Ways of Knowing During Pregnancy: Personal, Embodied, and Technological Information Practices

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High-stakes, personally meaningful health domains require decisions under urgency and uncertainty. However, existing everyday information-seeking models rarely capture these challenges. For example, pregnancy is deeply personal, often medically complex, and unfolds across months of shifting needs. To understand how people seek and use information during pregnancy, we study the design space of sources, challenges faced, and the role of technology, including AI, in these processes. We conducted semi-structured interviews with fourteen individuals who were pregnant or had given birth within six months. Findings reveal that participants engaged in multi-layered information-seeking to address medical, emotional, and practical needs, but repeatedly encountered challenges. Regardless of trust, all participants extensively cross-referenced sources and developed strategies that selected sources for question types and urgency. Our work suggests designing for cross-referencing by considering different needs, creating systems that recognize high-risk contexts to provide feedback, and overall, moving beyond "all-in-one" pregnancy apps toward specialized tools.

CCS Concepts: • **Human-centered computing** → **Empirical studies in HCI**.

Additional Key Words and Phrases: Information seeking, pregnancy, health informatics, information evaluation, women's health

1 Introduction

High-stakes domains are situations where decisions carry urgent, irreversible, or life-threatening consequences that impact both individuals and their surrounding communities [34, 47]. High-stakes situations can also be deeply *personally meaningful*—those closely connected to one's identity, values, or personal circumstances [21]. In such contexts, information seeking becomes consequential, meaning that outcomes can reshape one's sense of self and reinforce or challenge core beliefs [21]. However, existing information-seeking models do not adequately address the urgency, and emotional intensity inherent in these situations [14]. For instance, the Everyday Life Information Seeking (ELIS) model was conceptualized around routine scenarios rather than urgent or high-consequence contexts [48].

Pregnancy provides a compelling example of a high-stakes, personally meaningful situation that requires making decisions with lasting impacts, over months of evolving needs [15, 44]. A similar sense of ongoing change is mirrored in high-stakes health conditions where new symptoms and risks surface unpredictably. Research on health information-seeking demonstrates that serious health conditions generate profound uncertainty and emotional distress, driving individuals to seek information for multiple purposes: obtaining medical guidance, understanding symptoms, and managing anxiety [16, 33, 39, 50]. People navigate fragmented information landscapes, adapting their behaviors as their circumstances evolve [12, 14, 17, 21]. Pregnancy-specific research has highlighted the various information-seeking strategies people have [7, 35, 54]. While prior research provides valuable insights into information-seeking patterns, gaps remain in understanding the mechanisms behind source selection in high-stakes, personally meaningful domains. What needs do people have when they look for information? What challenges do people face, and what are priorities when it comes to choosing information sources? Answering these questions contributes to supporting pregnant individuals in their information needs and decision-making process.

To address these gaps, our research seeks to understand the information-seeking processes in pregnant people by examining four research questions: (1) What is the design space of information sources? (2) What reasons do people have when seeking information? (3) What are the challenges they face while seeking information? and (4) What mental models do people have of different information sources? Our study identifies dimensions of information sources that

influence information-seeking behaviors, examines how these processes vary among people facing similar challenges, and lists challenges to accessing and using information.

Drawing on semi-structured interviews with 14 pregnant people or those who had given birth within the last six months, our findings show that information seeking during pregnancy is a dynamic, adaptive process shaped by medical concerns, emotional needs, and the demands of daily life. This process was constrained by four interconnected levels of challenges including individual, institutional, information ecosystem and technology. To navigate the challenges, participants developed strategies choosing different sources for different purposes like information needs or emotional support, and performed extensive cross-referencing for all information sources, regardless of their level of trust. Technology-based information sources had limitations: they often reproduced rather than resolving existing problems, which led people to use them cautiously and develop several workarounds when using them. These findings point to the need for more adaptive, context-sensitive information systems that respond to users' multiple information needs in high-stakes, personally meaningful contexts.

2 Related Work

Our research draws inspiration from prior studies of high-stakes health information practices, which demonstrate the urgency, uncertainty, and emotional weight of decision-making in such contexts. Our ideas build on prior work around how people search across fragmented information sources of professional advice, peer networks, and digital platforms.

2.1 Information-seeking practices for high-stakes, personally meaningful topics are underexplored

People seek information on a wide range of topics in everyday lives—what to eat, how to travel, how to manage their time. Such everyday information-seeking has been studied within frameworks like the Everyday Life Information Seeking (ELIS) model, which studies how individuals navigate routine, low-risk decisions [14, 48]. However, certain situations that are unfamiliar, uncommon, or involve decisions with long-lasting consequences demand different strategies for gathering and interpreting information [14].

When people face high-stakes or personally meaningful decisions, their information-seeking takes on new complexity and urgency [14]. High-stakes situations involve substantial risk, uncertainty, or the possibility of irreversible consequences often tied to major life events with emotional, financial, or health-related implications [42]. Such situations make it essential to carefully assess credibility, weigh competing risks, and navigate uncertainty, all under heightened anxiety and time constraints that can impair judgment [1, 19, 23, 24]. For example, in emergency departments treating critically ill pediatric patients, healthcare providers must rapidly evaluate conflicting diagnostic information while managing their own stress responses and the emotional distress of family members [1].

At the same time, information-seeking becomes personally meaningful when it is closely tied to identity, values, or deeply personal circumstances [21]. The outcome of information seeking in such situations affects important personal matters. Hence, people pursue information to make decisions, to reduce uncertainty and navigate emotionally significant life changes. For example, during the pandemic, parents of young children often searched for behavioral strategies, questioned their own competence, and repeatedly sought reassurance from teachers and therapists while juggling roles of parent, teacher, and caregiver [38, 46].

