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Changing rules, recommendations, and risks: COVID-19 vaccination decisions and emotions during pregnancy

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As COVID-19 vaccinations rolled out globally from late 2020, rules and recommendations regarding vaccine use in pregnancy shifted rapidly. Pre-registration COVID-19 vaccine trials excluded those who were pregnant. Initial Australian medical advice did not routinely recommend COVID-19 vaccines in pregnancy, due to limited safety data and little perceived risk of local transmission. Advice from local medical authorities changed throughout 2021, however, with recommendations and priority access during pregnancy. In Western Australia (WA), recommendations became requirements as the State government mandated vaccines for some workers, with brief availability of pregnancy exemptions. Through an examination of 10 in-depth interviews with WA pregnant women, we explore their decision-making and complex emotions regarding COVID-19 vaccinations, and how they balanced mandates, recommendations, and shifting considerations and perceptions of risk. Changing recommendations and rules—and media and popular interpretation and communications of these—led to confusion, including for medical professionals. Expectant parents had to negotiate the risks of COVID-19 disease, potential benefits and risks of vaccination, professional and personal costs of vaccine refusal, and interpret mixed medical advice. Our findings can inform the development and communication of public health policies and medical advice, and contribute to our understanding of bodily autonomy, risk, and decision-making beyond the pandemic.

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Introduction

Globally, recommendations for COVID-19 vaccination differed for pregnancy—varying based on the local risk of transmission and as more safety data became available—and shifted throughout 2021 in particular. In Australia, where community transmission was limited at the start of the pandemic, initial government guidelines prioritised those at increased risk of severe COVID-19 disease (predominantly informed by age and underlying medical conditions; initially not including pregnancy) or subject to exposure and transmission (predominantly informed by role or occupation) (see Supplementary Table 1 for rules and recommendations and their sources). Later guidelines recommended vaccination during pregnancy, but pregnancy was also a brief (but not a lasting) criteria for exemption from vaccine mandates (Blyth et al. 2021; Jayasinghe et al. 2023). Furthermore, complex medical advice, media reporting, and popular discussion led some to presume that individuals 'not recommended' to vaccinate at a given time should therefore be concerned about the potential health impacts of a COVID-19 vaccine.

Thus, policy changes were perceived to be abrupt, and there was a high degree of confusion about—and some resistance to—COVID-19 vaccination among those who were pregnant, as well as the medical professionals advising them (Oliver et al. 2022; Ward et al. 2022; Wilson et al. 2022). Such issues are of particular interest in Western Australia (WA), where there was very little community transmission of COVID-19 for the first two years of the pandemic due to strict international and State border closures, quarantine requirements, physical distancing, and intermittent short periods of lockdown where workplaces, public spaces, events, and businesses were closed or restricted from operating in person (McKenzie, 2020).

In this article, we report on a WA study of 10 pregnant women, utilising in-depth, semi-structured interviews to examine a unique 'COVID-zero' context where the aforementioned government policies were highly successful at eliminating the virus in the local community. While there were a few cases of COVID-19 over this period, there was virtually no spread of the virus and cases were quickly resolved; as such, we refer to WA as 'COVID-zero'. As all of our participants identified as women, and most sources we discuss use this language, we largely use the term 'women' throughout this article; moreover, our work and the work we refer to focuses on those who are able to become pregnant and give birth. Among this cohort, we explore feelings about recommendations and mandates for COVID-19 vaccination, including their reflections on advice received from medical professionals, as well as how they negotiated their and their partners' interpretations of recommendations. By showing how women negotiate COVID-19 vaccination during pregnancy, our findings have the potential to inform public health communication, government policy, and vaccination during pandemics. Moreover, we contribute to broader debates about bodily autonomy during pregnancy and the role and effects of mandatory vaccination as we expose how people grapple with medical decision making while embedded in complex and politically charged health terrains.

Literature

Medical recommendations and government rules on vaccination during pregnancy. Accelerating medical knowledge has demonstrated the benefit of maternal vaccination during pregnancy over the past 50 years (Mackin and Walker, 2021). Currently, influenza and diphtheria, tetanus, and pertussis containing (dTpa) vaccines are strongly recommended for all pregnant women, given the clearly demonstrated benefits in reducing morbidity and mortality for mothers and children (Mackin and Walker, 2021; Omer, 2017). Additional vaccines for pregnancy are expected in the coming years (Omer, 2017), with the United States (US) Food and Drug Administration (FDA) approving the first respiratory syncytial virus (RSV) vaccine in August 2023 for use in pregnancy. The recommendations of healthcare providers are a key factor in acceptance of routine vaccines during pregnancy (Danchin et al. 2018; McRae et al. 2022; Taksdal et al. 2013; Wiley et al. 2013). One Australian study found that those who received such recommendations were 20 times more likely to vaccinate against influenza (Wiley et al. 2013).

Yet rates of pregnancy vaccination are low relative to childhood vaccinations. One explanation is that pregnancy vaccinations are almost entirely voluntary. In the 1990s and 2000s, Australia's dedicated program to improve childhood vaccine coverage used incentives for parents and general practice, education campaigns, immunisation days, and other voluntary initiatives. From 2016 onwards, Australia's governments employed stricter mandates to drive high uptake of childhood vaccines on the country's National Immunisation Program (NIP) Schedule, which lists recommended vaccines from birth to old age. 'No Jab, No Pay' and 'No Jab, No Play' policies mandate NIP childhood vaccines through restricting access to government benefits and childcare, with the aim of improving uptake (Attwell and Drislane, 2022; Attwell et al. 2020). The NIP funds vaccinations for influenza and dTpa during pregnancy, but, like other adult vaccines, these are not mandated, except where they are required for some high-risk occupations (e.g., certain healthcare workers in some jurisdictions).

