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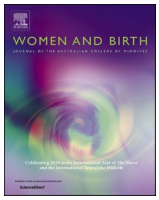

Understanding preconception health in Australia through the lens of people of reproductive age: Implications for care providers

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ABSTRACT

Problem: Limited awareness about the importance of preconception health is a recognised barrier to preparing for pregnancy.
Background: Opportunities exist to improve the health of future parents through preconception care. One of the recognised barriers to pregnancy preparation is a lack of knowledge and a lack of presentation for information and care.
Aim: To explore the understanding of "preconception health" amongst people of reproductive age in Australia to inform the delivery of preconception care.
Methods: A qualitative descriptive study using online interviews with people of reproductive age in Australia. Recruitment was via social media (Facebook). Interview transcripts were analysed thematically.
Findings: Of the 20 women and five men we interviewed, all acknowledged the importance of preparing for pregnancy. Despite broadly understanding the concept, most participants had limited understanding of the details of preconception health. To increase their knowledge, participants' preferred sources of information included education in schools, reputable online sources, primary and maternity healthcare providers, and community members with lived experience.
Discussion: People in Australia are keen to learn about preparing for pregnancy and appreciate this as important. Suggested avenues to improve awareness and understanding about optimal preconception health included through school education, primary and reproductive healthcare providers, and online resources. This can improve understanding and behaviours before first and subsequent pregnancies.
Conclusion: Preconception care requires a life-course approach, beginning with universal education through schools, enhanced by readily accessible reputable online resources, and access to trusted primary and maternity care providers. Maternity care providers can be key drivers in this process.

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Statement of significance

Problem

Good preconception health benefits parents and their children, yet half of all women report taking no health actions to prepare for pregnancy.

What is already known

Limited understanding about the importance of preconception health is a barrier to optimal pregnancy preparation behaviours

What this paper adds

People want to learn about preconception care and see this as an important health issue. Both women and their partners want to receive advice about pregnancy preparation from reputable sources and primary and maternity healthcare providers, the latter which was reported to influence behaviours in subsequent pregnancies.

Introduction

Preconception care aims to optimise the health of women and their partners prior to pregnancy [1]. Optimal parental preconception health improves chances of conception, pregnancy outcomes, childhood health and the health of future generations [1–4]. Evidence exists for the benefits of a range of preconception interventions, from micronutrient supplementation including folic acid, to increasing physical activity and optimisation of chronic medical conditions including diabetes [2, 3, 5, 6]. While many women seek care when pregnant, interventions delivered in the pregnancy period alone are too late to achieve the best health outcomes for women and their babies [1]. Preconception and inter-conception care interventions can benefit future parents and children.

Preconception care and the impact on clinical outcomes

There is growing evidence to support the positive impact of preconception care as a person's health before pregnancy influences gametogenesis and the early intrauterine environment [1]. Folate supplementation three months before conception and continued in pregnancy decreases the incidence of neural tube defects by up to 70 % [2]. Strict glycaemic control for women with pre-existing diabetes (target HbA1c < 6.5 %) reduces the incidence of congenital malformations and early pregnancy loss [3,7]. Smoking, vaping, alcohol consumption and use of recreational drugs remain important modifiable risk factors for adverse pregnancy outcomes especially in priority populations. Being above a healthy weight before pregnancy is associated with adverse short and long-term health outcomes for children, including being above a healthy weight in early childhood [8]. The preconception period has been identified by the World Health Organization as one of the six key areas to end childhood obesity, and the International Federation of Gynecology and Obstetrics (FIGO) have released best practice advice stating reproductive care providers should support weight optimisation prior to pregnancy [9]

Who needs preconception care?

All people of reproductive age stand to benefit from evidence-based preconception care. International data shows over 90 % of women have at least one modifiable preconception health risk factor [10], with a Canadian study showing that women have on average 15 modifiable preconception risk factors that can impact pregnancy outcomes [11]. Locally, one in four pregnancies in Australia is unintended and women receiving antenatal care report suboptimal rates of preconception folate supplementation [12,13]. Across Australia, almost half of all women entering pregnancy are above a healthy weight and more than one in five women smoke prior to pregnancy [14,15]. Data is limited on the number of women entering pregnancy who take recreational drugs. One recent Australian study found 1.6 % of women reported cannabis use in pregnancy [16] and the 2016 National Drug Strategy Household Survey found 2.3 % of women used an illicit drug while pregnant [17]. The incidence of chronic medical conditions, including diabetes and hypertension increases with increasing parity, highlighting the need for intervention in the interpregnancy period [18]. Certain priority groups, including those living in rural and remote areas, and from areas of socioeconomic disadvantage, endure higher risk of poor reproductive outcomes than others and therefore require targeted attention [19]. The prevalence of many modifiable risk factors, such as smoking, excessive alcohol consumption and being above a healthy weight is higher among those living in Australia's rural and remote areas than those living in metropolitan areas [19]

Who delivers preconception care in Australia?