Some situations can be both high-stakes and deeply personal for people. For example, individuals' decisions based on health information directly affect their physical well-being, safety, and long-term outcomes [36]. Poor or misleading health information can result in dangerous treatments or errors *e.g.*, people might use unproven home remedies that cause

more harm than good [51]. However, there remains limited empirical work examining the distinct information-seeking processes that emerge when people navigate decisions that are simultaneously high-stakes and deeply personal.

2.2 Needs for seeking information: knowledge and emotional

People seek health information to fill knowledge gaps–to understand treatments, interpret diagnostic results, or gain a broader understanding of their health and disorder [13, 16]. The sources people turn to are shaped by factors such as prior experience [13], the degree of privacy desired [16], and the perceived complexity of their condition [12]. For example, individuals dealing with personal, non-severe health concerns such as overweight and sciatic pain rely on familiar, trusted sources. Due to their ongoing engagement with such pre-existing health conditions, they are more likely to have already acquired prior knowledge about online health-related sources that best meet their needs [13]. Search engines are favored for sensitive or stigmatized concerns such as sexually transmitted diseases where anonymity is crucial [16]. For complex conditions like multiple sclerosis lay people lean on health professionals' inputs [12]. In contrast, for less urgent issues such as weight loss, lay people prefer advice from everyday individuals who share their personal knowledge and experiences online such as personal webpages or social network services [12].

For health-related contexts, people use information sources for purposes that go beyond addressing knowledge gaps. For instance, individuals undergoing In Vitro Fertilization (IVF) treatments often use information selectively to manage emotions rather than acquire new facts. In such uncertain situations, where outcomes are highly unpredictable and failure rates exceed 50%, returning to familiar sources provides comfort and reassurance as a coping strategy [33]. The value of information can rest as much in its emotional and social significance as in its factual content. During the COVID-19 pandemic, for example, many sought information due to social expectations; pressure from family, friends, and communities to remain informed, even among those who already felt knowledgeable [28].

High-stakes, personally meaningful contexts simultaneously drive a focus on accuracy and timeliness for health decision-making while demanding attention to emotional and social concerns. For example, people with dementia seek online health information to support critical life decisions: to continue working, and how to manage relationships. Simultaneously, they navigate the emotional impact of overly pessimistic content and use peer networks to collaboratively evaluate information credibility before making healthcare choices [17]. In such contexts, information-seeking no longer only fills in knowledge gaps. Information-seeking becomes an adaptive process in which information is reorganized to simultaneously meet medical, emotional, and relational needs. Prior research highlights that people pursue health information for purposes beyond knowledge acquisition, there is limited understanding of how individuals modify their strategies as personal circumstances, and emotional states evolve.

2.3 Information-seeking in pregnancy: strategies and adaptations

One instance of a high-stakes, personally meaningful topic is pregnancy. Pregnancy involves emotionally charged, urgent, often uncertain decision making with lasting consequences [15]. Information-seeking during pregnancy is often motivated by the need to reduce health risks. Throughout gestation, both maternal and fetal health are at risk; therefore, accessing and using reliable information is essential for reducing pregnancy-related complications [31]. Additionally, people's approach to information-seeking varies depending on their circumstance such as demographic characteristics, cultural traditions, and healthcare beliefs. For example, African-American people in the United States, specifically in Detroit, face higher risks of miscarriage or maternal mortality [9]. This disparity results partly from systemic failures in healthcare systems that inadequately inform and support pregnant people, prompting many to turn to YouTube videos, Facebook groups, and pregnancy-related apps for knowledge and emotional support [9]. Additionally, research in South

India (in rural and semi-urban areas of Karnataka state), found that pregnant and nursing people navigate reconciling traditional knowledge passed down from family with (often conflicting) guidance from medical professionals [7]. Some pregnant people also pursue *integrative medicine* because they value self-empowerment and holistic approaches to health [54].

Pregnancy information needs are inherently dynamic, changing throughout the pregnancy journey and beyond. The concept of pregnancy ecology captures the complexity of pregnancy by recognizing the interconnected needs for information, physical and emotional self-care, and social support [44]. Pregnancy needs also encompass "the whole experience," which includes the psychological, social, and personal dimensions that shape how individuals navigate pregnancy and childbirth [6]. Analysis of search logs from pregnant people reveals how information topics evolve across different trimesters. During early pregnancy, searches for pregnancy tests reflect needs for confirmation, while concerns about fetus's heartbeat seek reassurance about normal fetal development. These searches then shift to labor-related topics as people prepare for birth in later stages [20]. Research has also identified three key elements that continually evolve throughout pregnancy: support needs, sources of support, and the types of interventions available [45].

However, despite this rich body of research, important gaps remain. Pregnancy-related information-seeking is multifaceted and context-dependent. It reflects not just the urgency of addressing immediate health risks, but also the broader social and emotional conditions that shape how people access, evaluate, and use information. Current research has shown how people seek and use pregnancy information. However, gaps remain in understanding people's mental models of different information sources for pregnancy, and how challenges encountered by people during the information-seeking shape their mental model. Addressing these gaps can guide the design of supportive information systems that better serve people's information needs based on their preferences.

3 Methods

We conducted a mixed-methods study pairing surveys with follow-up interviews to answer the research questions: What is the design space of information sources? What reasons do people have when seeking information? What are the challenges they face while seeking information? What mental models do people have of different information sources?

3.1 Participants

We recruited adults living in the United States who were currently pregnant, or had been in the last six months. Participants were recruited through several mechanisms. We primarily recruited through existing networks, leveraging personal contacts to identify interested participants within the inclusion criteria. We also submitted our study information to ResearchMatch, a platform provided by the NIH to facilitate connecting volunteers with researchers across the United States. NIH ResearchMatch platform enabled us to search for volunteers within our criteria by setting up filters for specific demographics and health conditions. Lastly, some participants were recruited through snowball sampling, where participants who knew other eligible participants shared the study information. We designed a recruitment flyer that was shared with interested participants which included the study topic, location (Zoom), time requirement, compensation, and a QR code linked to a participant interest survey. All eligible and interested participants received an informed consent form prior to their interview. We received fourteen completed forms from participants who agreed to both the 10-minute survey and the 1-hour interview study. Participant demographics are represented in Table 1. This study was noted as exempt by the host's Institutional Review Board of a public research university.