COVID-19 vaccination and pregnancy: Recommendations and rules. During our data collection period, when we collected accounts of and views on COVID-19 vaccination during pregnancy, Australia's vaccine rollout included Oxford-AstraZeneca (henceforth 'AstraZeneca') and Pfizer-BioNtech (Comirnaty, henceforth 'Pfizer')—with supplies of the latter being limited in the early months of 2021. The Moderna Spikevax vaccine became available from September 2021. The rollout, which was led by the Federal government, identified priority groups based largely on age, comorbidities, and occupation. Recommendations, made to Australia's Health Minister to act upon, were provided by the Australian Technical Advisory Group on Immunisation (ATAGI). After reports of blood clots (thrombosis with thrombocytopenia syndrome (TTS)) emerged following the AstraZeneca vaccine, ATAGI recommended that those under aged 50 years, and later 60, preferentially receive Pfizer vaccine, given low disease incidence at the time. This limited access and attuned people towards safety concerns (Carlson et al. 2022).

Meanwhile, Australian recommendations and rules for pregnancy vaccination varied during 2021. On February 24th, 2021, as vaccines were first becoming available, ATAGI advised that, in the setting of low community exposure, pregnant women would need to assess their risk, with vaccination not routinely recommended for them (see Supplementary Table 1). On the 10th of March, the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) used subtly different words to reinforce the same message. On the 9th of June, 2021, in collaboration with updated guidance from medical bodies in Australia and internationally, Australian government advice was adjusted so that pregnant women *were* recommended for vaccination, due to greater risk of severe impacts to themselves and/or their fetus/newborn from a COVID-19 infection while pregnant (Giuliani et al. 2022). By this time, vaccinations had been administered to recipients worldwide who were unaware they were pregnant, or following recommendations

by local authorities (either due to countries' high disease burdens, or because recipients were essential workers); studies of their healthy newborns contributed to consensus that the vaccines were safe in pregnancy (Dick et al. 2022; Shimabukuro et al. 2021).

However, due to vaccine shortages in mid-2021, it was difficult to source vaccines in Australia (McKenzie and Attwell forthcoming). This remained the case until pregnancy became a priority classification on the 23rd of July, 2021. Even then, uptake continued to lag: one WA study found that, from September to October 2021, more than half of the pregnant women surveyed had not yet received *any* COVID-19 vaccine. That study highlighted the importance of medical recommendations: more than a quarter of participants had not received any medical advice on the matter (Ward et al. 2022; see also Dahlen et al. 2023). This came at a time when nearly 80 percent of WA people over the age of 16 years had received at least one dose (Australian Government Department of Health and Aged Care, 2021).

Building on public support for vaccine mandates for routine childhood vaccines (Smith et al. 2019; Trent et al. 2019) and COVID-19 vaccines (Smith et al. 2021), Australian States and Territories mandated COVID-19 vaccines in 2021 and 2022. The stated aim was to promote high vaccine coverage and protect key public functions and industries (see Supplementary Table 1). Public space mandates required proof of vaccination to access some entertainment, hospitality, and healthcare settings (Attwell et al. 2021). On the 20th of April 2021, the WA government required some industries to mandate COVID-19 vaccination for their workers to keep their jobs. Over time, more industries were mandated, and, on the 20th of October, large-scale occupational vaccine mandates were announced, covering 75 percent of the WA workforce (McGowan and Cook, 2021) (see Supplementary Table 1).

Medical exemptions to these mandates were initially available for pregnancy via a temporary Medical Exemption on a Federal government form. This form, which could only be completed and submitted by a restricted number of medical professionals, was already in use for childhood vaccine mandates; authorities added criteria to cover COVID-19 vaccines in pregnancy early in the rollout. The exemption was subsequently removed on the 13th of September 2021, however, exemptions approved before this date remained in place.

Thus, in WA, the move from COVID-19 vaccines *not being routinely recommended* during pregnancy (and exempted from mandates) to them being *mandated without exemption* occurred within a relatively short period of time. These changing rules and recommendations—and the varying ways they were interpreted—fueled complex understandings, emotions, and decisions about whether to vaccinate.

Pregnancy, autonomy, and 'risky' vaccination. Social scientists and public health experts have long examined medical decision-making during pregnancy (Nieuwenhuijze et al. 2014), including regarding vaccination (Ballif, 2023; Celikel et al. 2014; Taksdal et al. 2013). Ballif (2023) argues that scholars often bifurcate the stages of the human reproductive process—conception and parenting—yet recent work emphasises how identifying as a parent can precede fertilisation and pregnancy (Franklin, 2013; McKenzie, 2022), with the potential to impact vaccine decision-making (Danchin et al. 2018). Other scholars have argued that using 'paternalistic' risk-benefit calculations as the basis for recommendations can stymy new vaccine development by excluding pregnancy, and that alternative approaches are needed to think through the beneficiaries of pregnancy vaccinations (Chamberlain et al. 2017, p. 452; see also Verweij et al. 2016). For instance, those who are pregnant may wish to vaccinate themselves where a vaccine offers little benefit to them but substantial benefit to their infant, as is the case with pertussis-containing vaccines. Rather than the current focuses on autonomy, risk, and consent, (Chamberlain et al. 2017: 452) centre agency, autonomy, and the 'ability to decide to take preventive action against a threat to her child's life or welfare' (Chamberlain et al. 2017, p. 452) as part of an 'interests-based' approach.

Questions about autonomy—rooted in feminist scholarship on bodily autonomy and choice—have been central to many ethical and practical discussions of COVID-19 vaccination during pregnancy. Pregnancy was an exclusion criteria in trials (Pramanick et al. 2021), which raised issues regarding the vaccines' suitability, the risks associated with exclusion (given greater vulnerability to COVID-19 disease), and the negative implications for the bodily autonomy of individuals who *wanted* to be involved (Farrell et al. 2020). In Australia, issues of bodily autonomy and choice arose especially in relation to COVID-19 vaccine mandates and changing medical recommendations: how could parents remain informed if recommendations kept changing? And did mandates threaten their bodily autonomy?

