega-García et al., 2020). Changes included suspension of elective services (Lawson et al., 2021), altered workforce planning and availability (Czabanowska & Kuhlmann, 2021), redistribution of resources, (Shafi et al., 2020) and increased healthcare expenditure (Osman et al., 2021). The constraints of social distancing practices triggered the revision of national pol-

icy and procedures to enable a surge in telehealth services (Rimmer et al., 2020; Spaulding & Smith, 2021).

Changes to women's experiences of maternity-related care included reductions in face-to-face visits, restrictions on support people for ultrasound scanning, labour and birth, and early post-natal discharge (Green et al., 2020; Wilson et al., 2021). The transition to telehealth in the antenatal period and restructuring of clinical practice impaired women's access to their anticipated support systems (Green et al., 2020; Wilson et al., 2021). In severely impacted areas, women experienced reduced access to epidural anaesthesia due to the redeployment of anaesthesia staff (Bamber & Lucas, 2020). Similarly, inhaled nitrous oxide analgesia use was discouraged or discontinued because of infection risk to clinicians (D'Souza et al., 2021). The increased use of personal protective equipment (PPE) by healthcare providers and social distancing led to a reduction in personal contact between women and their caregivers (Green et al., 2020; Rimmer et al., 2020). In the

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United Kingdom, changes to place of birth occurred as midwives providing home birthing services were redeployed to the hospital sectors (Coxon et al., 2020), diminishing access to homebirth services.

In Australia, interest in out-of-hospital birth (at home or at free-standing birth centres) rose as women sought to avoid hospitals (Callander et al., 2021). One study reported approximately 30% of women sought to change their model of care in an attempt to gain greater support and achieve their desired labour and birth experience (Wilson et al., 2021). Privately practising midwives providing homebirth services reported an increase in enquiries and therefore administrative workload yet lacked the necessary access to PPE (Homer et al., 2021).

Antenatally, women were mandated to attend appointments alone. Support was circumscribed in the intrapartum and postpartum periods with birthing women restricted to one support person for their hospital birthing and postnatal journeys (Wilson et al., 2021). Limitations on women's support are of great significance when considering the social nature of childbirth (Olza et al., 2020) and the positive outcomes afforded by continuous support (Bohren et al., 2017; Nystedt et al., 2014). Breastfeeding support has also been affected by limited access to breastfeeding and lactation services (Brown & Shenker, 2021). Research has compared maternity care providers and women's experiences of receiving care during the pandemic and found women felt distressed, alone and had higher levels of anxiety in relation to COVID (Bradfield et al., 2021; Sanders & Blaylock, 2021; Wilson et al., 2021). Continuity of carer is known to confer multiple benefits to pregnant women which may help to mitigate the disruption childbearing women are experiencing due to the changes generated by the COVID-19 pandemic. To date, no research has reported the association between continuity of carer and women's experiences of care during the COVID-19 pandemic.

Continuity of carer has been defined as a relationship between a person and their care provider. The person knows their care provider by name and has come to trust the care provider (Saultz, 2003).

The person's relationship with the care provider centres on their health needs and the provider assumes responsibility for the person's overall health care (Saultz, 2003). Continuity of carer in maternity services provides a woman with a primary or named health professional (midwife or doctor) who provides most of the woman's antenatal, intrapartum and postnatal care and enables the woman to build a relationship of trust with her care provider. Midwife-led continuity of carer models have demonstrated considerable benefits to mothers and babies (Sandal 2016) and are defined as care provided by one midwife or a small group of midwives through a woman's pregnancy, birth and the early parenting period (Sandal, 2016).