Table 1. Participant Demographics

ID	Geographic Division	Pregnancy Progress	Age Range	Ethnicity	Education	Occupation	# Times Pregnant	# of Children	Household Income
P1	Western US	40 weeks	35-39	Southeast Asian	Master's	Product Manager	1	1	$100,000+
P2	Mountain West	08 weeks	31-34	White, West/Central Asian	High School	Dance Instructor, Barista	1	1	$70,000-$100,000
P3	Western US	03 months postpartum	35-39	Southeast Asian	Doctorate	Engineer	1	1	$100,000+
P4	South Atlantic	06 months postpartum	35-39	West/Central Asian	Doctorate	Pharmacist	1	1	$100,000+
P5	Western US	06 months postpartum	31-34	East Asian	Bachelor's	Software Security Engineer	1	1	$100,000+
P6	Mountain West	17 weeks	23-26	White	Bachelor's	Financial Analyst	1	1	$100,000+
P7	Western US	07 weeks postpartum	40+	Hispanic/ Latin American	Doctorate	UX Researcher	2	2	$100,000+
P8	Mountain West	06 months postpartum	27-30	White	Master's	Clinical Research Coordinator	2	1	$100,000+
P9	Mountain West	33 weeks	35-39	White	Doctorate	Research Scientist	2	2	$100,000+
P10	South Atlantic	06 months postpartum	35-39	West/Central Asian	Bachelor's	Homemaker	8	5	$100,000+
P11	Mountain West	14 weeks	27-30	White	Doctorate	Physical Therapist	1	1	$70,000 -$100,000
P12	Mountain West	38 weeks	27-30	White	Master's	Clinical Research Coordinator	1	1	$100,000+
P13	Mountain West	03 months postpartum	35-39	White	Doctorate	Professor	2	1	$100,000+
P14	Middle Atlantic	31 weeks	31-34	White	Master's	Epidemiology Research Associate	4	3	$100,000+

* All participants' marital status was married.

3.2 Study materials

3.2.1 Pre-Interview Survey. Preliminary work identified and categorized a comprehensive list of ten pregnancy information source categories in the United States. Based on prior work, two researchers designed this survey to capture the broad patterns around people's familiarity with, frequency of use, trust in, and cross-referencing behaviors around said categories. Each metric was measured using a predefined five-point Likert scale. Insights from our pilot study led us to restructure the survey questions to limit repetitive questions and total completion time. Our final survey presented participants with definitions and examples for each information source category, followed by four multiple-choice grid questions rating each category on its corresponding scale (1-5) by each metric (familiarity, frequency, trust, cross-referencing). Finally, participants were given the option to answer two open text questions about information sources we may have missed, and information gaps they have encountered.

3.2.2 Interview. From our knowledge of pregnancy information sources, we iterated over interview questions to target various aspects of our research questions. Pilot study results uncovered gaps in research question coverage and order. The interview questions were reordered for conversational flow, and modified to reveal participant's mental models. Final additions to interview questions were made after receiving each participant's survey results. We incorporated targeted questions to explore participants' specific behaviors in greater depth. We developed a structured interview guide covering five key areas:

(1) Opening questions that asked about people's general experiences during pregnancy: gestational age, challenges, and typical daily activities

(2) Information-seeking questions that prompted evaluation of sources and selection factors: information-seeking needs, criteria, and reasons

(3) Source-specific questions that were tailored to individual survey responses: experiences with and attitudes towards information sources

(4) Decision-making questions that focused on when information led to actionable changes: characteristics of information sources, decisions made, outcomes

(5) Mental-model questions that explored people's ideal way of seeking information: information source ranking, cross-referencing behaviors, and navigation paths

3.2.3 Demographic Survey. Lastly, we created a demographics survey through Qualtrics that captured participants' education, occupation, age, ethnicity, and household metrics (marital status, number of children, household income).

3.3 Study and Data Collection

Recruited members were contacted by email to schedule an interview time most convenient for them. Each participant was also sent the link to the pre-interview survey to complete prior to their interview. Researchers reviewed participant survey responses before conducting interviews to identify patterns and add probing questions.

Semi-structured Zoom interviews were conducted over private, password-protected virtual rooms. The lead researcher led each interview, accompanied by a second team member in some sessions. Every interview began with the lead researcher obtaining verbal consent from the participant to be audio- and video-recorded. Researchers emphasized that there were no wrong answers; all responses would be received without judgment; participants could decline to answer any question; and they could end the interview at any time. Throughout each interview, researchers asked follow-up questions to gather additional context around participant answers for clarity. After each interview, the link

to complete the demographics survey was sent through Zoom chat, and completed by participants before ending the call. Interviews ranged from 25 to 64 minutes, averaging 41 minutes. Participants were compensated with a $30 gift card of their choice from Amazon, Walmart, or Target.

3.4 Analysis

Results from the pre-interview survey were analyzed to gather statistical values including mean, median, and CI range. Interview transcripts were analyzed through inductive thematic analysis approach. Two researchers conducted separate coding of the transcripts using Atlas.ti followed by collaborative analysis. Codes were exported into Miro, and visually organized through affinity mapping to identify overarching themes regarding information-seeking behaviors during pregnancy. Insights from the results informed a set of design claims—logical inferences on how digital tools can better support the process of seeking information in high-stakes, personally-meaningful situations.