FIGO recently put out a "call to action" that all health care professionals who see women of reproductive age have a responsibility to deliver preconception care [20]. Primary health care has traditionally been proposed as the recommended setting for preconception care as ideally this care takes place before contact with hospital maternity services [21,22]. Evidence shows that preconception care in Australia is provided opportunistically and not routinely in primary care [23]. More recently, antenatal and postnatal care have been identified as additional settings to deliver preconception care. Assessing pregnancy intention, and the incidence of obstetric complications can serve as an impetus to improve health before a next pregnancy. [24,25]

Barriers to the delivery of preconception care

Barriers to delivering preconception care include people's lack of awareness of the importance of preconception health [21]. Additionally, it is reported that women do not see the need for formal preconception health checks [22]. Other barriers include time constraints, lack of access to health professionals and a lack of resources to support the delivery of preconception care. Cost has also been identified as a barrier to improving preconception health, with recommendations to provide affordable options to enable women to adopt positive preconception behaviours [26,27]. These barriers are more manifest for people living in rural and remote areas. [19]

Access to preconception health information

Across Australia strategies for maternity care identify access to information before pregnancy as a key action area [28]. Evidence suggests that Australian women want to learn about preconception care and adopt positive health behaviour changes [22]. Most women report a preference for online information sources and use technology to find information on pregnancy health [29,30]. Twenty-eight percent of Australia's population live in rural and remote areas [19] and The National Women's Health Strategy identifies "Women and girls from rural and remote areas" as one of its ten priority populations [31]. The aim of this study was to explore understanding about preconception health, and health information seeking behaviours among people of reproductive age in Australia, including from rural and remote areas to help inform preconception health promotion and education strategies.

Methods

This qualitative study to explore understandings of preconception health, was a key component of a project to optimise a pre-existing online preconception health self-assessment tool [32]. At the

beginning a Rural Women's Health Consumer Advisory Group (RWH-CAG) was established to ensure person centred study design, guide recruitment strategies and inform the interview questions to be inclusive for people living in regional and remote Australia.

This comprised six women aged 19 – 30 years old from rural locations across Australia.

Study design

A qualitative descriptive study using in-depth interviews to gain insight into individual viewpoints and understanding of preconception health [33]. The study was designed in collaboration with the RWH-CAG, who co-designed recruitment materials, advised on recruitment strategies, and co-developed the interview guide.

Participants & recruitment

People of reproductive age (18 – 41 years old), residing in Australia, who could speak and read English were purposively recruited between January and September 2021.

Given the COVID-19 pandemic restrictions enforced at that time, recruitment was via social media (Facebook) and sites for interview promotion were suggested by the RWH-CAG. Interested participants responded to the study advertisement and were contacted by the research team. Participant information statements were linked with the study advertisement and with correspondence to arrange interview times.

Facebook recruitment advertisements targeted regional and remote community parent groups and noticeboards, and parenting groups in lower socio-economic areas, as identified by postcode. Examples of the recruitment materials are shown in Fig. 1.

Provision of fifty-dollar gift certificates served as a gesture of appreciation.

Members of the research team met throughout the data analysis process to refine the interview questions, and adjust recruitment as required. Recruitment ended when no new data emerged, and previously identified themes were repeating [34]. Interim analysis showed that women viewed partner involvement as critical to improving attitudes to preconception care. This led to the extension of recruitment to to include men.