The Australian context

In the Australian context maternity care is provided using a range of models and is summarised in Box 1. Australia has a universal health insurance scheme (Medicare) and eligible pregnant women can access maternity care at no additional cost through Medicare. Around 30% of Australian women will choose to use private health insurance to pay for an obstetrician for pregnancy care, birth and postnatal visits (Commonwealth of Australia, 2009). In the pre-COVID era most women gave birth in a public hospital (75%) and just under a third chose to birth in a private hospital with an obstetrician (24.9%). Only a small number of women gave birth in a birth centre (2.3%) and even less, (0.3%), gave birth at home (Australian Institute of Health and Welfare, 2018). Publicly funded homebirth through Medicare is limited. Some women

employ a privately practising midwife to provide care including homebirth (Catling et al., 2014).

Our research addressed two distinct aims. The primary aim was to investigate the association between model of maternity care and pregnant women's levels of stress, anxiety and depression during the COVID-19 pandemic in Australia (Davis et al., 2023). The secondary aim, addressed in this paper, was to describe women's self-reported changes in their pregnancy care and birth plans and any association between continuity of carer and how women felt about those changes.

Methods

This study used a national cross-sectional online survey. Cross-sectional surveys measure data at distinct points in time (Whitehead et al., 2020). The study's design was reviewed by academic midwives with specialist expertise in survey design for perinatal populations. Access to the Qualtrics (Qualtrics, 2005) survey platform was provided through a license held by the administering university. Qualtrics uses encryptions for all transmitted data and holds security certification reflecting industry standards. Surveys on this platform are accessibility on most electronic devices. Settings that would allow multiple responses by participants were not enabled ensuring that each response corresponded to a pregnant woman.

Participants and recruitment

Women aged 18 years or over who were in their third trimester of pregnancy and receiving maternity care in Australia were the targeted population. This gestational period was selected to ensure participants had adequate time during their pregnancy to experience their maternity care. Postpartum women were not included in the sample as the primary aim was to report women's mental health status in pregnancy. A screening question on initiation of the survey highlighted this to potential participants.

An advertising flyer was created with a QR code linked directly to the online survey. The flyer was distributed via social media and the researchers' networks. Voluntary participation entailed undertaking the anonymous survey once. Participant access to the web link could occur at any time, on their chosen device. Responses were anonymous and the researchers had no direct contact with the participants. The survey was open for seven months from July 2020 to January 2021 when the target sample size was reached. Social media postings commenced in July 2020 and continued with monthly postings and a targeted, paid Facebook campaign until January 2021. The sample size was calculated to address our first aim (Davis et al., 2023), to investigate predictors of anxiety, stress, and depression in Australian pregnant women during the COVID-19 pandemic. The sample was set at 1584 which would allow us to demonstrate a difference in perinatal anxiety and/or depression in women experiencing continuity of carer compared to those not, with 95% confidence level and 80% power.

Data collection

The survey questions were based on a review of the available literature and the research group's professional expertise. Questions related to: demographic characteristics (age, ethnicity, level of education, state/territory of residence, relationship status), pregnancy-related data (parity, gestation), models of maternity care, continuity of carer, changes to pregnancy care and birthing plans and perceptions of these changes.

Models of maternity care

The Maternity Care Classification System (MaCCS) was used to identify model of care (Box 1).

The descriptors for each model were provided in a list and participants were asked to choose the model that best applied to them. Participants were provided with an 'other' option to specify an alternative model if the available choices did not apply to them.

Continuity of carer

Continuity of carer was defined as care provided by the same, named health professional (midwife or doctor) over the full length of the episode of care even when other caregivers may be involved (Donnelly et al., 2016). Descriptions of continuity of carer in the survey included the following: full (continuity of carer in antenatal, labour and birth and postnatal), partial (continuity of carer in at least one of antenatal, labour and birth or postnatal), and no continuity of carer. Participants chose the description best depicting the continuity of carer they were experiencing (and anticipated) in their maternity care arrangement. Participants were provided with an 'other' option with a 'please specify' if the available choices did not apply to them and also with an option of "unsure". Participants had not yet experienced labour and birth and the postnatal period, therefore, chose the option that best matched what they anticipated. We argue that their expectation for their care going forward was of significance with potential to impact their mental health wellbeing.