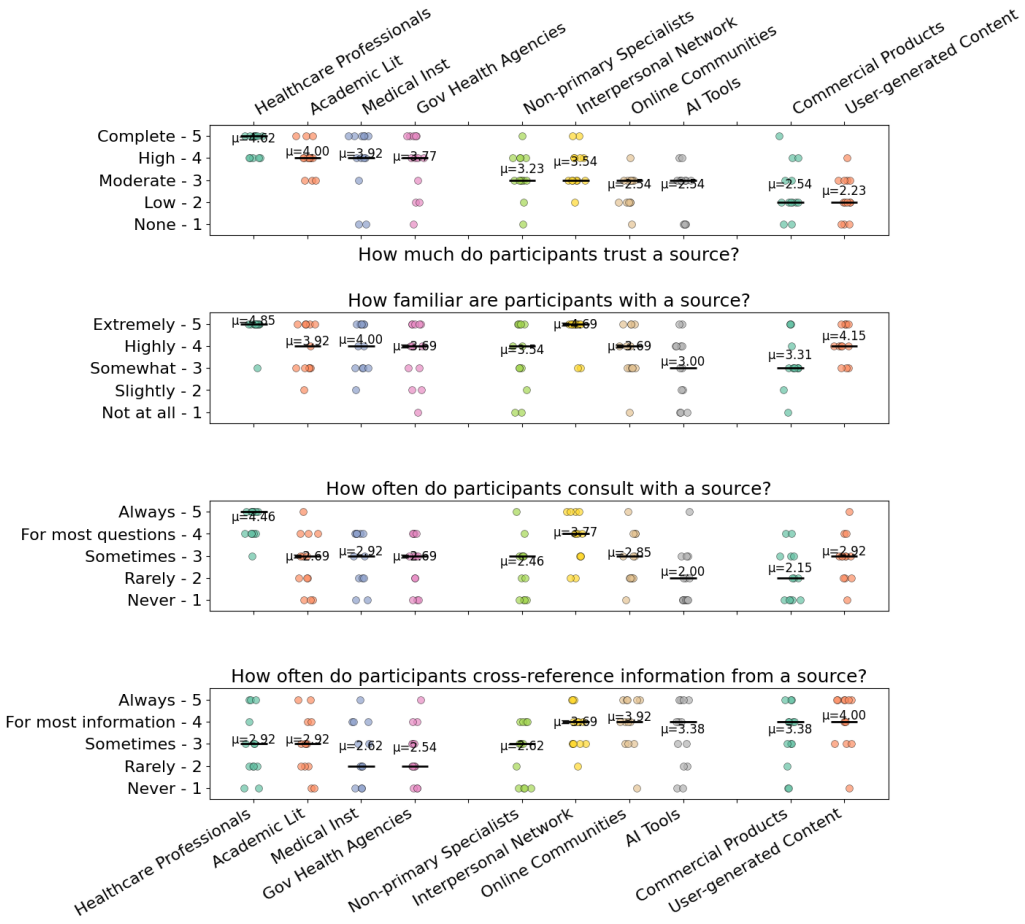

Fig. 1. Information source usage patterns: trust, familiarity, consultation, and cross-reference behaviors across different sources

4 Results

Our study focuses on pregnant people's information-seeking processes during pregnancy, including how they search for and assess health information, as well as the challenges they face throughout this process. We summarize the trends in trust, familiarity, frequency, and cross-reference along with the means and medians for all information sources in Figure 1.

We have organized the qualitative results in three sections. First, we describe the different reasons pregnant people seek information, revealing three primary drivers: medical concerns, emotional needs, and everyday practices shaped by identity and professional expertise. We then present eight interconnected challenges in accessing and evaluating pregnancy-related information. Finally, we explore the mental models participants developed for navigating information sources, which involved using certain information sources for specific purposes, and having ordered pathways for different information sources. We have underlined the most relevant part of participants' quotes and provided the remaining part for context and details.

4.1 Reasons for seeking information

Pregnancy represents a period of physical, emotional, and social changes that causes pregnant people to actively seek information across multiple domains. Our participants revealed that information-seeking during pregnancy addresses immediate practical needs and psychological concerns, caused by worries about health, emotional needs, and the information requirements of decision-making.

4.1.1 Pregnancy information-seeking addresses medical concerns. Health concerns emerged as the primary reason for seeking information among pregnant individuals, with participants pursuing guidance across three main categories of medical needs.

Symptom management and physical challenges. Morning sickness, fatigue, pain, and other pregnancy symptoms prompted urgent research and advice-seeking from both medical professionals and social networks.

> *"I experienced a lot of physical pain during this pregnancy, a lot of cramping early on, like Braxton Hicks, from as early as maybe 12 weeks or so."* (P10)

> *"I was exhausted...I'm a really active person, and I mean, I was struggling to walk a mile a day. It took an emotional toll, because I couldn't do anything that I normally did, and that I enjoyed doing...mostly it was those things that I would seek information about."* (P13)

Medication safety and health condition management. Participants navigated choices about prescription drugs, over-the-counter medications, and vaccines. Participants with preexisting medical conditions required specialized information tailored to their unique circumstances.

> *"I was being prescribed SSRIs for antidepressants and anxiety. I was on fluoxetine and Wellbutrin as well as Hydroxyzine for panic attacks and those were considered pregnancy tier C. They were dangerous on that tier level."* (P2)

> *"is the medication safe to take? Are the symptoms I'm experiencing normal? is this concerning? I might start at Reddit, just to see if other people have gone through this. But I would always confirm anything."* (P6)

> *"I feel like it's just that the last time I was pregnant was 2021, Covid vaccine and so the vaccine had just come out, I knew that I wanted to get it, but I was still, like I hope this turns out okay."* (P9)

P5's Type 1 diabetes made it necessary to do research into blood sugar management protocols and high-risk pregnancy care:

> *"your diabetes symptoms get worse when you're pregnant. So, I was watching the step counter, and then Libra 3 allows me to be able to check my blood sugar through a constant glucose-ometer."* (P5)

Similarly, P2's depression prompted research into medication safety and withdrawal strategies during pregnancy:

> *"Stopping my medication has been probably been the hardest part for me...it's not good to take antidepressants or any kind of medication in those tiers while you're pregnant.So, we were trying to find solutions for that."*(P2)

Medical procedures, screening, and appointment gaps. Participants researched prenatal screening options and medical procedures to make informed healthcare decisions. The lengthy gaps between appointments with healthcare providers created significant information gaps, particularly challenging first-time pregnant individuals and those with low-risk pregnancies.

