Preconception knowledge, beliefs and behaviours among people of reproductive age: a systematic review of qualitative studies.

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Review Article

Preconception knowledge, beliefs and behaviours among people of reproductive age: A systematic review of qualitative studies

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ABSTRACT

Background: The health of parents before pregnancy influences the short- and long-term health of their offspring. This systematic review explored the preconception knowledge, beliefs and behaviours held by women and men of childbearing age.

Methods: Databases were searched from 2009 to 2022 (MEDLINE, CINAHL Full-text, PsycINFO, EMBASE). Inclusion criteria specified qualitative research papers which recruited individuals of reproductive age (16–45 years) without existing chronic illnesses. Data were quality assessed and analysed using thematic synthesis.

Results: Twelve papers met inclusion criteria. Six themes were identified (cultural context, pregnancy planning, knowledge, gender roles and responsibility, information seeking, prior health behaviours) which relate to individual, social, psychological and cultural factors. Cultural context was related to all other themes. Pregnancy planners had greater motivation to optimise their health whereas those not actively planning were focused more on becoming financially stable. Women and men's knowledge of how and why to engage in health protective behaviours was limited, with health risks and behaviour change discussed in the context of pregnancy rather than preconception. Gender roles influenced individual responsibility for preparation for pregnancy, which in turn influenced information seeking behaviours and engagement in health behaviours. Online sources of support and information were seen as desirable, regardless of pregnancy planning stage.

Conclusions: Our findings indicate that behaviour change interventions designed to support people to optimise health before conception should address cultural, individual, social and psychological factors to facilitate behaviour change. Development of online resources may help to increase accessibility for people across different cultural contexts and stages of pregnancy planning.

1. Introduction

The preconception period can be defined from a biological, individual and public health perspective (Stephenson et al., 2018). From a biological perspective it is the 14 weeks prior to conception (Hoek et al., 2020). From an individual perspective, it is whenever two individuals with reproductive capacity decide they want to have a baby. From a public health perspective, it is any time, prior to pregnancy, when health behaviours are established (Stephenson et al., 2018). Broadly, a preconception population has three defining attributes; 1) reproductive age, 2) individual with the ability to conceive or contribute to conception, and 3) not currently pregnant (Hill et al., 2020). Health behaviours of this population are important as they impact fertility, pregnancy, and future health outcomes (Stephenson et al., 2018; Soubry, 2018). Pregnancy intention is recognised as a key driver to targeting preconception health behaviours. Barker et al. (2018) identified four preconception action phases; 1) children and adolescents who are forming a goal to become a parent, 2) adults with no immediate intention to become pregnant, 3) adults with intention to become pregnant and 4) adults with intention to become pregnant again. However, regardless of pregnancy intention and despite evidence for the benefits health promoting behaviours, women and men of reproductive

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age are rarely engaging in adequate health behaviours prior to pregnancy (Crozier et al., 2009). For example, in the UK 3 in 4 pregnant women do not take a folic acid supplement before becoming pregnant (Schoenaker et al., 2023). This low engagement can be attributed to lack of awareness of need to address health behaviours prior to pregnancy (Stephenson et al., 2021).

Systematic review evidence, from 42 quantitative and qualitative studies exploring barriers and enablers to women's preconception health behaviours, found that knowledge of preconception health was both an enabler and a barrier for engagement in health behaviours (Kandel et al., 2021). Specifically, misunderstanding what comprised a healthy diet and financial constraints were barriers to improving eating behaviours, whereas having appropriate knowledge of nutrition was considered an enabler. However, the review only focused on health behaviours of women, and did not explore the wider (biological, psychological and social) influences on preconception knowledge, beliefs and subsequent behaviours (Conner and Norman, 2017).

Thus, the existing literature indicates that many of the preconception population have low engagement in health promoting behaviours, linked to poor knowledge, lack of social support and beliefs about consequences. Research into preconception health and behaviours is in its relative infancy where the focus tends to be on women's behaviour, with less consideration of men's behaviour (Soubry, 2018; Cairncross et al., 2019). Hence, there is a need to comprehensively, collate existing qualitative literature to fully understand the potential individual, social, and psychological factors which influence engagement in health behaviours of women and men before conception. This understanding is essential to future health interventions and services so the preconception population can be supported at the biological, individual and public health level.

This study aims to systematically review existing qualitative literature to explore knowledge, beliefs and health behaviours of women and men of childbearing age in relation to promoting health before conception.

2. Methods

The protocol for this review was registered with PROSPERO (CRD42020176845) and uses publicly available summary data, hence, does not require ethical committee approval.

2.1. Inclusion criteria

Studies were eligible for inclusion if they met the following criteria:

- Recruited men and/or women of reproductive age (16–45, National Institute for Health and Care Excellence, 2019) who were not currently pregnant
- Addressed knowledge and/or beliefs of behaviours which can optimise health before conception
- Focused on knowledge and beliefs about optimising health before conception and specific recommended health behaviours (folic acid supplementation, physical activity, smoking cessation, fruit/vegetable consumption)
- Primary studies only
- Qualitative data collection and analysis only[1]
- Published in English language
- Published between 2009 and 2022[2]

[1] Inclusion of only qualitative studies allowed exploration of the context and nuances which influence a person's knowledge and beliefs around preconception.

[2] An initial publishing date for included studies of 2009 was chosen to allow a ten year period of relevant research to be analysed when the systematic review was first registered in 2019.

Studies which included healthcare professionals or participants who had pre-existing health conditions such as diabetes or epilepsy were excluded due to routine care often including preconception advice.

2.2. Search strategy

The search strategy aimed to locate published studies. An initial limited search of MEDLINE (Ovid) and CINAHL Full-Text (EBSCO) was undertaken to identify search terms and relevant articles on the topic. A librarian (AGo) developed a full search strategy for MEDLINE (Ovid) using text words and index terms gathered from relevant articles. The draft search strategy was then peer reviewed by a second librarian (AM) using the Peer Review of Electronic Search Strategies (PRESS) guidelines (McGowan et al., 2010). A revised search strategy, including all identified keywords and index terms, was adapted for each of the following databases: MEDLINE (Ovid), CINAHL Full-text (EBSCO), PsycINFO (EBSCO), and EMBASE (Elsevier). Databases were searched from inception to present, with date limits of 2009–2022 and English language limits applied to the results. Searches were initially run by AGo in February 2020 and the search was updated in its entirety on April 2022 using the same method except narrowing the search from 2020 onwards to ensure the most up-to-date evidence was incorporated into the review prior to publication (see Appendix I for full search strategies and results for each database).

2.3. Screening and data extraction

Duplicates were removed and all remaining titles and abstracts were screened independently by two reviewers (HW and SD). Full text screening was carried out independently using systematic review screening software Rayyan (HW and SD). Full text screening had an 86% agreement as two studies out of 12 required discussion before a final decision was made. All disagreements were resolved through discussion between HW and SD and did not require a third arbitrator.

All data extraction was carried out by one reviewer (HW) and checked by a second reviewer (SD).