Changes to pregnancy care and birthing plans

Changes to pregnancy care and changes to birth plans were identified based on a review of the available literature related to maternity care in the pandemic and the researcher's knowledge of the common changes women were experiencing. From a list of the most common changes, participants were asked to indicate those they had experienced. A drop-down text box provided a mechanism for participants to indicate other changes they had experienced that were not included in the list.

Feelings

How participants felt about changes to pregnancy care and birth plans was established by two questions; 'How do you feel about the changes to your pregnancy care?' and 'How do you feel about the changes to your birth plans?'. To enhance participant engagement and for ease of use, a five-point scale represented by a smiley face icon was used. The descriptors were: very unhappy (1), unhappy (2), neutral (3), happy (4), very happy (5). To enable analysis the responses were collapsed into three categories and labelled - negative (1 & 2), neutral (3) and positive (4 & 5). In logistic

regression analyses, neutral and positive were combined to form a binary: negative and neutral/positive.

Response formats in the survey included multiple response, fixed choice and five-point rating scales. The survey questions were reviewed for face and content validity. Pretesting of the survey for readability, acceptability and time taken to complete was undertaken with a small group of women prior to national distribution. Data from this group of women were not included in the results.

Ethics

Ethics approval was provided by the participating universities' accredited Ethics Committees (Project ID: 4696 and ETH20-4977). The pre-ambles to the questionnaire in the online platform provided participant information including what was involved in the survey and the benefits and risks of participating in the survey. Contact details of the researchers were provided for potential participants to discuss any aspect of the study. The initial survey questions established eligibility, followed by consent. Only eligible and consenting participants were able to progress with the remaining questions. The pre-ambles to the questionnaire provided contact details for freely available mental health services. Data were managed and stored securely, accessible only to the research team approved in the ethics approval.

Data analysis

Participant responses to the survey questions were analysed using the Statistical Package for Social Sciences (SPSS) v26 (2019). Forced responses were used minimally in the questionnaire; therefore, denominators for responses to some questions vary.

Descriptive statistics appropriate to the level of measurement were generated. Frequencies expressed as percentages were used to describe categorical data. Means and standard deviations were generated for continuous variables. Logistic regression was used to examine the relationship between binary and categorical variables and are presented with their 95% confidence intervals. A one-way ANOVA with post hoc Tukey test was used to describe relationships between continuous variables and categorical variables. All significance levels were set at $p = .05$.

Results

Demographic profile of participants

Two thousand and sixty-seven women commenced the survey with 1668 women progressing beyond the demographics section. The demographic description of participants is provided in Table 1. For the 399 women who did not progress beyond the demographics section, analysis revealed no significant differences on key characteristics including age, level of education, highest qualification and parity.

Box 1

Maternity care classification system - Major models of care (Donnelly et. al. 2019)

The Major Model Categories from the Maternity Care Classification System.

Private obstetrician (specialist) care
Private midwifery care
General practitioner obstetrician care
Shared care
Combined care
Public hospital maternity care
Public hospital high-risk maternity care
Team midwifery care
Midwifery Group Practice/caseload care
Remote area maternity care
Private obstetrician and privately practising midwife joint care