During the pandemic, changing recommendations about COVID-19 vaccinations in pregnancy led Minkoff and Ecker (2021: 479) to argue for 'shared decision making', which complements the 'interests-based' approach described above. Principles of shared decision-making informed COVID-19 vaccination guides prepared by Australian technical authorities (Australian Government Department of Health and Aged Care, 2023). Yet shared decision-making presumes that physicians and midwives will hold favourable views on COVID-19 vaccination in pregnancy (informed by the most recent medical advice), and that their communications will elicit informed, autonomous consent. In a rapidly changing health terrain, with multiple sources of advice and no immediate risk of COVID-19 infection in WA during 2021, expecting maternity care professionals to enthusiastically recommend COVID-19 vaccinations to those in their care becomes more difficult.

Our article examines the previously unexplored terrain of COVID-19 policy, medical recommendations, and pregnancy vaccination. These areas are highly relevant beyond the COVID-19 pandemic—when vaccination and vaccine mandates became subject to largescale public scrutiny—as new childhood pregnancy vaccines such as the aforementioned RSV vaccines are continually being tested and rolled out, and future pandemics (and thus pandemic vaccinations) are widely predicted. Our findings raise important points related to science communication, vaccine mandates, vaccine decision-making, and bodily autonomy in a context of rapidly shifting scientific development. In this context, it is crucial to understand how information could be (mis)communicated and interpreted by pregnant women and medical providers during the COVID-19 pandemic, how problems arose as government and medical recommendations were quickly developing, and the impact of mandates and exemption policies.

Methods and participants

Research methods. The findings we outline here draw on 10 in-depth, semi-structured interviews with pregnant women conducted by authors LM and SC between March and December 2021. The interviews were part of a larger project, *Coronavax: Preparing community and government for COVID-19 vaccination*, for which ethics approval was received through Western Australia's Child and Adolescent Health Services (CAHS) Human Research Ethics Committee (RGS0000004457) (Attwell et al. 2021). The overall project examined the COVID-19 pandemic and vaccinations in the State of WA, through over 200 interviews

Table 1 Participant demographics and vaccination statuses.

Characteristic	Number (%)
Identified as female	10 (100)
Age group (years)	
25–29	1 (10)
30–34	4 (40)
35–39	3 (30)
40–44	2 (20)
Comorbidities	1 (10)
Previously had children	6 (60)
Owned home	9 (90)
Highest level of education	
Year 12 or equivalent	1 (10)
Undergraduate university degree	4 (40)
Postgraduate university degree	5 (50)
Born in Australia	8 (80)
English spoken at home	10 (100)
Religion	
No religion	7 (70)
Christian	3 (30)
Postal Area (POA) Index of Relative Socio-economic disadvantage (within state)	
1–3	2 (20)
4–6	1 (10)
7–9	6 (60)
10	1 (10)
Interviewed prior to removal of temporary exemption for pregnancy	5 (50)[a]
Received/intending to receive vaccine during pregnancy when eligible	5 (50)[b]
Previously refused vaccinations for themselves/ their children	2 (20)

[a]As reported by interviewees themselves.
[b]One of these had not been pregnant at the time of her first vaccination with Pfizer, and had been unaware that she was pregnant for her second vaccination. After learning of her pregnancy she had spoken to her GP and been reassured about the safety of the COVID-19 vaccination, however, and was planning to receive her third (booster) shot while pregnant.

with a series of key participant groups—including pregnant women, parents, and a number of occupational groups—in addition to social media analysis and group discussions with State and Federal government policymakers.

Interviewees were recruited through brochures, posters, social media, word-of-mouth, radio, and newspapers. They were directed to an online pre-screening survey on the online quantitative data collection and analysis software, REDCap, where they provided contact and demographic information, including on whether they were currently or soon to be parents. Overall, 18 pregnant women volunteered to be interviewed. We interviewed 10, with the remaining eight either dropping out, birthing before the scheduled interview, or lost to follow up. We did not have due date information for all participants, and some may have been too early on in their pregnancies to have encountered detailed medical advice on COVID-19 vaccination.

Interviews were conducted online or over the phone and lasted between one and two hours. Interviewees read an information sheet and signed a consent form in advance of the interview. They received $20 gift cards for their participation. Interviewees were asked about their experiences of the pandemic and vaccination; their and their partners' views on COVID-19 and other vaccinations, particularly in light of their pregnancies and changing health recommendations; as well as government health policies and how they accessed vaccine information.

We audio recorded interviews and transcribed them using the online service *Otter* before sending to a professional transcriber to be finalised. LM thematically analysed interviews using NVivo 20, including content from additional follow-up emails and conversations, developing inductive codes though iterative and reflexive analysis. Themes included concerns about COVID-19; thoughts on COVID-19 vaccination during pregnancy; practical issues regarding vaccine access or exemptions to mandates; thoughts on fertility and vaccination; discussions of medical advice or research; references to the WA context; and emotions regarding vaccination and non-vaccination, including feelings of anxiety, fear, risk, safety, security, or protection. We use pseudonyms for interviewees and removed any sensitive or identifying information from transcripts.

Participants and research context. Interviewees were aged 29 to 42 years (Table 1). At the time of their interviews, three had received a COVID-19 vaccine, but one had not known she was pregnant at the time. A further two planned to be vaccinated as soon as they could access vaccines (Table 2). Three were waiting until later in their pregnancies, or after giving birth, and one wanted to be vaccinated but her husband opposed it. Finally, one did not want to be vaccinated at all, but said she would consider it when returning to work, only if still mandated.