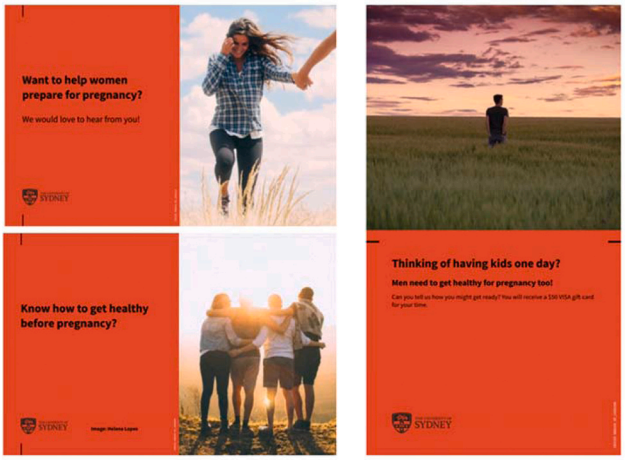

Fig. 1. Recruitment materials.

Data collection

Interviews were conducted via telephone or online videoconferencing at the participants request. As interviews were not performed face-to-face, verbal informed consent was gained prior to data collection. Participants were offered the opportunity to bring a support person (s) and were assured that withdrawal from the study could occur at any time. Interviews were completed by one researcher (ED) using an interview guide developed by the research team. (Supplementary File 1)

Interviews explored people's understanding, knowledge, and perceptions of the importance of preconception health, and their preferences for learning about preconception health. Reproductive health information-seeking behaviours were also explored. To establish clarity regarding the study's objectives, participants were reminded of the purpose at the outset of the interview, and inclusive, participant-led discussions encouraged explorative dialogue [35]

Interviews were recorded, deidentified and transcribed, and all data saved as per protocol on the Sydney University Data Dashboard with an endorsed Research Data Management Plan and will remain confidential until destroyed in due course.

Data analysis

A qualitative analytic approach of reflexive thematic analysis was adopted [36,37]. An analytic approach is not limited to answering a single research question and allows for the discovery of more than one content focus [33]. This approach was framed within this study as the development of a coherent understanding of patterned meaning across the whole dataset [38]. Through reading the transcriptions for thematic and implicit material, patterns of shared and differing meanings were inductively identified and interpreted [38]. The process, first described by Braun and Clarke [39] involved iterative repeated steps to ensure comprehensive conceptualisation faithful to the patterns of meaning in the data. Coding and thematic development evolved through cyclical engagement with the data and within shared researcher discussions. The involvement of experts in women's health enhanced critical reflexivity among the researchers during analysis.

Interview data was analysed by two researchers (ED and KC) who have reproductive and public health expertise. The researchers met regularly to review and discuss findings. Data was coded, manually without assistance of software programs, to detect key concepts and constructs to organise the findings [39,40]. All coding documentation has been securely stored in line with the governing institution's research data management processes. Constructs were further discussed between all members of research team to identify themes. The researchers have both personal and professional experience with pre-pregnancy care and were conscientious to actively separate their experiences from the analysis. The researchers applied a reflective lens, in which they were actively aware of any potential biases that could influence data analysis. An example of this was in synthesising the finding that women were not aware about preconception folate supplementation. The researchers had to reflect that such information is known to them from their professional background but is not known to others. Additionally, the researchers consulted with the broader research team, and the RWH-CAG to get different perspectives and ensure that their assumption did not influence coding and theme generation.

Additional analysis by pregnancy intention (those planning a pregnancy in the next 12 months "planners" and those not planning a pregnancy in the next 12 months "non-planners") and gender was also performed. This involved a separate analysis of transcripts for these groups to explore for any additional insights that could inform potential preconception interventions.

Ethics

This study was approved the University of Sydney Human Research

Ethics Committee Project Number 2020/430 (22 June 2020).

Findings

Forty-six women and six men responded to the recruitment advertising. Interviews were conducted with 20 women and five men between February and September 2021. All participants were interviewed individually, none brought a support person. Interviews ranged in time from 31 to 53 minutes. Participant characteristics are shown in Table 1. Participants resided in metropolitan, rural and remote locations, and were from a range of socio-economic backgrounds. None of the participants identified as Aboriginal or Torres Strait Islander. Thirteen participants were parents, and an additional three women had been pregnant previously. One participant was in a same-sex relationship. At the time of the interviews, nine women and one man were planning a pregnancy in the next 12 months.

Three key themes, informed by supporting constructs, emerged about information seeking and what impacts people's understandings of preconception health (Table 2). The first theme was about people's perceptions, awareness and understanding of preconception health. This revealed universal support for good preconception health, but a superficial understanding of the topic. Preferences for learning about preconception health and current practices for health information seeking were the two other key themes identified (Fig. 2).