> *"After the pregnancy was viable, or we knew it was viable...I Google a little bit about what are these things that you can find out from pre-screening and things like that."* (P3)

> *"then when you went online, or even that evidence-based work, they would say it's (the procedure) better with medication because they have to get in there, it's like a lot forced to move the baby."* (P7)

> *"I had a low-risk pregnancy, so I didn't see my doctor I think until 8 weeks, and then 20th weeks. So I had long gaps between seeing the doctor when my symptoms were the most surprising and exhausting for me... I used that app as kind of a proxy for reassurance that everything is happening is normal, even though it was extremely difficult for me."* (P1)

Nutritional guidance. The complexity of pregnancy nutrition drove participants to seek information on the food safety.

> *"For example, nutrition is more important in these (final) trimesters. I started paying attention to how much protein I have, I talk to my nutritionist. I do eat non-veg, but I did ask her if I mostly have a vegetarian diet, what kind of diet should I be having? I think that helped. Making sure I don't develop gestational diabetes or any other issues."* (P1)

> *"For food, like, what to eat, what not to eat, I look at the Mayo Clinic website the most of foods to avoid. It has a list of what to avoid, like undercooked meats, or undercooked eggs, raw fish. It has categorizations of which fish is safe to eat, which is low risk and then high risk."* (P9)

4.1.2 Pregnancy information-seeking serves emotional needs. Participants sought reassurance and emotional support by learning that others shared similar experiences, discovering their symptoms were normal, gaining broader understanding of pregnancy (especially as first-time mothers), and combating feelings of isolation.

Seeking reassurance. Many participants explicitly pursued emotional reassurance when they felt uncertain about the severity of their symptoms.

> *"I just want some kind of reassurance. Usually, my question to my doctor is more about reassurance, because if she says this is normal, I know that baby is okay, I'm okay, and it eases up my mind...I think knowing what might happen, and maybe some of the scenarios, that makes me feel a little less anxious."* (P1)

> *"I was so excited, it was a new experience, and I wanted to know emotionally how that would be... I would watch YouTube videos of women's pregnancy experiences...If I'm looking for emotional reassurance about a concern, or more experience-based, I'd be looking for more of a personal response."* (P6)

Finding a support system. Another reason for seeking information was to connect with others going through similar experiences.

> *"There is a specific subreddit called Bumpers Who Bolus. Bolusing is a term where you use to say I'm going to inject some insulin. And bumpers (is) in reference to I'm pregnant. These were all lifelong Type 1 diabetic birthing parents are in this subreddit group. All of the ranting and all of the suffering, the different diets, all the worrying, all of the risks that came associated with being diabetic while being pregnant that kind of filled in all of the emotional gaps of the advice that I was getting from healthcare professionals."* (P5)

> *"At the scan, there were two sacs, which indicated there were two, and then one of the babies had already miscarried, and when that happened, I was obviously very upset, and I remember kind of immediately going to YouTube, and someone else had also gone through that and had posted about it, and I just felt like I wasn't alone in it."* (P10)

Combating isolation. Pregnancy often left participants feeling disconnected from their social networks, particularly when they lacked pregnant friends or family members nearby. Participants sought experiences from others who had experienced pregnancy to reduce the sense of loneliness.

> *"I didn't know many other pregnant people, so I listened to a podcast of people who were currently pregnant, or had been pregnant, and were talking about their experience week to week and that was mainly to feel like I'm not alone, and just see how other people were experiencing it."* (P9)

4.1.3 People seek information to navigate pregnancy's impact on professional and daily life responsibilities. Pregnancy causes new information needs as people balance their changing physical condition with professional responsibilities and daily life demands. People often sought guidance on maintaining career and lifestyle activities throughout pregnancy.

Workplace and legal information. Participants sought information about employment rights, workplace accommodations during pregnancy, and guidance on managing physical demands of their jobs.

> *"I've used Gemini for other work-related stuff, like how do I navigate pregnancy accommodations at my workplace. Those are kind of things that I would use AI for, rather than medical questions."* (P1)

> *"just tried using it (AI) again for looking up maternity leave benefits...so I asked does Utah have a state-based paid parental leave program similar to Colorado's?"* (P9)

> *"For example, I guess one of my questions that I had for my OB-GYN was if I should start wearing compression socks, because I know that women's feet swell, and I've seen that, and I'm on my feet a lot, and I know that they could help with reduce some swelling."* (P11)

Recreational activities. Participants sought guidance on safely continuing specialized activities outside of work settings, including competitive sports.

> *"I play Ultimate Frisbee competitively, and in my first pregnancy, I was able to play up until one month before my due date. This time I had to stop kind of just before the third trimester... there's not a plethora of*

guidance out there for if you already were very active...and so a lot of it has been kind of word of mouth, because I play Ultimate Frisbee, there are 4 moms on my team who have gone through this before." (P9)

4.2 Challenges of information-seeking

Participants encountered challenges across four levels while seeking information: individual challenges (health knowledge gaps, information avoidance), institutional challenges (eroding trust in medical and government institutions, inaccessible academic literature), information ecosystem challenges (information overload, conflicting information, gap in specialized information), and technology challenges (digital platform limitations). Such challenges force people to navigate critical health decisions under uncertainty, often relying on elaborate workarounds to access reliable information.