Interviewees were largely highly educated, born in Australia, and owned their own homes (Table 1), resembling middle-class groups globally where there are concerns around vaccine hesitancy, and on which much research on parents' non-vaccination of children has been conducted (Attwell et al. 2018; Çelik et al. 2021; Howell et al. 2022; Reich, 2016, 2020; Sobo, 2015; Wiley et al. 2020). They were employed in a range of industries, as well as being unemployed, on maternity leave, and performing domestic and care duties. Six already had children, and two had previously refused vaccinations for themselves or their children, although all had received the recommended routine vaccines (influenza and dTpa) during their pregnancies. Interviewees were dispersed across the Perth metropolitan area.

Findings

Overall, interviewees were acutely aware of medical recommendations regarding COVID-19 vaccination and pregnancy, often referencing recent advice from professional bodies, emergent research, and detailing their conversations with medical professionals. They were largely willing to hear advice from medical professionals and scientists, yet did not always follow such advice. While many had been advised to vaccinate, GPs and other medical professionals also regularly advised waiting until after pregnancy, regardless of the official recommendations, often referencing the lack of COVID-19 cases in WA. Interviewees' families and partners also played a significant role in their decision making, which was framed in terms of balancing risks and benefits, and was discussed in emotional terms.

Faith in medicine: Certainties about medical advice and research. Half of our interviewees had either received COVID-19 vaccinations whilst pregnant or were actively seeking them. These interviewees saw vaccination in highly favourable terms, and two had gone ahead despite receiving mixed or discouraging medical advice. Maggie had received varying advice from the same obstetrician, while Carmen said 'I probably have had more pressure from the midwives' in her (medical) workplace to vaccinate, but not from her obstetrician or GPs (Table 2).

Forty-year-old Hayley was particularly notable amongst this group of enthusiastic acceptors:

> I thought it's very good science, it's such a massive sample size now, like, two hundred million people have had it.

Table 2 List of participants and COVID-19 vaccination status at time of interview.

Pseudonym	Age (years)	Month interviewed in 2021	Vaccination status[a]	Eligibility	Recommended by medical professional/s	Vaccination intent	Subject to mandate
Hayley	40	March	Unvaccinated	Eligible	Vaccinate during pregnancy	Seeking vaccination during pregnancy	No
Sarah	35	March	Unvaccinated	Potentially eligible[b]	Not yet discussed	Will seek vaccination when recommended	No
Sara	31	July	Unvaccinated	Eligible	Wait until after birth	Willing to vaccinate after birth, possibly when breastfeeding	No
Lindy	42	October	Unvaccinated	Eligible	Vaccinate during pregnancy	Willing to vaccinate after birth, possibly when breastfeeding	No
Claire	35	October	Unvaccinated	Eligible	Vaccinate during pregnancy	Willing to vaccinate later in pregnancy	No
Carmen	29	October	Unvaccinated	Eligible	Mixed advice (obstetrician recommended between pregnancies not during; GPs supported exemption; midwives suggested vaccinating)	Unwilling to vaccinate before birth, may vaccinate in order to return to work	Yes but obtained exemption
Tara	34	November	Unvaccinated	Eligible	Vaccinate during pregnancy	Contentious - husband hesitant, she is willing to vaccinate	No
Alison	35	December	Vaccinated	Eligible	Wait until after birth	N/A	Not when vaccinated
Zaara	33	December	Vaccinated	Eligible	Vaccinate during pregnancy	Unaware she was pregnant when vaccinated	Not when vaccinated
Maggie	32	December	Vaccinated	Eligible	Mixed (obstetrician advice changed based on WA outbreak of Delta variant)	N/A	Not when vaccinated

[a]"Vaccinated" refers to having received at least one dose at the time of the interview.
[b]Was eligible based on her occupation but currently on maternity leave.

> Even as a pregnant person I'm prepared to get it. Some guidelines said not to, and then some new ones came through, I think it was last Wednesday, saying that the benefits outweigh the risk and that twenty thousand in the US have had it. I was like, great. And you have other vaccines while you're pregnant, you have the whooping cough one and the flu one. It's not like it's unchartered territory.

Hayley worked in residential aged care as a quality and compliance manager, and, because she belonged to the priority group of 'aged care workers', was eligible for vaccination when we interviewed her in March 2021. Hayley was due to give birth in June and had two other young children. Her workplace was due to receive their vaccinations a few days after we spoke. Despite there being no strong recommendation to vaccinate during pregnancy at the time, she asked her obstetrician to write a letter of support, in case, as a visibly pregnant woman, 'they didn't want to give it to me'.

Hayley spoke of COVID-19 vaccination as a means of protecting her infant, saying she was glad 'the baby will be protected 'cause I know kids can't have the vaccine, the baby will hopefully get some antibodies to the placenta'. We followed up with Hayley shortly after her interview and she confirmed that she been vaccinated. Similarly, Alison spoke in terms of protection, presenting vaccination as 'the best way to protect myself and then my baby and my child and my husband and then everyone else, but primarily those'.

Thirty-five-year-old Alison, who was vaccinated when we interviewed her in December 2021, and was due to birth her second child in February 2022, also spoke about how she had initially received a medical recommendation not to vaccinate. This was discussed in terms of 'risk' and 'fear':

> When I was referred by my GP and I asked her about the COVID vaccine, now this is back in June [2021], she actually said, "No, don't do it, 'cause we don't know enough about it." […] She said, "Look, we don't have COVID in WA, it's a probability versus risk, so probably you're not gonna get COVID, and we don't know what the risks of vaccines are for pregnancy so don't do it". […] I was a bit perplexed, because by that stage I already read the statement […by RANZCOG] and they already had put a statement online saying that they fully support for COVID vaccination for pregnant people. And so I was like, well, my GP is a bit behind […] But, yeah, I was surprised […] and that didn't change anything for me, 'cause I was already convinced that I am getting vaccinated like as soon as I can […] But then imagine someone who […] is overwhelmed with the fact that they're pregnant and it's their first pregnancy, you know, and they're like, "Oh, I'm ten weeks and I need to do this appointment, that appointment, this appointment, and I'm feeling sick all the time and I'm tired and I'm terrified", and then their GP says, "No, don't get the COVID vaccine".