Theme 1: Perceptions of preconception health and care

Construct 1a. Preconception health is important

All participants were keen to learn about preparing for pregnancy and saw this as a critical issue. This was the case irrespective of gender, previous pregnancy experience and planning status.

Table 1
Participant Characteristics.

Characteristic	Number	Characteristic	Number
Gender		**Gender**	
Female	20	Male	5
Age (years)		**Age (years)**	
Range	19–40	Range	24–32
Median	29.5	Median	28
Postcode of residence*		**Postcode of residence***	
Major Cities of Australia (Metropolitan)	6	Major Cities of Australia (Metropolitan)	5
Regional Australia	9	Regional Australia	0
Remote & Very Remote Australia	5	Remote & Very Remote Australia	0
SEIFA ISRAD Quintile**		**SEIFA ISRAD** Quintile**	
Quintile 1 (Most disadvantaged)	5	Quintile 1 (Most disadvantaged)	1
Quintile 2	3	Quintile 2	1
Quintile 3	3	Quintile 3	1
Quintile 4	4	Quintile 4	0
Quintile 5 (Most Advantaged)	5	Quintile 5 (Most Advantaged)	2
Education		**Education**	
Secondary	3	Secondary	2
Vocational	1	Vocational	1
Tertiary	16	Tertiary	2
Reproductive status		**Reproductive status**	
Parent	11	Parent	2
Previous Pregnancy	14	Previous Pregnancy	2
Currently Pregnant	1	Currently Pregnant	0
Planning Pregnancy in the next year	9	Planning Pregnancy in the next year	1
Heard of term preconception care	7	Heard of term preconception care	0

* As defined by the Australian Statistical Geography Standard (ASGS)
** Socio-Economic Indexes for Areas, Index of Relative Socio-Economic Advantage and Disadvantage

Table 2
Key themes and supporting constructs for learning and understanding preconception health.

Theme 1	Perceptions of preconception health and care
Construct 1a	Preconception health is important
Construct 1b	The concept versus content of preconception health/or preconception health interventions
Theme 2	**Practices for reproductive health information seeking**
Construct 2a	Trusted online sources
Construct 2b	Role of the healthcare provider
Construct 2c	Trusted community sources
Theme 3	**Preferences for learning about preconception health**
Construct 3a	Teach everyone, early
Construct 3b	Accessible and available information as needed
Construct 3c	Community as a source of information

> *"it's definitely something that should be very much front of mind and very common knowledge."* (female, non-planner, previous pregnancy)

> *"Yeah, I think it's quite important, especially as a man."* (male, non-planner, no previous pregnancy)

Participants also viewed preconception health as an acceptable topic to discuss with people of reproductive age as part of routine health care. Non-planners identified that not all people may be considering pregnancy, and that the topic therefore should be raised sensitively.

> *"I think it's something that potentially is good to raise with people. But I think it's also very sensitive as well. So, just being more of a gently, gently approach… raising it as more of a general health concern."* (female, non-planner, previous pregnancy)

Construct 1b. The concept versus content of preconception health/or preconception health interventions

All participants demonstrated a fundamental understanding of the concept of preconception health, as being "healthy" before pregnancy, with many identifying that this includes both physical and mental health. Being healthy was most often defined as exercising regularly and having a balanced diet. Beyond this basic understanding, participants had limited knowledge regarding the breadth and detail of the content of preconception care. Those who had experienced a pregnancy, appeared slightly more knowledgeable about positive preconception health behaviours despite not having adhered to these behaviours prior to their own pregnancies.

There was also limited knowledge around who needs preconception care, with almost half of all participants associating this with defined populations rather than all people of reproductive age.

Degree of knowledge about the components of preconception health including specific actions to improve preconception health, and their timing, was variable. All participants recognised exercise and smoking cessation as recommended behaviours prior to pregnancy. However, several other interventions were not mentioned as part of preconception care, including the need for micronutrient supplementation and cessation of alcohol consumption.

Participants who had experienced more than one pregnancy reported a change in preconception actions having learned in antenatal care about the importance of preventive health behaviours prior to pregnancy. This was most frequently reported in relation to folate supplementation and alcohol.