Individual level challenges emerge from personal factors including health knowledge gaps and self-protection mechanisms that influence how individuals process and seek pregnancy information.

4.2.1 Health knowledge gap prevents people from fully understanding medical information. We use health knowledge gaps to refer to the absence of understanding about bodily processes, symptoms, and medical concepts that affect how individuals interpret health information. In the context of pregnancy, first-time mothers faced knowledge gaps regarding pregnancy symptoms due to lack of prior experience to contextualize new symptoms and bodily changes.

> *"I think there were a lot of symptoms that I didn't know were a part of pregnancy, and I didn't realize until I was pregnant. Then I would freak out and ask my doctor, and he's like, that's normal. But I didn't see that anywhere and so I didn't know if things were okay. For instance, implantation bleeding before you even find out you're pregnant. And so I had implantation bleeding right after I took a pregnancy test, and I thought I had a miscarriage. I didn't realize that could be normal."* (P8)

> *"This is my first pregnancy, so I don't know what's common, how much pain is normal, those are some questions...These are big changes in my life that I've never faced before...Usually, my question to my doctor is more about reassurance, because if she says this is normal, I just know that baby is okay, I'm okay."* (P1)

4.2.2 Pregnant people might avoid specific information or source due to heightened anxiety, or fear of being judged. Some participants reported that heightened anxiety or shame around certain topics led them to avoid related topics or information sources. Moreover, when people feared social stigma or judgment, they self-censored and sought information anonymously rather than consulting trusted individuals or healthcare providers.

Tension between information needs and anxiety. Participants described that information needed for informed decision-making about certain aspect of pregnancy such as giving birth can trigger anxiety.

> *"I was very curated about my information sources, because I was on the camp of I don't want to know more. I want to know as less as I can, because it's very stressful and anxiety-driven, and I didn't want to overwhelm myself...I just wanted to go blind, because I was really scared about childbirth and for me, knowing about it would give me more anxiety."* (P3)

> *Really early in my pregnancy, I did try to stay away from loss-related facts and odds...just so I didn't raise my anxieties. And I also kind of try to stay away from any labor horror stories, or bad experiences, anything that would kind of freak me out about the labor process, or even medical facts about how it (pregnancy) can go wrong."* (P6)

> *"When I was pregnant, I didn't want to scare myself. For example, giving birth or certain things. For example, I know a lot of people do so much detailed research when it comes to Epidoral? they want to see everything and know everything and all that stuff, and sometimes the less you know, the better. Was I curious? Yes. Did I seek information? No. Because I knew it wasn't good for me."* (P4)

> *"There was even one (Facebook) group that was called Evidence-based parenting, but it was more like Anxiety-based parenting. Everything was, like don't do this, don't do that, don't do that."* (P7)

Self-censorship and discretionary information seeking. People self-censored when they feared social stigma or judgment. Some mentioned feeling ashamed of their lifestyle choices, worrying about appearing vain or obsessive, or expected to receive dismissive responses from others which resulted in them seeking information anonymously. Poor relationships with potential information sources further discouraged seeking information.

> *"Going back to lifestyle, it's not necessarily comfortable talking to certain people, being like I used to drink a lot, and now I don't want to drink, or now I can't drink, so when you have something that I feel like there's a little bias on, or it could be judged, it's hard to reach out to people, so you kind of want to seek that information yourself."* (P2)

> *"For food, I never ask people, I always ask the internet because I'm kind of ashamed that I'm so paranoid about it, it feels almost unreasonable, and so I don't want someone else and I think I've had experiences with friends where they're like that's fine, you'll be fine. So after that, I'm like, okay, I can't ask them anymore. I'd have to ask the internet."* (P9)

> *"I found a lot of pregnant women fitness channels on TikTok and stuff. I would say my algorithm leans more towards wellness, like health and beauty regimens and stuff. It's been really cool because that information feels a little vain to ask about."* (P2)

> *"With one of the providers, sometimes I'd be a little uncomfortable, just because she wasn't always very friendly, and so sometimes I would think to myself, do I want to bother asking this, or do I think I'm fine. I just almost didn't want to hear the response, or have her think I was overthinking about something."* (P10)

Information ecosystem level challenges concern the broader information environment, including issues of information overload, conflicting sources, and the gap in specialized information that complicate information evaluation.

4.2.3 Information overload creates stress as expectant parents struggle to determine reliable sources for decisions that affect both maternal and fetal well-being. Information overload occurs when "the volume of information exceeds an individual's information processing capacity [32]." Two forms of information overload were prevalent. Abundant online resources made it difficult to process and prioritize guidance. A pharmacist noted confusion when seeking information about prenatal vitamins. Additionally, commercialized pregnancy content created constant exposure to sponsored posts and product recommendations.

Difficulty in choosing the most relevant information. Participants described feeling overwhelmed and anxious by the high volume of pregnancy-related information available online. Participants struggled to navigate extensive search results for topics like choosing prenatal vitamins or pregnancy-safe skincare products.

> *"There's so many information out there that can be overwhelming...this habit that we've developed, like, I have a headache, Google, tell me what, it can create a lot of anxiety, unnecessary anxiety...When you*

> *do a Google search, 10,000 things come up...how do you know which website to open? How do you know which ones a legit source of information versus, I don't know, Daily Mail today...When it comes to choosing a proper prenatal multivitamin, there's so much nonsense out there, and I'm a pharmacist."* (P4)

> *"when it comes to what to wear when you're pregnant, skincare products to buy, there's so much information to parse through, so AI is really useful for that to kind of just summarize the options of what's out there."* (P6)

Reduced trust in information sources due to commercialized information. Participants encountered commercial messages alongside health information during pregnancy, requiring them to constantly distinguish between useful information and marketing content.