Alison contrasted this with a more recent encounter with a medical professional, who had immediately asked her if she was 'double vaxxed', saying 'it was so funny. 'Cause it was just like part of their checklist now. […] She didn't blink, [*laughs*] it was great'.

Like Hayley, Alison had proactively pursued vaccination, as she was 'hoping that something out of my two shots will get onto the baby'. She told us how formal prioritisation had eventually allowed her to be vaccinated:

> When they started rolling it out, there was never a doubt in either my or my husband's mind that we are gonna get it as soon as it's available to us […] And then there was this really weird period where they opened it up to [ages] 30 plus in WA, and I made my appointment straightaway, as soon as we could, but then I got sick. I got, like, a cold and I had to cancel, and they bumped me out […] Then they changed the rules [removing eligibility for 30 to 39-year-olds due to supply issues…] and I was absolutely bummed […] And then I was pregnant, and I fell into that priority group as being pregnant and I went, "I'm going!" [*laughs*] […] So, like, in the end it's my pregnancy status that got me vaccinated.

While Alison was not fearful of COVID-19 vaccination, she did have serious concerns about the disease itself. She was worried about WA's border reopening around the time of her child's birth, saying 'I'm really concerned for my toddler, and I'm really concerned for my baby', and 'If the toddler gets it, then the baby will get it'.

Alison and Hayley discussed their fears and ideas of risk from COVID-19 disease in similar ways to other participants who expressed fears about COVID-19 *vaccination*. Talking about vaccination, for instance, Sara said 'the risk is very unknown [on] whether it could impact the baby or not'. Others, like Zaara, spoke about *balancing* risk, saying 'I'm still just sort of trusting in that advice from the medical community that was even if […] the risks [of vaccination] were unknown the risk of COVID was greater'. Like other interviewees, Alison and Hayley were highly aware of recommendations from medical professional bodies and research, and Alison had even received a recommendation not to vaccinate early on in her pregnancy, which she had ignored. Thus, their accounts were in many ways similar to those of women who had initially hesitated or were delaying their vaccinations due to pregnancy. What differed was where their fears were placed: they saw disease as riskier than vaccination.

Negotiating uncertainties in medical advice and research. As Table 2 illustrates, half our participants received clear recommendations to vaccinate from medical professionals, while the others received mixed, negative, or no recommendations at all. Some took the vaccines even in the face of mixed or negative advice, but half our participants were delaying or refusing, including three who had received positive recommendations from their healthcare professionals (Lindy, Claire, and Tara). Refusal or delay was often attributed to the 'risk-free' context of WA: for example, Lindy said 'we're pretty safe in WA, anyway, so there's no rush for me to go and get it'. Others pointed to recommendations from medical professionals (Sara and Carmen received advice to delay or refuse), perceptions that rules and recommendations were constantly changing, and partner opposition. Decisions not to vaccinate were also facilitated by the inconsistent application of vaccine mandates for pregnant women.

Carmen was a 29-year-old healthcare worker, employed as a nurse and midwife, who we interviewed in October 2021, when she was six months pregnant. Neither her nor her husband were vaccinated for COVID-19, and they did not anticipate vaccinating their toddler if the vaccine became available to them, although Carmen felt most childhood vaccines were safe. She talked about balancing risks from COVID-19 disease and vaccination, and had decided that, given her family's healthy immune systems, risk from the latter outweighed the former. Carmen had been subject to healthcare worker COVID-19 vaccine mandates in both of her workplaces, but had sought and received a medical exemption due to her pregnancy while these remained available:

> When the [healthcare worker] mandate was announced I was six or seven weeks pregnant, so still very early. I honestly didn't expect them to mandate it for healthcare workers, because I thought the state of the healthcare system was not in a place to lose staff, so I didn't see it coming yet […] I spoke to [my GP] about getting an exemption for pregnancy […] and we talked about options, the pros and cons of being vaccinated or not, and what I would do if I caught COVID pregnant without a vaccine, and discussed it thoroughly with her […] I think about a week later [she] signed off my form for an exemption and so that's now listed on my [electronic immunisation] register. The form changed about nine days after I processed mine, so you can no longer get exemptions for pregnancy [but…] mine still got processed. […] I have two workplaces. One, I'm casual and they've basically said you can't work [when the mandate comes in], which is fine […] And then my other work is permanent part-time, and they accepted my exemption. They brought it to the board and they reviewed it, and 'cause I still have contract hours there, they've moved me to an admin position, and so I started that yesterday.

Carmen explained her anxieties about receiving the COVID-19 vaccine. She had spent a significant amount of time seeking out information and medical advice, including the visit to her GP mentioned above. Her concerns centred on what she saw as a lack of long-term testing, as well as perceived risks to her baby:

> The first COVID vaccine was given in the UK apparently, like, the 12th of December, 2020, and they then started recommending them in pregnancy in WA, I think it was the 15th of July, and then I think RANZCOG also made a statement in June believing that that was safe. And that really actually made me feel a bit unsettled because […] that hasn't even been 40 weeks […] How can you have, like, solid data when the time of a pregnancy has not yet been completed since it's been released?

Like other interviewees who were delaying or refusing vaccination, Carmen also felt that medical advice had rapidly changed. This had led her to feel uncertain about vaccinating.

> The initial advice [regarding catching COVID-19 during pregnancy] was there's currently insufficient data in pregnant women and the RANZCOG advice was that we believe majority of pregnant women will experience mild to moderate cold or flu like symptoms [from COVID-19]. So, basically, don't be concerned that you're not eligible right now because you're not considered high risk. And that was back in March [2021…] I'm young, like, I'm 29. I have a normal BMI and no health history. So I was like, I feel okay with […] my own risk assessment […] It was around that time that I did start seeing presentations to [the Emergency Department at work] with people having side effects [from vaccinations]. And that made me feel a bit unsettled, particularly because I didn't see any of them reported. And I felt like it was just brushed off as being a coincidence, brushed off as anxiety.