> *"Yeah… I did not do anything – so, when I got to do the doctors to do the pregnancy test, he said, "Have you been taking Elevit?" And I said, "No,*

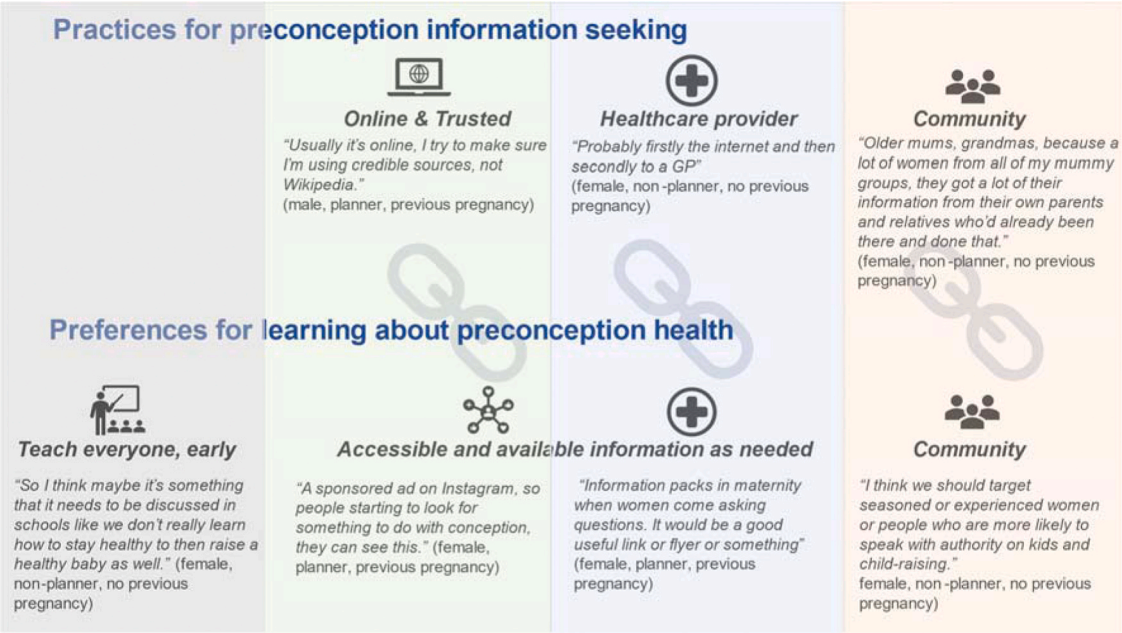

Fig. 2. Practices and preferences for preconception health information.

I've never heard of it." So, I didn't do any sort of preconception care. There was no journey to falling pregnant. It was literally just – yeah. I think it's time to fall pregnant. So, yeah, there was no talking about it or journey. (female, non-planner, previous pregnancy)

"Yeah, I guess about the alcohol. I guess I knew, obviously, you don't drink during pregnancy, but I didn't know that it's important to not drink beforehand. Even when you're trying." (female, planner, previous pregnancy)

When discussing target populations for preconception health and care, all participants felt that good preconception health was relevant and could benefit all people of reproductive age regardless of pregnancy intention. There was also a strong consensus that partners should be actively included in discussions about preconception care.

"I think everyone - I think all parents considering to have children would benefit from it. I think whether or not you considered to have children or not, the kind of information is important and should be in our education system. Because you don't have to plan to have children, it happens." (male, non-planner, previous pregnancy)

Despite the perceived universal applicability of good preconception health, some participants reflected they did not seek preconception care before a previous pregnancy as they perceived themselves to be "healthy". Several participants felt that preconception care was a fertility issue only, directly relating to the ability to conceive and therefore only necessary for those who experienced fertility difficulties. Others felt that preconception care is only important for certain population groups, including "older" women or those who have a health condition.

"I don't think it would have *particularly crossed my mind to go and have a check-up before I fell pregnant Yeah, and you know I didn't go to my GP before I fell pregnant. Like, I was healthy"* (female, non-planner, previous pregnancy)

"I think elderly women, so I think maybe like women from their 30's. I like to think that a lady in her 20's is less likely to need it because of her age." (female, planner, no previous pregnancy)

Terminology was raised as an issue as few participants had heard of the term "preconception care" despite understanding the concept. Participants indicated that the term was "medical", and "jargon", one participant identified this as a disconnect between language used by healthcare providers and the community. This sentiment was consistent across female and male participants, planners and non-planners, and those who had and had not experienced pregnancy. Participants identified that this impacted communication and subsequent awareness of this health issue.