Table 1
Demographic of participant

Characteristic	n=1668 Mean (SD) / n (%)
Age	30.77 (4.52)
Ethnicity	
Aboriginal and Torres Strait Islander	38 (2.3)
White/European	1462 (87.6)
Middle Eastern	13 (0.8)
Asian (East, South Eastern and Eastern)	67 (4.0)
Maori and Pacifica	19 (1.1)
Other	69 (4.2)
Education	
Nil	8 (0.5)
School Cert	60 (3.6)
Higher School Cert	163 (9.8)
Trade /Certificate/Diploma	490 (29.4)
Bachelors or higher degree	919 (55.1)
Other	28 (1.7)
State	
WA	63 (3.8)
SA	89 (5.3)
VIC	593 (35.6)
ACT	93 (5.6)
NSW	562 (33.7)
QLD	218 (13.1)
TAS	34 (2.0)
NT	10 (0.3)
Missing	6 (0.4)
IRSAD decile	
1	104 (6.3)
2	106 (6.4)
3	105 (6.3)
4	176 (10.5)
5	147 (8.8)
6	190 (11.3)
7	165 (9.9)
8	192 (11.5)
9	252 (15.1)
10	219 (13.2)
Missing	12 (0.7)
Relationship status	
Single	59 (3.5)
In a relationship	1590 (95.3)
Other	19 (1.1)
Parity	
Primiparous	911 (54.6)
Multiparous	756 (45.3)
Missing	1 (0.1)
Gestation	33.45 (3.72)

The mean age of participants was 30.77. The majority were of white European ethnicity (87.6%), in a relationship (95.3%), and more than half (55.1%) were university educated. Half (50%) of respondents resided in postcodes with an Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) in the top three deciles of relative socio-economic advantage. Residents of all states and territories in Australia responded to the survey with most participants residing in Victoria (35.6%) followed by NSW (33.7%).

Model of care and continuity of carer are shown in Table 2. Most participants experienced standard public hospital maternity care (34.4%) followed by General Practitioner (GP) shared care (17.6%).

Participants described their continuity of carer as full (42.8%), partial (21.7%), nil (3.7%), missing data accounted for 3.7% (Table 2).

Changes to pregnancy care and birth plans

Pregnancy care

Women were asked to identify how their pregnancy care changed as a result of COVID-19 from a list of possible changes with 69% (n=1419) of the total sample identifying they experienced at least one change. Women reported fewer (51%), shorter

(48%) appointments and replacement of face-to-face appointments with online/phone contact (73%). Women also reported an inability to have their partner or support person attend antenatal appointments with them (74%). Seventy percent of respondents reported they were not able to attend childbirth education classes (Table 3). Supplementary table 1 provides these data by model of care demonstrating that the top three changes to care experienced by women in the different models of care were similar.

Birth plans

Women were asked to identify whether their birthing plans had changed as a result of COVID-19 with 68% (n=1405) of the total sample identifying they experienced at least one change. Forty-nine and a half percent of respondents identified they were no longer able to have a friend/support person at their birth. Sixteen and a half percent of women reported being offered a caesarean section and 18.1% were offered an induction of labour. Women planned to reduce the time they spent in hospital with 24% planning to go to hospital later in labour and 39% planning to leave hospital earlier. A small percentage of women (3.8%) indicated their planned pain relief options were no longer available (Table 4). Supplementary table 2 provides these data by model of care demonstrating that the top three changes to labour and birth care anticipated by women, in the different models of care were similar.

Participants were able to indicate unavailable pain relief options using a drop-down text box. The options no longer available included birthing/labouring in water and the use of nitrous oxide. Use of the shower when in labour was also restricted.

Place of birth

Women were asked where they were planning to give birth prior to the pandemic. Fourteen hundred and six women responded to this question. The majority had planned to give birth in a hospital (90%), with smaller numbers of women planning to birth in a birth centre (5%) and at home (4%). When asked if their planned place of birth had changed as a result of the pandemic, a majority of respondents (92%, n=1291) reported they had not changed their plans. A total of 78 women did report changing plans, with 42 women now planning to give birth in hospital while 36 women were now planning a home birth. A further 36 women were unsure where they were going to give birth.

Women's feelings about the changes in pregnancy care and birthing plans

Twelve hundred and forty-four women responded to the question about their feelings regarding changes to their pregnancy care. The majority (63%) were feeling negative about the changes they were experiencing, with fewer numbers of women reporting they were neutral (20%) or positive (16%) about the changes.

When women were asked how they felt about changes to their birthing plans, only 734 women provided a response. The majority (69%) felt negative about the changes with equal numbers of women feeling neutral (15%) or positive (15%). There were no significant differences in how women felt about changes to pregnancy care or birthing plans between nulliparas and women who had given birth previously.