Thus, advice that originally sought to provide reassurance regarding the dangers of COVID-19 disease was later deployed in participants' logics to *not* vaccinate. Maggie, who spoke about receiving differing advice from her obstetrician with the emergence of the Delta variant in WA, said she feared receiving the vaccine: 'I think there was probably, like, two weeks where I just cried, I just really didn't want to have to make the decision'. The perceived inconsistency of advice—combined with concerns about how potential adverse events following vaccination were being handled—raised questions about the validity of medical advice, even amongst medical professionals like Carmen.

Others, like 31-year-old government worker Sara, spoke about how WA being 'COVID-zero'—and medical advice from doctors reflecting this—had influenced their decision not to vaccinate, despite not being particularly worried about the vaccine. Sara was interviewed in July 2021 and was due to birth her first child in August, long before talk about WA's border reopening emerged. Unlike participants who were interviewed later, Sara felt at low risk from COVID-19, even though she was a diabetic who was eligible for vaccination as a priority group member from March 2021:

> I have no concerns with the COVID vaccine […] Right now, I [am not getting] the vaccine because I'm pregnant, [despite the fact that] they updated their recommendations somewhat recently saying that it's safe […But] they haven't really tried it out on enough pregnant people for me to feel comfortable to get it right now. And then, even a couple of my doctors have kind of said similar things to me […] I think that's more their personal opinion as opposed to their professional [one]. I think [RANZCOG…] released some stuff earlier this year that they've assessed the risk […] It wasn't unsafe but […] there hadn't been enough testing on pregnant people to know the implications, and then I know they updated that recently to say that it's safe. So I decided to just wait until after the baby's born before being vaccinated. But whether I do that while I'm breastfeeding or not I'm not too sure yet, I haven't really thought that far ahead […] My doctor yesterday [said], "I would just wait until you have the baby".

Like others (such as Alison, who had decided *to be vaccinated* because of the risk of COVID-19 to her baby), Sara spoke explicitly in terms of the vaccine posing a risk to her baby, saying, 'Although I'm sure it would be totally fine […] the risk is very unknown'. She added:

> The other thing that kind of factors into my view is that we're pretty low risk of catching COVID in Perth. It's not like we're in America. […] The risk is a lot higher there as opposed to the risk here in Perth. And we don't really leave. We went to South Australia for a weekend earlier this year, but other than that we haven't left the bubble that is Perth.

We spoke to Sara during one of WA's short lockdowns in 2021, and she reflected how her decision might shift if she felt at greater risk from the disease.

> I think if the risk in WA, all of a sudden it became, we had a huge outbreak, [my husband and I would] be more inclined to get [the vaccine] sooner rather than later. But even at the moment, with the current lockdown, we've still only got three or four cases [in the State]. A risk analysis there: it's very low at the moment.

Sara not only spoke in terms of risk, but also in terms of anxiety. While Carmen spoke of being 'unsettled' about COVID-19 vaccination advice, Sara told us that 'uncertainty' was her 'biggest concern', describing:

> A lot of uncertainty around pregnancy and breastfeeding and the COVID vaccine, and I don't think that the information that's been released hasn't really been that reassuring, if that makes sense. It just kind of says: Oh, now it's safe. You assess the risk so, yeah, I think that would be the main driver behind that.

Frustration about the perceived lack of clarity and consistency in information about pregnancy vaccination emerged across accounts, even amongst those who were eager to be vaccinated. Maggie, who was initially reticent, spoke about how medical professionals' refusal to acknowledge that vaccination might not be '100 percent safe' was off putting, as she was aware that *all* vaccination carried some, small risk. Only after a medical professional acknowledged this risk did Maggie consider vaccinating. Tara echoed this, saying 'it was a little bit confusing, being at the start of our pregnancy they said that they didn't recommend any COVID vaccines because the research hadn't been done yet, and then a couple months later they changed that advice'.

Negotiating relations and families' uncertainties. In addition to considering their own perceptions of risk, anxiety, and safety from COVID-19 disease and vaccination, families and partners also influenced our interviewees. Tara, a 34-year-old communications adviser whose baby was due around February, told us in November 2021 that her husband would not 'let' her be vaccinated, although she wanted to be:

> *Tara*: Originally I thought okay maybe I can just […] have the luxury of being able to hold off 'til [the baby is born] because I wasn't expecting the borders to open until around April [2022…] I thought I could keep my husband happy, I could get vaccinated just shortly after bub gets born, I'd still be passing some antibodies over to her through my breast milk even if it's not as much as if she was in me. But now that the borders are opening potentially now, I mean, who knows what's happening with Omicron, but that's really pushed me to want to get [vaccinated] earlier. In one conversation I had with my husband, he seemed like he was agreeing that okay, I'll let you do it now, but he asked me to just wait until I was at least into my third trimester […] I know that the doctors are saying you can have it anytime, but for him, psychologically, it's like the baby's bigger and stronger. And I did read a study recently that said that the best time to get the vaccine is between 27 and 31 weeks because […] that's the period that passes the most antibodies onto your baby. So I need to get on that this week.
>
> *Interviewer*: Have you […] talked about it?
>
> *T*: I haven't talked about it this week […] it'll turn into an argument, that's the tricky thing. So it's just about mentally preparing myself for that argument, I guess. And it's difficult […] it's his baby, as well, that he's worried about, but it's also my body. And I know that they say that as a pregnant woman you've got the immune system of a 95-year-old when it comes to COVID. And we're lucky that there's no COVID in the community now. I think if I was in Melbourne or Sydney, I probably would've just raced off to get it, and said, "screw you". But because the risk isn't as [great here I haven't…] It's just all the uncertainty.