"Yeah, whereas some people might not use the word preconception, that's a real medical term for some people" (female, non-planner, no previous pregnancy)

"I think it's really important to have it in normally words. I know it feels more professional and more important if it's in proper academic words, but most people don't understand that and they don't understand the concept. And if you're too busy trying to read the big words, you don't actually get the full story." (female, planner, no previous pregnancy)

Theme 2 Practices for reproductive health information seeking

Construct 2a. Trusted online sources

All participants reported using the internet to seek reproductive health information, and that online sources were their first point of call. Most participants reported prioritising their online searches to what they perceive as reputable sources. They expressed a preference for web handles associated with government websites, but some also visited commercial and public forum sites. People who had experienced pregnancy before also identified hospital-based, and maternity child and family health information sites as trusted and valuable resources.

"I probably would Google first. I think that's my default – yeah" (female, planner, previous pregnancy)

"I look for does it come from a trusted source, is it from the Royal Children's Hospital website or is it from Breastfeeding Victoria's website, not just a mummy blog or a website that has obvious ads or links to creams that they want to sell you." (female, non-planner, previous pregnancy)

2b. Role of the healthcare provider

Healthcare providers were also identified as an important source for reproductive health information. Primary care providers were cited as a

source of information by all participants, regardless of pregnancy intention. Some participants acknowledged that for people in rural and remote locations seeking information about reproductive health from a healthcare provider could be challenging due to practitioner workload, travelling distance, and lack of privacy in a small community. For those who had pregnancy experience, maternity and early childhood care providers were also seen as valuable sources of information.

> *"Obstetrically, the maternity unit is fantastic, and the child and family health nurses, they're quite health-promotion, health-advocation kind of thing."* (female, planner, previous pregnancy)

> *"Well, what I would do is I'd go straight to my GP but if she didn't have - she's a GP, not a specialist. The maternity clinic in [location] specifically is very, very good."* (female, non-planner, previous pregnancy)

Construct 2c. Trusted community sources

Participants also used trusted community sources such as a friend and family member for reproductive health information, particularly those with relevant experience. Participants were not mutually exclusive in their health information seeking behaviours, with many reporting seeking information from multiple sources.

> *"I do probably just Google it and then I ask my mum or my sister."* (female, non-planner, previous pregnancy)

> *"First of all, we went online, Googled. Google tells you everything, doesn't it? But then also, we did also book appointments with our doctor and had that discussion, and then friends as well."* (female, planner, no previous pregnancy)

Theme 3: Preferences for learning about preconception health

Construct 3a. Teach everyone, early

Participants supported the universal promotion and education about preparing for pregnancy and identified several avenues to increase awareness. An early, foundational understanding of preconception health was viewed as critical and inclusion in school curricula was identified as an opportunity to increase awareness and knowledge of specific components of preconception health. This view was shared by male and female participants, planners and non-planners.

> *"I guess school, the issue of school education…is kind of a perfect chance to teach people just a bit younger than me about this. So that then it's not new to them, like the supplements were for me when I took the survey, I'd never heard of them before."* (female, non-planner, no previous pregnancy)

> *"I think it's just really something that should be taught in schools."* (female, non-planner, previous pregnancy)

Construct 3b. Accessible and available information as needed

Participants identified having readily available, easy to find preconception health information as an enabler for those who were planning a pregnancy and seeking information. Active health promotion was also suggested to increase awareness about preconception health. Social media, including promotion within dedicated social media groups, health care settings, both primary and tertiary care, and Government health information websites were suggested avenues for health promotion and information resources.

> *"I think social media would be a good place to promote because usually partners are always browsing through phones together at the same time, and then they all can have that conversation together about it as well."* (male, non-planner, no previous pregnancy)

> *"Give it out to the midwife clinics…that's where most people go to have their pregnancies. Also give it out to the Breastfeeding Association as well. That's where I would also start. Then your pharmacists and then your GPs"* (female, non-planner, previous pregnancy)

> *"you'd probably have to run it on your hospital pages, or even your state medical websites."* (male, non-planner, no previous pregnancy)

Construct 3c. Community as a source of information

Participants also identified trusted community members as a valuable source of health information and advice. Over half of the participants cited family and friends with lived experience of pregnancy as valued communicators of health information and identified them as a source of trustworthy information. Some participants went on to express that those with lived experience should also be included in preconception health promotion efforts to ensure they provide current advice for future parents.