> *"The pregnancy itself and everything that's advertised to you prior to pregnancy, and then throughout the pregnancy, and then after with the baby care and all that stuff. It's an industry. Especially when it comes to nutrition and food for the baby after you give birth, and maternity leave, and how it affects all that stuff."* (P4)

> *"When you're looking online, a lot of those first pages are sponsored, or they want to push a product at you as well. If you have maybe questions about how breastfeeding will go after your pregnancy ends, a lot of those first links and websites tend to be buy our breast pump...It's kind of hard to get to the root of things, because a lot of websites or other sources are more geared at trying to get you to buy something, or they are trying to get you to believe in something, but they don't give you a study, or anything to sort of back up what you're being told on that website."* (P12)

4.2.4 *Conflicting information between different sources makes it hard to trust information sources.*

Conflicting health information consists of two or more health-related propositions that are inconsistent with one another [11]. Conflicting information creates uncertainty and makes it difficult to determine what is accurate, safe, or requires action. In this study, three main types of conflict emerged: friction between embodied health knowledge and other information sources; online information contradicts medical advice; evolving information and cross-cultural healthcare differences.

Friction between embodied health knowledge and other information sources. Personal values and knowledge of one's own body can conflict with advice from trusted sources, creating tension when healthcare providers dismiss a person's beliefs or lived experiences. This dismissal drives people to seek confirmation elsewhere [25].

> *"I always gain a lot of weight in the first trimester which is not that common and then I don't really gain any more weight the rest of the pregnancy. One of my healthcare providers told me at my 20-week appointment that I'd gain too much weight, she thought my baby was gonna be a 10-pound baby which has never happened and that I needed to start working out more. I took her advice and tried to do it, and I nearly passed out. It was kind of bad advice...sometimes it'd be frustrating, because I don't always feel like healthcare providers want to validate patients' beliefs or feelings. You do have an appointment that just does not go well, because you're dealing with someone who's not willing to kind of believe you, or not have the same values."* (P10)

> *"I felt like my provider wasn't listening to me, because I felt like I was miscarrying, but they were telling me everything was fine. Part of why I felt like I was miscarrying was because of intuition. But also, I was just having some weird bleeding stuff, and those user-generated things had all these stories about people*

> *who are having similar bleeding, I'm like, maybe we're miscarrying, but maybe we aren't, so there was a lot of uncertainty around that."* (P13)

Online information contradicts medical advice. People encounter conflicting advice when medical professionals provide guidance that contradicts people's findings via online searches and social media platforms. For example, healthcare providers may offer reassuring explanations while digital platforms present opposing viewpoints.

> *"I remember I started developing some bulging on one of my legs. They weren't really bothering me, but I'd never seen anything like that before. On YouTube or Google, people are saying that once you get them, they never go away, and you have to wear compression socks to help manage them. I did ask my provider about that and she gave a different response (and said) they will go away after pregnancy, and you don't need to worry about them unless they're hurting you."* (P10)

> *"Different views from different sources of information that I initially had a trust in that kind of leads me to rethink what they're saying...For example, even induction of birth which used to be something which was very medically trained, with Instagram everybody has this opinion on social media about you should raw dog your pain, not have inductions, say no to everything that the doctor says because they're trying to steer you in the wrong direction. That is controversial as well."* (P1)

Evolving information and cross-cultural healthcare differences. Conflicts can occur when medical knowledge evolves over time, making it difficult for people to determine which recommendations are the most contemporary. Differences between national healthcare systems added to the difficulty of choosing the best recommendation.

> *"My sister has gave birth roughly a year right before I did, and that was her third child. Throughout her pregnancy, she was actually advised, for example, for breastfeeding if you have a clogged milk duct, the advice back then was you have to massage it, you have to put heat on it...That was literally medically advised information until her third pregnancy. By the time she got to her third kid, the advice had changed to it's inflammation, so you have to take ibuprofen or some sort of anti-inflammatory, you should ice it instead of heating it... So information literally changed...I think I hove a healthy amount of skepticism (on medical information)."* (P5)

> *"The way my OBGYN mentioned, it (uterine fibroids) could lead to miscarriages. If you even look up American literature, that's what they talk about...We were trying to figure out if there's an increased risk of miscarriage because of uterine fibroids. At least according to the British literature, that was not the case. I mean, the big difference is that American healthcare system is a little bit more aggressive, it's not holistic versus, I think the British system is more holistic because it's nationalized care."* (P3)

> *"I would talk to my mom, but you don't trust them for the information. She's also very evidence-based, but she hasn't had a baby in 40 years. So she's not up to date with the latest, so I would take a lot of things that she said with a grain of salt."* (P7)

4.2.5 Pregnant people encounter information gaps for unique personal experiences and health crises. Participants dealing with unique personal experiences such as being on specific medication, a professional athlete, or having a certain disability struggled to find relevant or applicable information for how to manage their circumstances during pregnancy. Other participants sought information about common but under-discussed aspects of pregnancy such as miscarriage. Emerging health crises, such as the decision to take vaccines during pregnancy further highlighted these information

gaps, with healthcare providers unable to provide definitive guidance due to insufficient research. Not receiving sufficient information from healthcare providers made it hard for people to make decisions.

Having unique personal experiences. Some participants had pre-existing medical conditions or were engaged in professional activities, such as competitive sports. They sought guidance on how these factors might impact their pregnancy but encountered information gaps tailored to their specific context.