2.4. Quality appraisal

The Critical Appraisal Skills Programme qualitative checklist (CASP, 2018) was used. Using the 'yes', 'can't tell' and 'no' for appraising each checklist item, a score of one was given to 'yes'. Zero points to 'no' or 'can't tell'. This allowed a maximum score of 10 per study. All studies were appraised by one reviewer (HW) and checked by a second reviewer (SD). Any disagreement between reviewers was resolved through discussion.

2.5. Analysis and synthesis

The data were analysed using a thematic synthesis (Thomas and Harden, 2008). This involved three stages; 1) line by line coding of the text; 2) development of descriptive themes; 3) development of analytical themes. Data for analysis included the studies' full results including participant quotes and author interpretations of them. One reviewer (HW) closely read the included studies and carried out line by line coding, under supervision of the research team. Codes and themes were discussed and developed with the review team (VS,AGr,SC,SD,HW). Through discussions, themes were refined.

3. Results

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidance was followed (Page et al., 2021).

3.1. Search results and study selection

The initial search identified 1984 records. After the screening process was complete, nine studies met the inclusion criteria (Fig. 1). An updated search was conducted in February 2022 and three additional studies met inclusion criteria, resulting in 12 studies included in analysis. The table of characteristics (Table 1) identifies included papers.

3.2. Study characteristics and quality appraisal

Included studies were published between 2010 and 2022. Nine studies included women only (Kretowicz et al., 2018; Lang et al., 2020; Liu, 2014; Mazza and Chapman, 2010; M'hamdi et al., 2018; Tuomainen et al., 2013; Walker et al., 2021; Ware et al., 2019; Yiga et al., 2021), and three included women and men (Lewis et al., 2013; McGowan et al., 2020; Quayyum and Dombrowski, 2021). Of the three studies including both sexes, two recruited individuals and one recruited couples (Lewis et al., 2013). Five studies specified whether participants had children (Lang et al., 2020; Lewis et al., 2013; McGowan et al., 2020; M'hamdi et al., 2018; Tuomainen et al., 2013), four specified that all participants were without children (Kretowicz et al., 2018; Quayyum and Dombrowski, 2021; Walker et al., 2021; Ware et al., 2019) and three did not specify (Liu, 2014; Mazza and Chapman, 2010; Yiga et al., 2021). The pregnancy planning status of participants was specified by one study (Lewis et al., 2013), two studies stated that participants were planning to conceive in the future (M'hamdi et al., 2018; Quayyum and Dombrowski, 2021) and nine did not specify pregnancy planning status (Kretowicz et al., 2018; Lang et al., 2020; Liu, 2014; Mazza and Chapman, 2010; McGowan et al., 2020; Tuomainen et al. 2013; Walker et al., 2021; Ware et al., 2019; Yiga et al., 2021).

A CASP score of 10 was given for three studies, a score of 9 was given for seven studies and a score of 8 was given for two studies (Table 1). Hence studies were of high quality.

3.3. Synthesis

Six themes were identified and developed (Table 2). Data from participants are presented in italics in quotation marks. Data from study authors are non-italicised in quotation marks.

Through stages 2 and 3 of the analysis, links between themes were identified. This allowed the six themes to be organised into a guiding framework (Fig. 2). The contextual role of culture was overarching and influenced all five other themes. Gender roles and pregnancy planning status influenced information seeking behaviour, which in turn was associated with knowledge. Gender roles, knowledge and pregnancy planning status are all associated with engagement in health promoting behaviours before conception.

3.4. Cultural context (2 subthemes)

The theme 'cultural context' incorporates cultural norms and societal norms between countries, religions, and ethnicities. The perceived influence of cultural context was reported in terms of beliefs and preferences towards healthcare and discussed across four studies (Lang et al., 2020; Liu, 2014; Tuomainen et al., 2013; Ware et al., 2019).

3.4.1. Cultural context influenced specific behaviours

Among a sample of native Chinese women, maintaining a healthy physique was viewed as important for both partners (Liu, 2014). Concerns were expressed regarding a greater risk of miscarriage if the

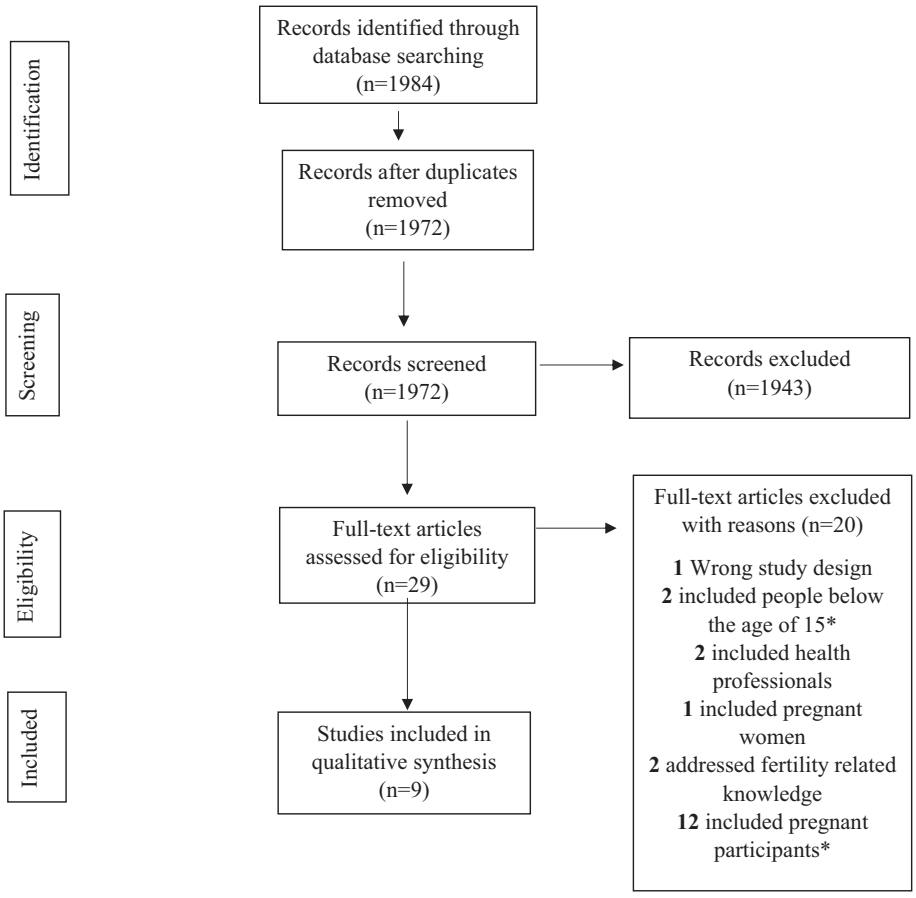

Fig. 1. PRISMA flow diagram of initial search, review process and study selection.
*Sub-group analysis was not possible due to data being combined.

Table 1
Characteristics and quality appraisal of included studies.