> *"Because I think it would be even beneficial for grandmothers to help understand the message, to deliver that message to when their daughters or granddaughters are trying to fall pregnant. So, even if they are - you know, have gone through menopause and are no longer able to reproduce, just having that knowledge and talking about it with their daughters or their daughters' daughters is going to help spread the message."* (female, planner, previous pregnancy)

> *"The first thing I want to say is older mums, grandmas, because a lot of women from all of my mummy groups, they got a lot of their information from their own parents and relatives who'd already been there and done that."* (female, previous pregnancy, non-planner)

Discussion

Our findings show that people of reproductive age across Australia, broadly appreciate the concept of preconception health and perceive that it is important to women and their partners. Despite this broad understanding, significant gaps in knowledge about preconception health and care were identified. Detailed understanding of the components of preconception health and care, the timing of implementing these components and which populations required preconception care were lacking. This is consistent with previous local and international research calling for increased health promotion efforts and availability of reliable evidence-based information for consumers [26,41]. Our study identified opportunities to improve preconception health information at the individual and population level.

Increasing awareness of the importance of preconception health at the individual level

Participants in our study identified the impact of preconception education provided by health professionals during antenatal care, reporting a change in preconception behaviours for subsequent pregnancies. The impact of preconception information provided in primary care has been shown to increase the likelihood of adopting a preconception health behaviour to those who are not currently pregnant [42]. Stephenson et al. showed that women who received preconception advice from a health professional were twice as likely to take folic acid and adopt a healthier diet before pregnancy, compared to those who had not received advice [42]. Participants in our study also expressed confidence their maternity care providers and see them as trusted sources of reproductive health information during and after pregnancy. This is supported by international data, including Vogels-Broeke et al.'s cross sectional study in over 1900 women in the Netherlands. They demonstrated over ninety percent of respondents identified midwives as a source of information for women during pregnancy, making them the most common source of information. [43]

While participants acknowledged the role of primary healthcare providers for reproductive health information, most women stated they

and their partners did not seek help from their GP prior to pregnancy even when they had good access to one. This presents a missed opportunity for preconception care. Additionally, women from rural and remote areas reported lengthy wait times to see their GP.

All participants in our study identified the need to include partners in discussions about pregnancy planning and preconception care. A survey of over 300 GPs in Australia showed that most do not discuss pregnancy intention or the importance of preconception care with men [44]. Midwives and maternity care providers also have a unique role in offering continuity of care to a woman and her partner on their pregnancy journey, which is often the first healthcare presentation for otherwise healthy individuals and couples [45,46]. This presents an opportune time to deliver preventive health information that can benefit parents and their children for the current and future pregnancies.

Midwives, who are Australia's primary maternity care providers, also work across many settings in a variety of models of care, including primary care and community health services, Aboriginal and Torres Strait Islander medical services, hospitals and health clinics. A midwife's scope of practice involves providing care and preventive measures across the pregnancy continuum from before pregnancy (preconception), during pregnancy, intrapartum an in the postnatal period [47]. There are over thirty thousand registered midwives in Australia, with 13.7 % having their principal work setting in primary care [48]

Recent studies have shown that midwives in Australia are keen and willing to provide preconception care and see that this is within their scope of practice [24,49]. This endorsement of the importance of preparing for pregnancy from this study should encourage midwives, working in all models of care and healthcare settings to ask opportunistically about pregnancy intention and provide preconception care in health consultations. This was also supported by a recent population-based study that showed 74 % of people of reproductive age felt it was acceptable to be asked about pregnancy intention [50].