Relationship between continuity of carer and women's feelings about changes to pregnancy care and birth plans

Logistic regression was used to examine the relationship between response to changes and continuity of carer with adjust-

Table 2
Model of care and continuity of carer

Model of maternity care	n (%)	Continuity of carer		
		Nil	Partial	Full
Standard public hospital	573 (34.4)	60.3%	22.5%	17.2%
GP shared care	293 (17.6)	40.4%	38.9%	20.7%
Private obstetrician	263 (15.8)	2.7%	13.1%	84.2%
Private obstetrician and midwife joint	58 (3.5)	3.6%	21.8%	74.5%
Private practicing midwife	71 (4.3)	0.0%	5.7%	94.3%
GP obstetrician	25 (1.5)	8.3%	29.2%	62.5%
Employed midwifery team	106 (6.4)	32.7%	19.2%	48.1%
Employed caseload midwife	151 (9.1)	0.7%	11.9%	87.4%
Specialist high risk	57 (3.4)	42.3%	36.5%	21.2%
Combined care	22 (1.3)	27.3%	45.5%	27.3%
Remote	7 (0.4)	57.1%	14.3%	28.6%
Other	42 (2.5)	26.5%	14.7%	58.8%

Table 3
Changes to pregnancy care during COVID

Change	Response				
	n	Yes	No	Unsure	N/A
Partner/support person no longer able to attend appointments with you	1417	1052 (74.2%)	317 (22.4%)	19 (1.3%)	29 (2.0%)
Some face-to-face appointments replaced with phone/online	1418	1027 (72.4%)	359 (25.3%)	9 (.6%)	23 (1.6%)
Not able to attend childbirth education classes	1419	987 (69.6%)	177 (12.5%)	53 (3.7%)	202 (14.2%)
Fewer pregnancy care appointments	1419	718 (50.6%)	519 (36.6%)	158 (11.1%)	24 (1.2%)
Shorter pregnancy care appointments	1417	686 (48.4%)	499 (35.2%)	210 (14.8%)	22 (1.6%)
Change of venue for appointments	1419	405 (28.5%)	873 (61.5%)	80 (5.6%)	61 (0.3%)
Student midwife no longer able to attend appointments with you	1416	278 (19.6%)	414 (29.2%)	152 (10.7%)	572 (40.4%)
Scheduled ultrasound scan delayed	1419	205 (14.4%)	1141 (80.4%)	40 (2.8%)	33 (2.3%)
Scheduled ultrasound scan cancelled	1419	72 (5.1%)	1287 (90.7%)	24 (1.7%)	36 (2.5%)

Table 4
Changes to birth plans during COVID

Change	Response			
	Yes	No	Unsure	N/A
Friend/other support person no longer able to be present for labour & birth (n=1405)	696 (49.5%)	339 (24.1%)	169 (12.0%)	201 (14.3%)
Hope to leave hospital earlier than planned after birth (n=1403)	549 (39.1%)	466 (33.2%)	240 (17.1%)	148 (10.5%)
Hope to go to hospital later than originally planned when in labour (n=1402)	334 (24.5%)	481 (34.3%)	300 (21.4%)	277 (19.8%)
Offered an induction of labour (n=1405)	254 (18.1%)	728 (51.8%)	91 (6.5%)	332 (23.6%)
Offered a caesarean section (n=1405)	232 (16.5%)	805 (57.3%)	53 (3.8%)	315 (22.4%)
Student midwife no longer able to be present for labour & birth (n=1403)	194 (13.8%)	330 (23.5%)	263 (18.7%)	616 (43.9%)
Partner no longer able to be present for labour & birth (n=1404)	60 (4.3%)	936 (66.7%)	274 (19.5%)	134 (9.5%)
Planned pain relief options no longer available (n=1385)	52 (3.8%)	597 (43.1%)	446 (32.2%)	290 (20.9%)
Planned caesarean section brought forward (n=1400)	19 (1.4%)	602 (43.0%)	51 (3.6%)	728 (52.0%)
Planned induction brought forward (n=1404)	16 (1.1%)	634 (25.3%)	75 (5.3%)	679 (48.4%)
Planned induction delayed (n=1405)	13 (0.9%)	641 (45.6%)	75 (5.3%)	676 (48.1%)
Planned caesarean section cancelled (n=1404)	2 (0.9%)	64 (43.5%)	47 (3.4%)	730 (52.2%)
Planned caesarean section delayed (n=1399)	13 (0.9%)	609 (43.5%)	47 (3.4%)	730 (52.2%)
Planned induction cancelled (n=1405)	9 (0.6%)	669 (47.6%)	78 (5.6%)	649 (46.2%)