	Reference; CASP score	Number of participants	Location of study	Participant demographics	Participant ethnicity (N)	Status regarding previous pregnancies	Participants planning a pregnancy	Method of data collection
1	Kretowicz et al. (2018) CASP 9	20	UK	- Age range 18–49 - All women	White British (20)	All without children	Not specified	6 focus groups
2	Lang et al. (2020) CASP 10	25	Australia	- Lowest age 18 - All women - Migrant and refugee backgrounds	Afghan (10), Ethiopian (2), Indian (2), Pakistani (2), Sri Lankan (2), Other (7)	13 without children 12 with children	Not specified	2 focus groups with optional interviews if participants preferred
3	Lewis et al. (2013) CASP 9	116	USA	- Age range 18–44 - 58 couples (all heterosexual)	White (46 women, 42 men), African American/ Black (8 women, 9 men), Native American (1 man)	13 couples without children 45 couples with children	3 groups of participants: planners, non-planners and recent parents	Couple based structured interviews
4	Liu (2014) CASP 8	40	China	- Age range 20–29 - All women	Chinese (40)	Not specified	Not specified	Semi structured interviews
5	Mazza and Chapman (2010) CASP 8	17	Australia	- Age range 18–45 - All women	All native to Australia (17)	Not specified	Not specified	3 focus groups
6	McGowan et al. (2020) CASP 9	21	UK	- Age range 18–45 - 13 women, 8 men	All native to Northern Ireland (21)	13 without children 8 with children	Not specified	5 focus groups
7	M'hamdi et al. (2018) CASP 9	28	Netherlands	- Age range 18–41 - All women	Dutch (24) Other unspecified (4)	22 without children 6 with children	All planning to conceive in the future	Semi structured interviews
8	Quayyum and Dombrowski (2021) CASP 9	19	Canada	- Age range 19–23 - 14 women, 5 men	Not specified	All without children	All planning to conceive in the future	Semi structured interviews
9	Tuomainen et al. (2013) CASP 10	41	UK	- Age range 18–45 - All women	South Asian (14) African-Carribean (11), White (11), Mixed (5)	18 without children 23 with children	Not specified	9 focus groups, 19 follow up interviews
10	Walker et al. (2021) CASP 9	31	Australia	- Age range 18–45 - All women	Unspecified	All without children	Not specified	7 focus groups
11	Ware et al. (2019) CASP 10	29	South Africa	- Age range 18–24	South African (29)	All without children	Not specified	4 focus groups
12	Yiga et al. (2021) CASP 9	41	Uganda	- Age range 18–45 - All women	Ugandan (41)	Not specified	Not specified	12 focus groups

woman was not physically strong and, for men, a strong physique was associated with a healthy infant but also as a factor to determine the sex of the baby.

In this sample (Liu, 2014), women focused on regulating their menstrual cycle and engaging with Chinese medicine approaches. Cultural views regarding food were discussed in relation to the belief that cold foods should be avoided to preserve fertility and 'tonic foods' such as red dates and donkey-hide gelatin should be consumed alongside dietary supplements to promote health.

Nutrition was also discussed among a group of black, South African women who stated that they engaged in particular behaviours because that was seen as normal among their society and ethnicity (Ware et al., 2019). The concept of race was discussed regarding physical activity were engaging in health promoting behaviours such as exercise were viewed as an activity exclusively practised by white people (Ware et al., 2019).

3.4.2. *Cultural practices and family structure relate to information seeking*

The influence of cultural and societal norms within the context of education was discussed in two studies (Lang et al., 2020; Tuomainen et al., 2013) around the availability of sexual and reproductive health information. Among women who received sexual and reproductive health education in Australia, there was discussion about the difficulties they experienced in having subsequent discussions with older family members (Lang et al., 2020).

Conversations around accessing preconception health information were seen as important and women felt it was essential to engage with this after marriage due to cultural expectations of pregnancy (Tuomainen et al., 2013). One woman from an Indian background stated "*because we are thinking about our culture, if you are married then obviously you're going to be having babies.*". Within this study, women from a South Asian background had concerns about stigma associated with infertility in their communities which resulted in a reluctance to discuss pregnancy preparation with friends, family and health professionals (Tuomainen et al., 2013).

3.5. *Gender roles and responsibilities (3 subthemes)*

Gender roles and responsibilities when preparing for pregnancy were discussed across eight included studies, (Kretowicz et al., 2018; Lang et al., 2020; Lewis et al., 2013; Liu, 2014; McGowan et al., 2020; M'hamdi et al., 2018; Quayyum and Dombrowski, 2021; Tuomainen et al., 2013) often in terms of partner support and men's involvement in the preconception period.

3.5.1. *Men left out of conversations and less likely to talk*

In all three papers including men (Lewis et al., 2013; McGowan et al., 2020; Quayyum and Dombrowski, 2021), men discussed preconception and pregnancy as something to be focused on by women and therefore felt less inclined to discuss it. Authors (Tuomainen et al., 2013) described how women felt that preconception health should "encompass men more directly", this was echoed by a male participant from one study (Lewis et al., 2013) who described a shared approach to pregnancy preparation as being "*pretty motivating*".

Table 2
Themes, subthemes, descriptions and example supporting data.

Themes	Subthemes	Description of theme	Supporting data
Cultural context	Cultural beliefs influence specific behaviours	Culture influences prioritisation of specific behaviours along with avoidance of behaviours which do not align with women's cultural norms.	*"If a man maintains good physical strength before conception, it's likely for a couple to have a baby boy."* (Liu, 2014). *"…As a black kid, I was raised to eat like pap, meat, and sweets"* (Ware et al., 2019) *"I leave the house early in the morning at 5 and tell myself, you know what? I'm going to jog today. I'm going to start this diet thing. The minute you walk out, there are people that literally laugh at you. She is acting like a white person, she is running, she is jogging, what is she doing?"* (Ware et al., 2019)
	Cultural practices and family structure relate to information seeking	Conversations Centre around acculturation and the contrasting beliefs about preconception healthcare between family members and western education.	*"…Here [in Australia] we learn about period, whatever… how to use condoms… stuff like that. But there [in Thailand, where I lived] no, you just learn math, English…They don't have… proper health [education]…"* (Lang et al., 2020). *"I've been raised [in Australia]… so I've been taught all of these things in high school… At first I remember her [my mother] being a bit not willing to talk… about it; but I've seen over the years that she's more open to it…"* (Lang et al., 2020).
Gender roles and responsibilities	Men left out of conversations and less likely to talk	Men perceive preconception to be focused on women and felt uncomfortable discussing it with peers.	*"I can imagine there would be a bit of a stigma around [discussing] pregnancy in general [with males] because it's just perceived as a female-led operation"* (McGowan et al., 2020)
	Women seen as more knowledgeable with greater responsibility	Women are perceived as knowing more about pregnancy preparation and men acknowledged that greater responsibility for a baby's health is placed on the mother	"*They [people] would probably have blamed the woman if there were any problems [with a baby]"* (McGowan et al., 2020). *"You feel kind of like a baby making machine, if they're like 'you need to do this because it will be good for your pregnancy' and just not highlight other things and be like actually this is really good for your health in the long term"* (Kretowicz et al., 2018).
	Partners behaviours influencing woman's wellbeing	Partners are of great importance when supporting women with engaging in specific health behaviours	*"…we'd be a team and I'd get jealous if I saw him eating a hamburger all the time and I was stuck to salads and fish"* (Quayyum and Dombrowski, 2021). *"A man's temper will affect a woman's emotions, and it will have an impact on the future baby"* (Liu, 2014).
Limited knowledge	Some awareness of important behaviours	Health behaviours such as smoking cessation, avoiding alcohol along with improving ones fitness and nutrition are frequently recognised as being important.	*"The only precautions beforehand are quit smoking, drink less, get into some sort of a healthy routine, make sure that your body is in good shape. But that's a very general kind of precaution. It's not even a precaution. It's what everyone should do anyway"* (Lang et al., 2020). "*But weight, fitness and nutrition are really the main things [for PCC], and stay away from bad habits."* (McGowan et al., 2020)
	Limited understanding of nutrition and supplementation	Limited understanding as to what a healthy diet entails, along with a lack of knowledge regarding folic acid supplementation and its benefits.	*"I've always bought them [folate supplements] and had them ready to go but never really knew why."* (Lewis et al., 2013) *"Because you think you know it. I don't have a child with spina bifida, so why should I take the folate? And I don't need to go the doctor because I've done it all before."* (Lewis et al., 2013). *"Nutrition [is important for preconception health] probably with the lifestyle choices that you make too, but I don't really know [what else], probably more nutrition I would say"* (McGowan et al., 2020) *"There are so many different things out there, so many different diets that's a benefit and there's another bit of research that goes against it, and for everything they say is good, there is something else saying it's bad, so I don't really tend to pay too much attention"* (Kretowicz et al., 2018).
	Limited awareness of preconception and health risks	Health risks often conceptualised within the context of pregnancy and there is limited awareness of the benefits of engaging in health promoting behaviours before conception.	*"But I did stop drinking alcohol. Regarding smoking, yes I'll consider that when I really am pregnant….I have started to smoke a bit less."* (McGowan et al., 2020). *"I've heard of iron… thing that you just said [folic-acid] … But I didn't know that you have to take before you get pregnant…"* (Lang et al., 2020).
Information seeking	Preference for online information	Seeking health information online preferred by people across ages and cultures rather than speaking to a health professional initially.	*"I would seek information beforehand… My first source would be the internet. If I find… conflicting messages then I would go to a doctor and… asking around who I know has been pregnant…"* (Lang et al., 2020). *'So, if it's on Facebook, if there's like an article or something that seems of interest…[you're] going to look[at it]'* (McGowan et al., 2020).