Increasing awareness of the importance of preconception health at the population level

Both national and state-based strategies in Australia prioritise the provision of preconception information [28,31]. One state-based strategy states that "*Information about how to optimise health before conception is evidence-based, easily accessible and understood.*"(28p9) Messaging about the importance of preparing for pregnancy must begin early and at scale, then be available opportunistically, and on demand, via reputable sources to those who are seeking it. Participants in our study indicated the need for school-based education on preparing for pregnancy, so that this was not a new concept when adolescents reach their reproductive years. The need to include preconception health education in the school setting, to reach people at the beginning of their reproductive years, has been identified in other Australian studies [26]. Internationally school-based preconception education sessions have proven to be effective in increasing knowledge about preconception health [51]. Charafeddine et al. described a preconception health education session to more than 7000 students in years 10 – 12 in Lebanon. This included students aged 14–26 years old, with 75 % (5198) students younger than 18 years of age. The session comprised a 20-minute presentation, including visual resources that covered seven key preconception health areas and their impact on reproductive outcomes. Student's knowledge about preconception health was measured before and after the education session with students in all grades showing a 47 % improvement in their test scores after attending the session. [51]

At the very core of health promotion and education is the need to communicate in a language that people understand [52]. Most participants in our study had not heard of the term "preconception care" and preferred more simple terms to describe the concept. This must be considered and adopted when designing messaging to improve health prior to pregnancy. Plain language terms, that resonate with the population must be tested and incorporated into health promotion efforts.

The finding that people seek out trusted sources of information is consistent with existing Australian research that found that women wanted reproductive health information from credible sources, and that they often looked to the web handle to prioritise such information sources [22]. Online preconception and pregnancy health resources in the United Kingdom have been successful in their reach and engagement, proving a valuable vehicle for the delivery of evidence based reproductive health information [53]. These sources have adopted jargon-free terminology, using everyday terms such as "Planning for pregnancy" to be easily found by people.

The importance of trusted community members for reproductive health information mirrors findings from research on breastfeeding advice, which demonstrates the importance to family members and grandparents for decisions to breastfeed [54,55]. Recent international studies that explore awareness about and uptake of preconception health behaviours, have shown the influence of partners, friends and family as information resources. [41,56]

People living in rural and remote areas face the inequity of poor access to health care providers. This can lead to a lack of opportunistic provision of advice on preventive initiatives, including preparing for pregnancy. Almost 30 % of Australia's midwifery workforce practice outside of metropolitan centres, with the highest proportions of midwifery full-time-equivalent roles per 100,000 population being in remote and very remote communities [48]. Expansion of continuity-of-care models in these settings offers a key opportunity to improve preconception health and care for women and their partners in remote communities and the health of their future children.

Strengths and limitations

Strengths of this study include that it captured perspectives from both women and men and from people with different reproductive intentions and experiences. The findings support previous Australian research and demonstrate the urgent need to normalise conversations about pregnancy planning and incorporate advice about what people can do to give themselves and their children the best chance of good health into primary and antenatal care encounters.

We also acknowledge study limitations. Given most participants had a tertiary education, our sample may not have included those of lower health literacy and this needs to be considered when developing strategies for health promotion and education. These findings in an educated population may underestimate the true limitations in knowledge among people of reproductive age hence suggesting more urgency to improve awareness about preconception health and care [57]. People from rural and remote areas are only one priority population and understanding the needs and preferences of other key priority groups, including those from Aboriginal and diverse backgrounds, people living with disability and people with language backgrounds other than English should also be explored.

Conclusion

Our study has shown the appetite of people in reproductive age in Australia to learn about how to best prepare for pregnancy and their preferences for how to receive this information. This embodies a life course approach, with universal foundation of education through school settings, enhanced by a combination of readily accessible and opportunistically provided information from trusted sources and healthcare providers. The findings from this study can inform strategies to improve promotion of preconception health, provision of preconception care, and reproductive outcomes. Partnerships between health and education sectors to deliver reliable health information needs to begin in schools. Positive health messaging from trusted healthcare providers, including midwives is required to support the delivery of preconception care.

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CRediT authorship contribution statement

Edwina Dorney: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Investigation, Resources, Data curation, Writing, Project administration, Funding acquisition. **Kate Cheney**: Methodology, Investigation, Data curation, Analysis, Writing. **Loretta Musgrave**: Methodology, Analysis, Writing. **Karin Hammarberg**: Conceptualization, Methodology, Writing. **Ray Rodgers**: Conceptualization, Methodology, Writing. **Kirsten Black**: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data curation, Writing, Supervision, Funding acquisition

Ethical statement

This study was approved the University of Sydney Human Research Ethics Committee Project Number 2020/430 (22 June 2020).

Declaration of Competing Interest

All authors of this paper have no conflicts of interest to declare.

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