Table 5
Feeling neutral/positive about changes to pregnancy care and expected birth plans

Factor	OR (unadjusted)	95% CI	OR (adjusted)	95% CI
Pregnancy care				
No Continuity of carer	Reference group			
Partial continuity of carer	1.212	0.864-1.700	1.218	0.864-1.718
Full continuity of carer	2.617	1.979-3.461	2.593	1.951-3.447
Birth plans				
No Continuity of carer	Reference group			
Partial continuity of carer	1.707	0.852-3.418	1.882	1.156-3.061
Full continuity of carer	4.819	2.802-8.286	3.783	2.518-5.683

Table 6
Total changes to pregnancy care by perceived model of carer (n=1364)

Perceived model of carer	n	Mean(sd)	df	F	p-value
No Continuity	443	4.81(2.02)	2	57.93	.001
Partial continuity	304	4.17(2.06)			
Full continuity	617	3.44(2.02)			

Table 7
Total changes to birth plans by perceived model of carer (n = 1345)

Perceived model of carer	n	Mean(sd)	df	F	p-value
No Continuity	438	2.29(1.73)	2	15.93	.0001
Partial continuity	302	1.89(1.68)			
Full continuity	605	1.71(1.49)			

ments made in the analysis for parity, age, gestation, level of education and IRSAD. Results are presented in Table 5 and significant results are presented in bold. Women experiencing full continuity of carer were more than twice as likely to feel neutral/positive about the changes to their pregnancy care and three times more likely to feel neutral/positive about expected changes to birth plans compared to women who had no continuity of carer. Women experiencing partial continuity of carer were more likely to feel neutral/positive about changes to their birth plans than women who experienced no continuity of carer.

Relationship between continuity of carer and total changes to pregnancy care and birth

Changes reported by each woman in the categories of pregnancy care (n=1364) and birth plans (n=1345) were summed to give a total number of changes for each woman. Changes to pregnancy care ranged from none to 12 (\bar{x} 4.04, *sd* 2.13). Changes to birth plans ranged from none to eight (\bar{x} 1.94, *sd* 1.63).

One-way between groups analysis of variance ANOVA was conducted to compare the associations between perceived model of care on the number of pregnancy and birth changes for woman experiencing no, partial and full continuity of carer. There was a significant association between model of care and changes to pregnancy care. Post hoc comparison using the Tukey test indicated the mean score of changes for women who reported experiencing full continuity of carer was significantly different than the mean scores of women who received partial or no continuity of carer (Table 6).

There was also a significant association between model of care and changes to birth plans. Post hoc comparison using the Tukey test indicated the mean score of changes to birth plans was significantly different for women who reported experiencing full continuity of carer compared to women who reported experiencing no continuity of carer (Table 7). There were no significant differences in the mean changes to birth plans between women experiencing partial or full continuity of carer.

Discussion

The aim of this paper was to report the changes women experienced to their pregnancy care and birth plans due to the COVID-19 pandemic and how they felt about these changes in relation to their model of care. Changes included shorter and fewer face-to-face antenatal visits, an inability to have their partner or support person attend antenatal appointments or to attend childbirth education classes. The women who received full continuity of carer were more likely to report they felt neutral/positive about the changes to pregnancy care.