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Table 2 (*continued*)

Themes	Subthemes	Description of theme	Supporting data
	Health professionals considered when complications arise	Consultations with health professionals are considered in the instance of a problem arising. This could be after finding conflicting information online, or when a couple had fertility concerns.	"*We already had a desire to have child for some time but still had not succeeded. Therefore, we wanted an appointment with the GP…"* (M'hamdi et al., 2018) *"but for preconception care it's an appointment to go and talk, it's not actually a procedure"*. (M'hamdi et al., 2018)
Pregnancy planning stage	Planners more receptive to preconception health information	People who are planning a pregnancy re interested in receiving health information. Receptiveness to health information among inter-conception couples planning a pregnancy is influenced by previous pregnancy and birth experiences.	*"If you were actively trying I think you would be more inclined to make the effort [to be healthy], but I think that at the minute it's not in my radar"* (McGowan et al., 2020). "*For my unexpected baby, I didn't have idea I had fibroid… I should have done more check-ups before falling pregnant… I should have prepared"*. (Lang et al., 2020)
	Planners/non-planners prioritise different ways to prepare for pregnancy	Planners are more receptive to health information, unlike non-planners who prioritise financial stability and building a healthy relationship with their partner. There is uncertainty as to the appropriate time to engage with health information.	*"…It's more to do with practicalities rather than to do with health…"*. (Lang et al,. 2020) *"It's kind of hard to say, like, 'When do I sign up for these things?"*. (Lang et al., 2020)
	Preconception action phaseand degree of planning influence engagement in behaviours	Motivation to engage in health promoting behaviours differs according to preconception action phase and stage of planning. Whilst those not planning a pregnancy are less receptive to health specific information in relation to conception, younger people not currently planning pregnancy are motivated to engage in behaviours such as healthy eating for different reasons such as aesthetics.	*"I think more about fitness and what I am going to look like in a bikini"* (Kretowicz et al., 2018). *"If they're planning on having a child in the next couple of years, there'd definitely be some motivation to try and make sure that you had a healthy baby and stayed healthy yourself"* (Lewis et al., 2013).
Behaviour specific barriers and facilitators	Influence of the family	Family dynamics are particularly important regarding behaviours such as eating healthily. Families can be a source of motivation or a barrier to changing behaviour.	*"I would love to cook with them [lentils and pulses] actually, I really would, but I would need to work on my other half, because he thinks a meal without meat is not a meal"*(Kretowicz et al., 2018). "*…my mother. I draw inspiration from her. I want to live a healthier lifestyle because I saw what happened to her when she was leading a healthy life…"* (Ware et al., 2019).
	Cost of a healthy diet	The perception of the cost of particular foods could be either a facilitator or a barrier to engagement in a healthy diet. Fresh foods are seen as too expensive to be practical for some.	*"Fruits and veg and quality meat is actually really quite expensive"* (Kretowicz et al., 2018) *"I don't think it has to be expensive, eating healthy, as people think, because frozen vegetables have just as much nutritional value as fresh I think, and things like lentils and beans and pulses are very cheap"*. (Kretowicz et al., 2018) *"There is no accessibility of healthy food; the only things you get is chips, bunny chow. It's the only things we can afford"* (Ware et al., 2019).
	Waning motivation	Motivation to engage in health promoting behaviours reduces the longer it takes to achieve pregnancy.	"*Yeah I tried quitting smoking but it took so long, so .. yeah… Well my mother also smoked during her pregnancy and here I am, so yeah…"* (M'hamdi et al., 2018).

3.5.2. *Women seen as being more knowledgeable with greater responsibility*

Men perceived women as being more knowledgeable about health before conception and recognised that women often bear greater responsibility for infant health outcomes. They considered the implications that can arise from pressure being applied to women (Kretowicz et al., 2018; Tuomainen et al., 2013).

Despite women being perceived as knowing more and preconception health being viewed as a female dominant area, both women and men expressed a desire for both sexes to be included in discussions about preconception health (Kretowicz et al., 2018; Tuomainen et al., 2013). Women expressed a particular discomfort with health messages being aimed at improving health for the purpose of having a baby *"You feel kind of like a baby making machine, if they're like 'you need to do this because it will be good for your pregnancy' and just not highlight other things and be like actually this is really good for your health in the long term"* (Kretowicz et al., 2018).

3.5.3. *Partners behaviours influencing woman's wellbeing*

Support from partners was recognised as important for engagement in health behaviours and general mental and emotional well-being across three studies (Lewis et al., 2013; Tuomainen et al., 2013; Lang et al., 2020). This was discussed by a woman from an inter-conception (in between pregnancies) couple regarding behaviour change *"…the support of a spouse can greatly affect the positive behaviors…"* (Lewis et al., 2013). The importance of partner support was echoed around dietary changes.

Partner's behaviours were also recognised as being important regarding the woman's mental and emotional wellbeing. Women stated that some behaviours such as smoking and alcohol use are more relevant to men and due to the importance of women *and* men's behavioural influence, preconception health information should include men (Tuomainen et al., 2013). Having preconception health messaging being aimed at men was suggested to include encouragement to support and communicate with their partner (Lang et al., 2020).