Tara was attempting to balance her own desire to be vaccinated with her husband's wishes. She referenced the unique WA context and how, despite the low level of risk, she felt 'uncertain' about outbreaks and the border reopening. Minimal local risk had, until now, allowed her to suspend her decision and delay starting 'an argument', yet the impending border reopening and recent local outbreak of the Omicron strain had led her to reconsider this delay. She also raised issues of bodily autonomy and 'choice'. Tara saw it as problematic that her husband would not 'let' her be vaccinated, yet also wanted to respect his anxieties.

Tara's case provides a clear example of the complex ways that pregnant women went about making decisions to (not) receive COVID-19 vaccinations, and their emotions and considerations of risk and benefit. Other participants likewise considered the views of their husbands and families, but tended to be aligned on vaccinating during pregnancy (for instance, both Carmen and her husband were concerned; Alison said there was 'never a doubt in either my or my husband's mind'; while Sara told us 'we are both just kind of waiting and seeing').

Discussion

Autonomy and emotion in pregnant women's vaccine decision making. Current scholarship focuses on the role that medical professionals can play in promoting vaccination among those who are pregnant, and the importance of providing accurate information (Celikel et al. 2014; Taksdal et al. 2013; Ward et al. 2022; Wiley et al. 2013). While such considerations are clearly crucial, there are complexities in decision-making that qualitative research can further expose. In the accounts we discuss, notions of risk and benefit are weighed against women's experiences of vaccination advice, pressures, and observations. Our participants were all highly informed about the science of COVID-19 vaccination, and the rules and recommendations surrounding pregnancy. Yet they came to very different decisions: actively seeking vaccination, delaying it, or refusing it. Some of their medical professionals were ambivalent or unwilling to strongly recommend vaccination, although this did not necessarily influence the women.

We agree with Chamberlain et al. (2017) that vaccination rules and recommendations should recognise pregnant women's experiences, autonomy, and choice. Their 'interests-based' approach encourages policymakers to prioritise the 'voiced interests' of expectant mothers in providing access to medical trials and enabling vaccination decisions based on embodied reasoning rather than paternalism. This framing 'keeps a woman's agency front and center, making it less vulnerable to discounting or subversion of the woman's moral standing to make the relevant decisions' (Chamberlain et al. 2017, p. 453). Women like Hayley and Alison—who actively sought and were prepared to advocate for their own vaccinations—embodied such an 'interests-based' approach. An interest-based approached also helps scholars and policymakers to move beyond straightforward 'risk-benefit' approaches, which can oversimplify the emotional realities of decision-making.

In a non-pandemic setting, Chamberlain et al. (2017) counsel against mandates for maternal vaccination, noting that their 'interests-based approach would honor a woman's agency and autonomy in making health-related decisions that affect her and her fetus'. We believe that Australia's short-term medical exemption for COVID-19 vaccines on the basis of pregnancy protected this agency and autonomy in a rapidly changing health terrain, and that continuing this exemption may have been of benefit even after a strong recommendation was in place. Healthcare worker mandates in other Australian jurisdictions saw pregnant employees potentially have their jobs terminated even if they sought to go on parental leave early or take unpaid leave and vaccinate before their return to work—strategies that would have removed them from potentially risky contact with their colleagues or patients. By contrast, Carmen's medical exemption enabled her temporary redeployment in an administrative role with the option of working from home—a strategy that did not require her to choose between her job and what she saw as putting her unborn child at risk.

However, from a messaging point of view, it would be very difficult for policymakers and health providers to both strongly recommend pregnancy vaccination and to explain the availability of a pregnancy exemption. KA faced this dilemma whilst consulting to

aged care providers about vaccine mandates, and ultimately used the perspective of Chamberlain et al (2017) to explain that the medical exemption protected pregnant women from coercion even though the vaccine was strongly recommended for them.

Considering mixed feelings, risk, and medical advice. One of our key and expected findings is that pregnant women were confused about COVID-19 vaccination recommendations and rules. Interviewees, while well informed, needed to negotiate their decisions to be vaccinated (or not) with medical advice. Often, their GPs and obstetricians were not fully up to date with this advice, and interviewees needed to seek further information, or seek advice from multiple professionals, as well as considering their partners' views. While this led to confusion and delay for some, it also revealed how women could actively make their own decisions where they were interested in—and had access to—accurate information. Indeed, many of our interviewees had consulted the online statements of RANZCOG and used this to inform their own decision-making.

Our findings to some extent contradict pre-pandemic findings that medical advice to vaccinate from professionals leads pregnant women to vaccinate. Instead, interviewees received a range of advice, some of it 'weak', where the medical professional passively communicated information (which was sometimes out of date); these professionals may have been risk averse themselves and were similarly having to deal with quickly changing advice. Some women refused or delayed despite receiving stronger recommendations to vaccinate, others went ahead even without the support of their providers.

Mixed medical advice was often given to our participants in light of WA's 'COVID-zero' environment. This advice was being provided in the context of unfolding COVID-19 outbreaks in other States. When advising our participants not to vaccinate, their GPs and specialists regularly cited the low risk of COVID-19 in WA, at times also suggesting there had been inadequate testing of the vaccines during pregnancy. Such framings reduced over time, however, as WA's border reopening loomed and as vaccination rates climbed with few visible side effects. Thus, policies and recommendations informed medical professionals' views of local risk, at times encouraging or discouraging women to vaccinate.

Conclusion

Interviewees' views reflected the broader context of WA, with just over 1,100 cases and only nine deaths by the end of 2021, in a State of around 2.7 million people (Australian Government Department of Health and Aged Care, 2022). This was attributed to the country's border closure—closing in March 2020 and reopening in November 2021—as well as hotel quarantine requirements and a national lockdown in 2020. Of even greater local significance were State border closures (restricting movements to and from other Australian States and Territories even after national borders reopened), three short, strict lockdowns when a single or few local cases emerged (lasting between a few days and two weeks), and WA's geographical isolation from the rest of the country.