Reducing face-to-face visits aims to reduce the transmission of COVID-19 and the earlier this is implemented the more effective (Ortega-García et al., 2020). However, a one-size fits all rule is problematic because it prevents care being tailored to women's specific needs (Green et al., 2020). In another Australian study into the effects of COVID-19 on maternity care, women and their partners were less satisfied with changes to maternity care when compared to midwives and medical staff (Bradfield et al., 2021) indicating a desire for more individualised care.

The findings from this study demonstrate full continuity of carer results in fewer maternity care changes and leaves women feeling more neutral/positive about any changes. This is significant because other studies have reported women feeling distressed and alone as a result of pregnancy care changes during the COVID-19 pandemic (Wilson et al., 2021). Full continuity of carer as found in midwifery continuity of carer models has been found to mitigate the effects of high levels of stress experienced by women in the context of natural disasters (Kildea et al., 2018). In this study the women who did not receive full continuity of carer were more likely to report feeling negative about the inevitable changes to their pregnancy care, such as reduction in face-to-face visits and inability to attend childbirth education classes. Studies have found childbirth education classes help to prepare women and their support people for birth (Jones et al., 2019; Smyth et al., 2015). Our study suggests women feel less prepared for birth when experiencing changes to their birth plans due to COVID-19 restrictions.

Changes to women's birth plans included a reduction in support people. Continuous support for women during labour has been found to improve the rates of spontaneous vaginal birth, shortened duration of labour, and decrease incidence of caesarean section, instrumental vaginal birth, use of any analgesia, use of regional analgesia, low five-minute Apgar score and negative feelings about childbirth experiences (Bohren et al., 2017). During the pandemic, women were advised they could only have one person with them for labour and birth, forcing women to make difficult decisions in choosing between familial support (partners, parents, siblings) and professional birthing support personnel, such as doulas (Green et al., 2020). A recent study from the United Kingdom found women were generally happy to adopt preventative measures to avoid being infected with a relatively unknown pathogen; however, the widespread changes to services caused distress and emotional trauma to women (Sanders & Blaylock, 2021; Wilson et al., 2021). The women in our study reported the same

restrictions. However, those who received no continuity of carer were more likely to report negative feelings about the changes to their birth plans. The women who received full continuity of carer were more likely to report feeling positive about changes to their birth plan and this may be due to the trusting relationship from a consistent caregiver found in continuity of carer models (Green et al., 2000; O'Brien et al., 2021; Saultz, 2003).

Only a small number of women in this study reported a change in place of birth; however, the percentage of women reporting a planned homebirth (4%) in our study was higher than the national rate of just 0.3 (Australian Institute of Health Welfare, 2021). During the pandemic, privately practising midwives who provide homebirth services reported an increase in enquiries compared to non-pandemic times (Homer et al., 2021). In a recent study, women reconsidered where they wanted to give birth due to fear of contracting COVID-19 and 60% of women who wanted a homebirth could not access a midwife (Homer et al., 2021). Despite these findings, almost all the women in the current study (90%) planned to give birth in a hospital.

Almost a fifth (16.3%) of all women who participated in this survey were offered a caesarean section as part of changes to their birth plan, while other women (18.6%) were offered an induction of labour. It is important to note that we did not explore women's understanding of the reasons for these changes. In the absence of clinical indications, being offered a caesarean section has no known evidence-based benefit and contributes to the overmedicalisation of childbirth (Renfrew et al., 2020). Similarly, induction of labour for non-medical reasons in women without complications in pregnancy has been associated with higher birth interventions such as epidurals, instrumental birth, episiotomy and caesarean sections for women having their first baby, with a higher incidence of neonatal birth trauma, resuscitation and respiratory disorders (Dahlen et al., 2021). From the data collected, it is difficult to tell if the women included in the current study had a low-risk pregnancy and whether obstetric interventions such as caesarean section and inductions of labour were indicated. However, the caesarean section rate has been steadily rising in Australia over the past two decades and is now one of the highest in the world at 35% (Australian Institute of Health Welfare, 2021). Unnecessary caesarean sections have significant short and long-term impacts upon the health of populations (Sandall et al., 2018).