3.6. *Limited knowledge (3 subthemes)*

Knowledge of health behaviours and risks was discussed across nine studies (Lang et al., 2020; Lewis et al., 2013; Liu, 2014; Mazza and Chapman, 2010; McGowan et al., 2020; M'hamdi et al., 2018; Quayyum and Dombrowski, 2021; Tuomainen et al., 2013; Yiga et al., 2021). Behaviours such as alcohol consumption and smoking were frequently recognised as being detrimental to health during pregnancy, however risks were not always understood relative to preconception health. When intending to become pregnant, a healthy diet was often acknowledged as being important however depth of knowledge varied. There was a limited understanding across all studies regarding the importance of health behaviours before conception with behavioural changes often discussed within the context of pregnancy.

3.6.1. *Some awareness of important behaviours*

Abstaining from smoking and alcohol consumption were commonly

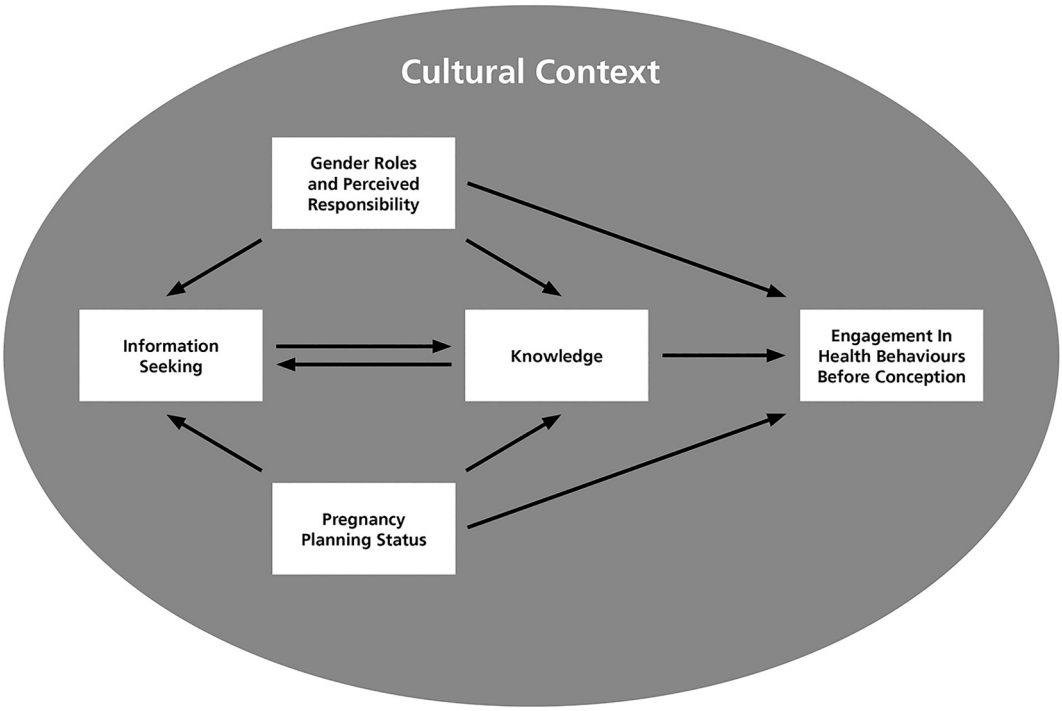

Fig. 2. Guiding framework of themes related to knowledge, beliefs and health behaviours of people of reproductive age.

mentioned across included studies by participants of different age, gender and cultural context (Lewis et al., 2013; Liu, 2014; McGowan et al., 2020).

The concept of maintaining a healthy physique by adhering to a healthy diet and engaging in physical activity was mentioned in three studies. One study discussed how participants felt it important to have a *"healthy lifestyle"* (Lewis et al., 2013). This concept was also mentioned with exercise and diet being mentioned specifically as important behaviours to engage in when intending to become pregnant (Liu, 2014, McGowan et al., 2020).

3.6.2. Limited understanding of nutrition and supplementation

When discussing folic acid supplementation before conception, there was limited awareness as to why this was important along with confusion regarding dosage and timing of starting supplementation (Lang et al., 2020; Lewis et al., 2013; Mazza and Chapman, 2010; M'hamdi et al., 2018). Among women with previous pregnancies there was some scepticism regarding the protective health benefits of folic acid supplementation as conception was viewed by some as a natural event which does not require medical intervention (Mazza and Chapman, 2010). Adequate nutrition was also deemed important however participants' understanding of how to prepare nutritionally was often superficial. Whilst participants felt there was wealth of available information regarding nutrition, this led to a sense of confusion due to variation of advice.

3.6.3. Limited awareness of preconception and health risks

When asked about health prior to conception, risks to health were mentioned in relation to pregnancy specific behaviours (McGowan et al., 2020). A male participant discussed the risks they perceived to be associated with alcohol consumption, *"I've just heard about miscarriages and stuff with drinking alcohol and things like that and smoking causing…I don't know if it's a myth, about it [smoking]stunting growth and that sort of thing. I've heard that before."* (McGowan et al., 2020). The same study reported how smoking cessation was seen as something to be considered after conception. Health risks associated with smoking were also discussed in terms of harm to the smoker, with risks related to passive smoking not mentioned.

The health risks caused by smoking and alcohol consumption and the benefits of behaviours such as folic acid supplementation were also reported as being discussed in the context of pregnancy rather than before conception (Lang et al., 2020).

3.7. Information seeking (2 subthemes)

Eight studies included discussions about seeking information regarding pregnancy planning and changing health behaviours (Kretowicz et al., 2018; Lang et al., 2020; Lewis et al., 2013; Mazza and Chapman, 2010; McGowan et al., 2020; M'hamdi et al., 2018; Tuomainen et al., 2013; Walker et al., 2021). Accessing preconception information was deemed desirable by women and men of different preconception action phases (Barker et al., 2018) and cultural context, however there were differences of opinion regarding timing of information being accessed and the delivery of that information.

3.7.1. Preference for online information

Across age and cultural backgrounds there was a preference for using internet sources as a method to find relevant health information (Lang et al., 2020; McGowan et al., 2020; M'hamdi et al., 2018; Walker et al., 2021). Online resources were discussed from two perspectives, that of people planning a pregnancy (adults with intention to become pregnant for first time or again) and that of passive social media users with no immediate plans to conceive (adolescents and adults with no immediate intention to become pregnant). For those with intention to become pregnant again, the internet was seen as a useful tool (Lang et al., 2020; Walker et al., 2021). Among all planners, online resources were used as an initial method of information seeking with health professionals consulted for further guidance Online health information was also an effective means of reaching those not actively planning a pregnancy. Many studies described the use of social media and influencers for providing information that younger participants could relate to.