While more populous States like New South Wales and Victoria experienced larger outbreaks during 2021, WA remained relatively insulated. Western Australians overall had lower vaccination rates throughout 2021, up until the comprehensive mandates were introduced (Australian Government Department of Health and Aged Care 2021). The State thus provides an important case study in how women balanced pregnancy with risk from COVID-19 and risk from vaccination, all in a context of changing recommendations, mandates, and where there was constant talk of when the State borders would reopen. Although our interviewees were not representative of Australia's population—most were highly educated and middle-class—their responses offered significant insights into pregnancy, anxieties and confidence about COVID-19 vaccination, and the role of governments' and medical professionals' recommendations and rules.

Pregnancy vaccines require nuanced consideration, but nuance in public policy can be problematic and misinterpreted. Pregnancy-specific rules and recommendations—like the mandate exemption that was briefly accessible during our data collection—can have implications beyond just pregnant women: complicating workplace laws; risking others' health; fostering confusion among medical professionals and the general public; and undermining public confidence in vaccines. Yet it is likewise crucial to consider autonomy and choice; indeed, our interviewees demonstrated the active role women can play in *informing themselves* and *advocating for* their vaccinations in contexts of uncertainty and fear. Thus, facilitating choice does not necessarily mean choice *against vaccination*.

Given our interviewees' confusion over recommendations and rules, the following recommendations and reflections can inform future vaccination campaigns in pregnancy. First, governments must support GPs and specialists with clear, up to date information on the logic underpinning recommendations to help avoid misinterpretation about new and newly available vaccines as they become available. This is especially important for emergent pregnancy vaccines, such as the RSV vaccine, as well as in an interconnected world where future pandemics are widely predicted. It is likewise crucial to provide clear information, where possible, on the risks posed by disease versus vaccination during pregnancy, as well as factors that potentially change this risk assessment. This is particularly important given the challenge that COVID-19 presented for vaccination worldwide: with widespread public criticism of vaccines leading many people question and lose trust in them, and politicising vaccine decision-making. It is also crucial to note how changing recommendations continue to impact vaccination decisions. Indeed, at the date of submission, the most recent Australian Government advice regarding COVID-19 vaccination during pregnancy is that the vaccine is not routinely recommended, except for people who have never received a COVID-19 vaccine. This shift has the potential to further complicate medical providers' recommendations and women's decisions, both for COVID-19 vaccines and vaccines more broadly.

Second, at the policy level, considering potential ethical issues around risk and bodily autonomy is key. Carmen's case raises some possibilities: her exemption allowed her to move to an administrative role and work from home while pregnant. Architects of future mandates for novel vaccines—for instance, mandating vaccination in pregnancy during future pandemics or viral outbreaks—might consider facilitating remote working where viable and allowing access to paid or unpaid leave for the specific period of pregnancy. This would avoid coercing those who—during a unique period of embodied reasoning—would otherwise sacrifice their jobs based on a misguided but sincerely held belief that this was necessary to 'protect' their unborn children. Likewise, vaccine policy might consider women's choice *to* vaccinate when it is not yet medically recommended: either because it does not directly benefit them (but would benefit their babies), or in cases where vaccines are newly developed or in trials (as in Hayley's case, where she sought to vaccinate early as a pregnant aged care worker). In this case, it is important to preserve bodily autonomy and aim to avoid 'paternalistic' policies that stymie women's vaccine decision-making.

Data availability

Research data are not shared, as participant anonymity was a condition of human research ethics approval. Policy documents

analysed, and where they may be accessed, are included as a supplementary file.

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Author contributions

All authors were involved in research design and writing. Lara McKenzie's contribution included Data curation (Equal); Formal analysis (Lead); Funding acquisition (Supporting); Investigation (Lead); Methodology (Equal); Writing—original draft (Lead); and Writing—review & editing (Lead). Samantha Carlson's contribution included Data curation (Equal); Funding acquisition (Supporting); Methodology (Equal); Writing—original draft (Supporting); and Writing—review & editing (Supporting). Christopher Blyth's contribution included Conceptualisation (Equal); Funding acquisition (Equal); Methodology (Equal); Writing—original draft (Supporting); and Writing—review & editing (Supporting). Katie Attwell's contribution included Conceptualisation (Equal); Funding acquisition (Equal); Methodology (Equal); Writing—original draft (Supporting); and Writing—review & editing (Supporting).

Competing interests

Lara McKenzie and Samantha Carlson have no conflicts of interest to declare. Christopher Blyth was a member of the Australian Technical Advisory Group on Immunisation (ATAGI; 2012-2021), leading the development and implementation of Australia's COVID-19 vaccination program. In addition, he is appointed to the Commonwealth Government's COVID-19 Vaccines and Treatments for Australia Science and Industry Technical Advisory Group (SITAG; 2020-2023). He is a current recipient of a National Health and Medical Research Council (NHMRC) Investigator award (APP1173163). Katie Attwell is a specialist advisor to the ATAGI COVID-19 working group. She is a current recipient of a Discovery Early Career Researcher Award funded by the Australian Research Council of the Australian Government (DE19000158). *Coronavax* is funded through a Wesfarmers Centre of Vaccines and Infectious Diseases Catalyst grant, a Future Health Research & Innovation Fund COVID-19 Focus Grant, and by the Western Australian Department of Health.

Ethical approval

This project has ethical approval from the Child and Adolescent Health Services Human Research Ethics Committee (HREC) under permit number RGS0000004457. The University of Western Australia (UWA) HREC reciprocally recognised this approval under permit number 2020/ET000339, and separately granted ethical approval for the federal functional dialogues under permit number 2020/ET000340.

Informed consent

All interviews were provided with an information sheet and signed a consent form prior to the interview.

Additional information

Supplementary information The online version contains supplementary material available at https://doi.org/10.1057/s41599-024-03004-6.

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