We found women experienced significant changes to pregnancy care and birth plans. Women who received full continuity of carer reported feeling more positive about these changes when compared to those women who received no continuity of carer or partial continuity carer. In the environment of uncertainty and restrictions to maternity care imposed by COVID-19, the improvement in women's positive feelings when receiving continuity of carer is particularly significant.

Strengths and limitations

To our knowledge this is the first study to examine associations between pregnant women's maternity care experiences during the COVID-19 pandemic and continuity of carer. This study drew on a convenience sample recruited by social media and is not necessarily representative of the population of women birthing in Australia. Over half of the participants (55%) in our study had a university degree and this is not representative of the overall Australian population. As stated in the discussion the number of women planning a homebirth in this study (4%) is higher than the recorded Australian average.

The study may also be impacted by response bias with only those more affected, or feeling negative about their maternity care changes, choosing to respond. Changes to care brought about by the COVID19 pandemic may have caused women to move into a

different model of care and this could have been in two directions: from continuity of carer to fragmented models (if continuity of carer was no longer offered in some situations) and from fragmented models to continuity of carer (if women chose to employ a private midwife for example). We did not address this issue in the survey so we are unable to determine how this might have impacted these women's experiences. We did not undertake a separate power calculation for this part of the study as this is a new research area we did not have any data to base the calculation.

All studies and particularly observational studies are vulnerable to biases brought about by confounding variables. While we collected relevant demographic data and information on health history, there may be other variables not captured that contribute to the study findings.

Internationally, there are different interpretations of continuity and whilst the Cochrane review refers to continuity across the continuum of pregnancy, birth and postnatal care, it is still useful to see evidence about continuity of antenatal care. Women in their third trimester of pregnancy were eligible to participate in this study to limit the potential for recall bias to impact responses to questions about their feelings concerning their maternity care. Participants were potentially comfortable responding to the question about changes to pregnancy care as this was something they were currently experiencing. Fewer women responded to the question on changes to birth plans and this may be because these changes were not yet experienced but were anticipated. Further, "changes" to care reflect the woman's own interpretation of what is meant by "change". This may have meant change from previous pregnancy experience, change from expectation, or change from care provided pre pandemic.

Conclusion

The majority of women participating in this survey experienced significant changes to their maternity care due to the COVID-19 pandemic. Most felt negative about these changes. Women experiencing full continuity of carer (most commonly in private midwifery, private obstetric and midwifery group practice/caseload models of care) experienced fewer changes to their antenatal care and birth plans. Furthermore, these women were less likely to report feeling negative about the changes to their maternity care brought about by the COVID-19 pandemic. Models of maternity care that provide continuity of carer may provide a buffer against the uncertainty and disruption the pandemic has brought to maternity services.

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Ethical Statement

Ethics approval was provided by the participating universities accredited Ethics Committees (Project ID: 4696 and ETH20-4977). A pre-ambule to the questionnaire in the online platform provided participant information with contact details of the researchers if the potential participant wanted to discuss any aspect of the study. The first questions of the survey established eligibility, followed by consent. Only those eligible and consenting were able to progress with the remaining questions in the questionnaire. The pre-ambule

to the questionnaire also provided contact details or relevant freely available, mental health services.

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CRediT author statement

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- 2 Annabel Sheehy: investigation, data acquisition, analysis and contributing to writing the manuscript
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- 4 Helen Nightingale: data acquisition, contributing to writing the manuscript
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Declaration of Competing Interest

The authors declare no competing interests relating to this study.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.midw.2023.103761](https://doi.org/10.1016/j.midw.2023.103761).

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