3.7.2. Health professionals considered when complications arise

There was a concern expressed by participants across some studies that seeking advice was not the appropriate use of a doctor's appointment (Lang et al., 2020; M'hamdi et al., 2018). Consultations with a doctor were considered to discuss any fertility issues or stopping contraceptive use rather than general advice. The concept of having a particular issue or problem to discuss was viewed as a justification for visiting a health professional more so than the desire for general preconception health advice. This perception of the appropriate use of a doctor's appointment led to participants feeling an obligation to seek information independently before consulting a health professional (Lang et al., 2020; M'hamdi et al., 2018).

3.8. Pregnancy planning stage (3 subthemes)

Preparation for pregnancy was influenced by how soon people wished to become pregnant, with planners and non-planners having different priorities. Eight studies included discussion of various aspects of planning (Lang et al., 2020; Lewis et al., 2013; Liu, 2014; Mazza and Chapman, 2010; McGowan et al., 2020; M'hamdi et al., 2018; Tuomainen et al., 2013; Walker et al., 2021).

3.8.1. Planners more receptive to preconception health information

Women suggested that delivering preconception health information to people actively planning a pregnancy would be motivating (Mazza and Chapman, 2010; Quayyum and Dombrowski, 2021). However, receptiveness to preconception health information differed among interconception couples depending upon their previous pregnancy experiences. Those who had experienced a healthy pregnancy were less likely to view pregnancy preparation as important (Mazza and Chapman, 2010). For women who had previous complications, this viewpoint was different. One participant expressed regret about not having planned her pregnancy after experiencing complications (Mazza and Chapman, 2010).

3.8.2. Planners/Non-planners prioritise different ways to prepare for pregnancy

Couples at different stages of pregnancy planning were found to prioritise different behaviours to prepare for pregnancy. For those who were not planning a pregnancy, financial preparation was prioritised more than optimising health (Lewis et al., 2013). These findings were supported in an additional study whereby women who were yet to have children also focused on financial readiness along with their career and having a good relationship with the partner and family (Lang et al., 2020).

There was a general confusion among people as to when the most appropriate time is to engage with health advice.

3.8.3. Preconception action phase and degree of planning influence engagement in behaviours

Factors which influenced engagement in health promoting behaviours among those not planning a pregnancy included aesthetic reasons along with mental health and prevention of illness (Kretowicz et al., 2018; Lewis et al., 2013). Among non-planners (who tended to be younger), the intention to exercise and eat a balanced diet was largely driven by the desire to appear physically attractive. These views are in contrast with those of people who were planning their pregnancy. Among those who had an intention to conceive in the near future, there was a greater motivation to seek health information (Lang et al., 2020; McGowan et al., 2020).

3.9. Behaviour specific barriers and facilitators (3 subthemes)

Behaviour specific barriers and facilitators were addressed by five studies (Kretowicz et al., 2018; M'hamdi et al., 2018; Quayyum and Dombrowski, 2021; Ware et al., 2019; Yiga et al., 2021).

3.9.1. Influence of the family

Family roles were seen to influence diet quality and could act as a barrier or a facilitator to improving diet, depending on context. One participant stated her husband was a barrier to improving the family's diet (Kretowicz et al., 2018). Family influences were observed across cultural backgrounds.

3.9.2. Cost of a healthy diet

The cost of buying healthy food was discussed across studies where some participants felt that price of certain foods was a barrier to healthy eating. When experiencing financial barriers, food choice preferences included low cost, high satiety options which are energy dense. Fresh food was often viewed as unattainable due to financial constraints (Yiga et al., 2021). However, within the same study, some participants identified methods to improve diet quality at a low cost.

Whilst perceived financial barriers influenced food choices, availability of healthy foods was a factor which influenced eating behaviours in deprived communities (Ware et al., 2019).

3.9.3. Waning motivation

In some cases, motivation to engage in health behaviours diminished over time whilst trying to become pregnant. This was discussed within the context of taking folic acid supplements and eating a healthy diet, with the longer the time taken to achieve pregnancy, and therefore the timeframe leading to conception was unknown, the more likely people found it 'difficult to commit' to behaviour changes. Women described feeling more motivation to make changes to their behaviours once they knew they were pregnant (M'hamdi et al., 2018).

4. Discussion

The themes represent key individual, social, cultural and psychological factors which underpin preconception knowledge, beliefs and behaviours.

4.1. Cultural factors

There is clear importance of cultural context and how an individual's cultural influences impact preconception knowledge, beliefs and behaviour (Fig. 2). Cultural context was predominantly influential upon family and gender roles, preferences for receiving information and how certain health behaviours are engaged in. Research (mainly carried out in majority white/western contexts) has indicated higher pregnancy related mortality and morbidity among some ethnic minority groups (Badura et al., 2008; Horner-Johnson et al., 2021). Hence, the cultural context of health care, information provision and behaviour change should be prioritised in any preconception health research or service. This will enable preconception health information to be culturally sensitive and accessible.

4.2. Individual factors

Both women and men's knowledge of the importance of engaging in health promoting behaviours before conception was limited. Behaviours were often discussed within the context of pregnancy. Knowledge of how and when to engage in folic acid supplementation in particular was poor. This is problematic as greater knowledge regarding folic acid is associated with adherence to supplementation (Bayrami et al., 2020; Zadarko-Domaradzka et al., 2021; Kandel et al., 2021). Whilst it has been recognised that knowledge alone is not sufficient for behaviour change, it is seen as the first step to behaviour (Alm-Roijer et al., 2004).

There was a preference across pregnancy planning stage and cultural background for online, preconception health information which could be accessed privately. Online resources can provide low-cost intervention opportunities to increase awareness of the importance of preconception health for those not actively planning a pregnancy, whilst also

providing specific health information for those planning to conceive (Barker et al., 2018). Online preconception resources supporting behaviour change before conception have had promising results (Jack et al., 2020; Gardiner et al., 2013). The current findings could contribute to online interventions to ensure that appropriate information is given to users at the optimal time, whilst addressing knowledge gaps and including a gender neutral, and culturally appropriate approach to ensure that partners can be included.

4.3. Social factors

Gender roles related to perceived responsibility of preparation for pregnancy. Research has acknowledged that healthcare providers should avoid reinforcing gender stereotypes which put undue pressure on women (Mello et al., 2019). Despite gender roles influencing perceived responsibility to prepare for pregnancy, both women and men were receptive to the idea of receiving health information before conception. However, this varied according to pregnancy intention, aligning with Barker et al.'s (2018) preconception action phases which posits that receptiveness to health information is greater after there is intention to conceive. Whilst planning stage was related to openness to seek and receive information, this relationship was complex regarding those who had already experienced pregnancy. Our findings confirm Hill et al.'s (2019) conclusions that those who intend to become pregnant again are less likely to engage in preconception health behaviours compared with those intending to become pregnant for the first time. Although our findings caveat that those who had previous healthy pregnancies and births were even less likely to seek information, unless they had experienced complications.

4.4. Psychological factors

Motivation was implicit in many themes as influencing behaviour. Motivation to engage in healthy behaviours was strongest when pregnancy was planned and in the short term. The fact that motivation to engage in positive health behaviours waned over time is an important finding, confirming earlier work (Barker et al., 2018).

Interventions need to be targeted to pregnancy planning stage and individual motivations, whether that be for a future baby, current health, aesthetics or other motives. Our findings make it clear that behaviour change interventions designed to support people to optimise health before conception should address cultural, individual, social and psychological factors to facilitate behaviour change. Development of online resources may help to increase accessibility for people across different cultural contexts and stages of pregnancy planning.

4.5. Study limitations and strengths

This review systematically summarised the current qualitative evidence describing what people of reproductive age know and believe about preconception health behaviours across different locations, cultural backgrounds and preconception action phases. The inclusion of women and men across studies meant that individual perspectives could be examined along with views regarding partner support before conception.

Although women and men's perspectives are reviewed, only one study included partners which limits any inferences which can be made about dyadic planning within couples. Additionally, people with pre-existing conditions were excluded. These individuals are more likely to have dedicated healthcare support and possibly preconception health counselling or support. Although such preconception counselling is not consistent between condition or healthcare provider, this variation would have influenced results. Additionally, pregnant women were excluded as the review aimed to explore current preconception beliefs, knowledge and behaviours rather than past accounts. However, the knowledge, beliefs and behaviours of both groups are extremely important and should also be explored.

5. Conclusions

This review identifies key themes related to peoples knowledge, beliefs and engagement in health behaviours before conception. These themes span individual, psychological, social and cultural factors and should be considered key when addressing behaviour change in the preconception population.

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CRediT authorship contribution statement

Hannah Welshman: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Stephan Dombrowski:** Conceptualization, Data curation, Funding acquisition, Methodology, Writing – review & editing. **Aileen Grant:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **Vivien Swanson:** Conceptualization, Methodology, Writing – review & editing. **Alex Goudreau:** Methodology, Writing – review & editing. **Sinéad Currie:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ypmed.2023.107707.

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Search originally conducted on Feb. 11/20 and rerun on Apr. 12/22.

#	Query	Results Feb. 11/20	Results Apr. 12/22
1	Preconception Care/	2198	2606
2	((pregnan* or conception) adj3 (pre or prior or before or prepar* or plan* or intent*)).ab,ti.	25580	30408
3	"preconception".ab,ti.	3428	4495
4	"pre-conception".ab,ti.	506	677
5	"prepregnan*".ab,ti.	3353	3960
6	"pre-pregnan*".ab,ti.	3796	4972
7	(trying adj2 conceive).ab,ti.	408	524
8	"reproductive age".ab,ti.	12650	15771
9	"childbearing age".ab,ti	5769	6917
10	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9	48345	58268
11	exp Attitude to Health/	407158	459219
12	exp Health Behavior/	310144	350289
13	exp Health Education/	239506	257441
14	Adaptation, Psychological/	92687	101089
15	"Quality of Life"/	188047	237895
16	exp Self Care/	53592	59736
17	exp Life Style/	90547	105761
18	exp Motivation/	166272	185596
19	Attitude/	46629	51254
20	Information Seeking Behavior/	2252	3031
21	Awareness/	19731	21468
22	Choice Behavior/	31837	34391
23	(health adj3 (behavio$r* or attitude* or belie* or practice or plan* or education or know* or advice or aware* or information* or view* or opinion* or perception* or perspective or influence* or determinant* or barrier* or facilitator* or motiv* or choice* or action or adopt* or litera*)).ab,ti.	243033	298041
24	(lifestyle adj3 (change* or intervention)).ab,ti.	14668	18335
25	"knowledge gap* ".ab,ti.	10076	16608
26	11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25	1319663	1528403

27	((("semi-structured" or semistructured or unstructured or informal or "in-depth" or indepth or "face-to-face" or structured or guide) adj2 (interview* or discussion* or questionnaire*))). tw , kw or (focus group* or qualitative or ethnograph* or fieldwork or "field work" or "key informant"). ab,ti. or interviews as topic / or focus groups / or narration / or qualitative research /	373348	460138
28	10 AND 26 AND 27	1079	1394
29	Limit 28 to (english language and yr="2009 -Current")	790	
30	limit 28 to dt=20200211-20220412	[redacted]	271
31	limit 29 to english language		268

APA PsycINFO (EBSCO)

Search originally conducted on Feb. 11/20 and rerun on Apr. 12/22.

#	Query	Limiters/Expanders	Results Feb. 11/20	Results Apr. 12/22
S35	S30 AND S34	Expanders - Apply related words; Apply equivalent subjects Narrow by Language: - english Search modes - Find all my search terms	[redacted]	74
S34	ZD (2020* OR 2021* OR 2022*)	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms		431,546
S33	S18 AND S25 AND S29	Limiters - Publication Year: 2009-2020	227	[redacted]

		Expanders - Apply related words; Apply equivalent subjects Narrow by Language: - english Search modes - Find all my search terms		
S32	S18 AND S25 AND S29	Limiters - Publication Year: 2009-2020 Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	231	
S31		Limiters - Publication Year: 2009-2019 Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	1,600,582	
S30	S18 AND S25 AND S29	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	304	379
S29	S26 OR S27 OR S28	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	311,989	367,666

S28	DE "Qualitative Methods" OR DE "Focus Group" OR DE "Grounded Theory" OR DE "Interpretative Phenomenological Analysis" OR DE "Narrative Analysis" OR DE "Semi-Structured Interview" OR DE "Thematic Analysis"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	14,452	19,163
S27	TI ((focus group* or qualitative or ethnograph* or fieldwork or "field work" or "key informant")) OR AB ((focus group* or qualitative or ethnograph* or fieldwork or "field work" or "key informant"))	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	246,239	291,898
S26	TI (("semi-structured" or semistructured or unstructured or informal or "in-depth" or indepth or "face-to-face" or structured or guide) N3 (interview* or discussion* or questionnaire*)) OR AB (("semi-structured" or semistructured or unstructured or informal or "in-depth" or indepth or "face-to-face" or structured or guide) N3 (interview* or discussion* or questionnaire*))	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	102,194	122,262
S25	S1 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	6,620	7,721
S24	TI trying N2 conceive OR AB trying N2 conceive	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	84	96
S23	TI "childbearing age" OR AB "childbearing age"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	680	780

S22	TI "reproductive age" OR AB "reproductive age"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	1,068	1,290
S21	TI "preconception" OR AB "preconception"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	689	846
S20	TI "preconception care" OR AB "preconception care"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	106	129
S19	TI prepregnan* OR AB prepregnan*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	436	483
S18	S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	485,589	548,833
S17	TI aware* OR AB aware*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	122,684	139,667

S16	TI (health N3 (behavio$r* or attitude* or belie* or practice or plan* or education or know* or advice or aware* or information* or view* or opinion* or perception* or perspective or influence* or determinant* or barrier* or facilitator* or motiv* or choice* or action or adopt* or litera*)) OR AB (health N3 (behavio$r* or attitude* or belie* or practice or plan* or education or know* or advice or aware* or information* or view* or opinion* or perception* or perspective or influence* or determinant* or barrier* or facilitator* or motiv* or choice* or action or adopt* or litera*))	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	102,679	119,623
S15	DE "Intention" OR DE "Behavioral Intention"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	19,059	23,507
S14	DE "Preferences" OR DE "Aesthetic Preferences" OR DE "Brand Preferences" OR DE "Food Preferences" OR DE "Occupational Preference"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	32,125	36,088
S13	DE "Planned Behavior" OR DE "Behavioral Intention"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	4,331	5,378
S12	DE "Behavior Change" OR DE "Readiness to Change" OR DE "Stages of Change"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	13,610	15,043
S11	DE "Lifestyle" OR DE "Active Living" OR DE "Lifestyle Changes"	Expanders - Apply related words; Apply	11,557	13,092

		equivalent subjects Search modes - Find all my search terms		
S10	DE "Choice Behavior"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	29,712	31,823
S9	DE "Quality of Life"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	54,580	62,021
S8	DE "Awareness"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	20,638	24,298
S7	DE "Motivation"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	72,649	81,261
S6	DE "Health Education"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	19,723	21,237
S5	DE "Health Behavior"	Expanders - Apply related words; Apply equivalent subjects	37,755	41,424

		Search modes - Find all my search terms		
S4	DE "Health Knowledge"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	7,572	8,636
S3	DE "Attitudes"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	26,475	29,456
S2	DE "Health Attitudes"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	10,141	10,896
S1	TI ((pregnan* or conception) N3 (pre or prior or before or prepar* or plan* or intent*)) OR AB ((pregnan* or conception) N3 (pre or prior or before or prepar* or plan* or intent*))	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	4,217	4,907

CINAHL Full-Text (EBSCO)

Search originally conducted on Feb. 11/20 and rerun on Apr. 12/22.

#	Query	Limiters/Expanders	Results Feb. 11/20	Results Apr. 12/22

S28	S23 AND S26	Expanders - Apply related words; Apply equivalent subjects Narrow by Language: - English Search modes - Find all my search terms	[redacted]	264
S27	S23 AND S26	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms		274
S26	ZD (2020* OR 2021* OR 2022*)	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms		858,014
S25	S10 AND S18 AND S22	Limiters - Published Date: 20090101-20201231 Expanders - Apply related words; Apply equivalent subjects Narrow by Language: - english Search modes - Find all my search terms	739	[redacted]
S24	S10 AND S18 AND S22	Limiters - Published Date: 20090101-	764	

		20201231 Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms		[redacted]
S23	S10 AND S18 AND S22	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	993	1,401
S22	S19 OR S20 OR S21	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	249,108	319,582
S21	(MH "Qualitative Studies+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	134,597	167,789
S20	TI ((focus group* or qualitative or ethnograph* or fieldwork or "field work" or "key informant")) OR AB ((focus group* or qualitative or ethnograph* or fieldwork or "field work" or "key informant"))	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	157,392	209,724
S19	TI (("semi-structured" or semistructured or unstructured or informal or "in-depth" or indepth or "face-to-face" or structured or guide) N3 (interview* or discussion* or questionnaire*)) OR AB (("semi-structured" or semistructured or unstructured or informal or "in-depth" or indepth or "face-	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	75,743	101,622

	to-face" or structured or guide) N3 (interview* or discussion* or questionnaire*))			
S18	S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	16,996	22,934
S17	TI "reproductive age" OR AB "reproductive age"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	3,458	5,032
S16	TI "childbearing age" OR AB "childbearing age"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	1,698	2,239
S15	TI trying N2 conceive OR AB trying N2 conceive	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	180	255
S14	TI "preconception" OR AB "preconception"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	1,748	2,394
S13	TI prepregnan* OR AB prepregnan*	Expanders - Apply related words; Apply equivalent subjects	1,612	2,079

		Search modes - Find all my search terms		
S12	TI ((pregnan* or conception) N3 (pre or prior or before or prepar* or plan* or intent*)) OR AB ((pregnan* or conception) N3 (pre or prior or before or prepar* or plan* or intent*))	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	9,275	12,428
S11	(MH "Prepregnancy Care")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	1,801	2,221
S10	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	1,192,094	1,467,670
S9	TI aware* OR AB aware*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	89,754	118,616
S8	TI (health N3 (behavio$r* or attitude* or belie* or practice or plan* or education or know* or advice or aware* or information* or view* or opinion* or perception* or perspective or influence* or determinant* or barrier* or facilitator* or motiv* or choice* or action or adopt* or litera*)) OR AB (health N3 (behavio$r* or attitude* or belie* or practice or plan* or education or know* or advice or aware* or information* or view* or opinion* or perception* or perspective or influence* or determinant* or barrier* or	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	151,259	201,119

	facilitator* or motiv* or choice* or action or adopt* or litera*))			
S7	(MH "Life Style+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	203,249	254,367
S6	(MH "Health Education+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	115,937	134,437
S5	(MH "Health Information+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	26,221	33,613
S4	(MH "Behavior+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	893,611	1,090,525
S3	(MH "Health Knowledge")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	27,138	33,989
S2	(MH "Attitude")	Expanders - Apply related words; Apply equivalent subjects	14,733	17,218

		Search modes - Find all my search terms		
S1	(MH "Attitude to Health+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	145,065	172,350

Embase (Elsevier)

Search originally conducted on Feb. 11/20 and rerun on Apr. 12/22.

#	Query	Results Feb. 11/20	Results Apr. 12/22
#22	#7 AND #15 AND #19 AND [english]/lim AND [11-02-2020]/sd NOT [13-04-2022]/sd		675
#21	#7 AND #15 AND #19 AND [english]/lim AND [2009-2020]/py	1,623	
#20	#7 AND #15 AND #19	1,944	2,573
#19	#16 OR #17 OR #18	425,793	530,965
#18	'qualitative research'/exp	71,582	99,319
#17	'focus group*':ab,ti OR qualitative:ab,ti OR ethnograph*:ab,ti OR fieldwork:ab,ti OR 'field work':ab,ti OR 'key informant':ab,ti	315,224	396,197

#16	(('semi-structured' OR semistructured OR unstructured OR informal OR 'in-depth' OR indepth OR 'face-to-face' OR structured OR guide) NEAR/3 (interview* OR discussion* OR questionnaire*)):ab,ti	154,880	196,997
#15	#8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14	69,237	84,273
#14	(trying NEAR/2 conceive):ab,ti	753	973
#13	'reproductive age':ab,ti	17,921	22,770
#12	'childbearing age':ab,ti	7,729	9,518
#11	preconception:ab,ti	4,872	7,574
#10	prepregnan*:ab,ti	4,415	13,239
#09	((pregnan* OR conception) NEAR/3 (pre OR prior OR before OR prepar* OR plan* OR intent*)):ab,ti	37,799	45,943
#08	'prepregnancy care'/de	1,590	2,339
#07	#1 OR #2 OR #3 OR #4 OR #5 OR #6	4,442,453	5,189,310
#06	awareness:ab,ti	199,044	252,106

#05	(health NEAR/3 (behavio$r* OR attitude* OR belie* OR practice OR plan* OR education OR know* OR advice OR aware* OR information* OR view* OR opinion* OR perception* OR perspective OR influence* OR determinant* OR barrier* OR facilitator* OR motiv* OR choice* OR action OR adopt* OR litera*)):ab,ti	302,904	375,879
#04	'awareness'/de	79,161	111,111
#03	'lifestyle modification'/exp	36,534	45,343
#02	'health education'/exp	319,432	359,461
#01	'behavior'/exp	4,038,732	4,708,095