> *"Getting off of antidepressants, or weaning off of any sort of medication that you can't take anymore when you're pregnant. There's not a lot of talk about that, and that would be awesome to feel more supported in that aspect, because it's really hard."* (P2)

> *"For pregnant athletes, it's just a lack of information. I think it's just because it's hard to do research on pregnant people, and so we just don't have the answers to a lot of it. I guess another challenge is the answer to a lot of questions of is this safe, is this not safe? we don't know. and that's sometimes frustrating. Information related to activity during pregnancy are mostly for non-athlete people."* (P9)

> *"Seeking information about the experience of disabled pregnancies (is challenging). The less credentialed an individual was, or the less specialized an individual was the less likely their advice would align with what my reality. Like doulas that I talk to, they pretty much were like I've never really dealt with it before... By comparison, my healthcare professionals, that was their bread and butter. They were like this is how we do it, this is what has worked, this is what I've seen."* (P5)

Emerging health crisis and specific pregnancy concerns. Participants sought detailed information about specific pregnancy concerns, such as miscarriage risk and the safety of vaccination during pregnancy, but found this information difficult to find. Additionally, inadequate information from healthcare providers hindered participants' ability to make informed decisions about their concerns.

> *"My fourth pregnancy was in the thick of COVID. There was talk of, should you get the COVID vaccine when you're pregnant, should you not and I ended up doing it. No one was able to really give me, a definitive (answer). I guess I will say my healthcare providers were very pro-vaccine but I just felt I didn't know for sure if it was the right move. There just was a lack of information and getting balanced information of what are the pros, what are the potential cons?"* (P10)

> *"Miscarriage (is) so common and it's such a normal part of pregnancy. There was not much about miscarriage. (pregnancy) is romanticized (in information sources)."* (P4)

Institutional level challenges reflect systemic issues within healthcare institutions and government agencies that affect trust, and the accessibility of official medical guidance.

4.2.6 Eroding trust in medical and government institutions and their perceived limitations undermines pregnant people's reliance on official medical guidance. Many participants expressed mistrust and skepticism toward institutional and government agencies (*e.g.*, CDC, NIH), which undermined their reliance on official medical guidance. Concerns centered on government agencies and medical institutions prioritizing financial and monetary considerations over health outcomes. Participants also suspected that well-intentioned scientists could also be influenced by administrators and external pressures. Moreover, some participants did not use government and medical institutional resources because of

perceived limitations of these resources such as not being specific or not being clear about which one is relevant for pregnancy.

Skepticism of the government and medical institutions. Some participants described deliberately rejecting or suspecting medical and government institutions based on perceived conflicts of interest or institutional failures.

> *"A big one goes back to that distrust in medical institution as well like the CDC, because a lot of people now have distrust in them, and being like maybe the scientists think what they're posting is real, but whoever's in charge of them is fabricating things. Just kind of putting that doubt. I thought I could trust these sources."* (P8)

> *"I have always had skepticism of our healthcare system in the past. Now that I'm pregnant, I'm just a little bit more hyper-aware of that and I think I have a lot of skepticism when it comes to our healthcare system lately. So when it comes to what my best interest is, I feel like that might not necessarily be the priority versus when I get help from a doula or a midwife."* (P2)

> *"I've just grown a little skeptical of government agencies. Just with the whole COVID thing and different agendas, and I feel like it kind of went away from focusing on medicine to money and funding, and what's gonna help move this agenda, and I think sometimes when you mix the government with different things like that, you just run into more scandalous type thing. So I just figure I'll avoid it at this point."* (P10)

> *"With the COVID vaccine, they clearly don't want people to be able to make an informed decision, all of that has been scrubbed from government websites, and a lot of academic websites, too. I think the federal government right now is intentionally undermining our trust of those sources...I would love to know if the updated booster for this year is appropriate for me as a pregnant person and there is virtually no available data for that."* (P14)

Perceived limitations of government and institutional guidance. Participants noted that they did not know of many health institutions. Others who were familiar with such sources, found them unable to meet their specific needs.

> *"I like to go to them (government resources) for guidelines, like CDC, NIH, the American Society for Babies and stuff, the ACOG? And then WHO. It's a great resource but again, for specific questions? I mean they provide a lot of guidelines, but if this is what I'm going through, you can't see answers."* (P4)

> *"I don't know much about these organizations. For example, I don't know which one to go to, especially for pregnancy care. I know ACOG is for vaccines, for example, like measles outbreak happened. so I knew that I wanted to search for, if I have immunity already or not, I knew I could go to CDC or NIH, so it's just knowing where to go is the first step, and these kinds of agencies never really crossed my mind for pregnancy-related things."* (P1)

4.2.7 Academic literature remains largely inaccessible due to paywalls, access restrictions, and the specialized knowledge needed to interpret research. Most participants expressed high trust in academic literature and were inclined to seek evidence-based answers to their questions through scholarly sources. However, many participants noted that they cannot access research due to paywalls and not being affiliated with academic institutions. Even when papers are available, people often require specialized knowledge to search effectively for specific topics and interpret the results correctly.

Academic literature is not easily accessible. Participants described encountering paywalls when attempting to access full research articles, with many expressing frustration at the need to pay for content. Participants who previously had institutional access through educational settings found themselves excluded from scholarly resources after graduation.

> *"I've felt like I don't have a ton of access to it (academic literature), especially when you get out of schooling and all that stuff, you have to pay for all of these articles when you're like, I just want to read them."* (P11)

> *"Sometimes you have to pay for the paper and I assumed that would be the case for medical papers. If I click on it, and it's like you need institutional access or pay for this article to read it then I kind of don't even try to open it."* (P9)

Lack of expertise for reading academic literature. Participants expressed doubt in their ability to understand or evaluate scientific papers.

> *"I don't feel qualified that I should be the person reading the paper and seeing if there are any faults in the experimental methods or anything like that. I'm not an expert, so I just take the paper results at face value as they're presented in the article."* (P9)

> *"I've never gone to a research paper and read them through...You need to really know what you're looking for because they're pretty specific...Unless you really know what you're looking for, you can misinterpret them really easily. You have to be really specialized and know what you're looking for."* (P1)

> *"They're not technically out of reach, because I could read the abstract. But the fact that I don't know what to search for, and I need some level of education to be able to at least decipher or know what to look for research papers, I guess, are the most difficult to get for a layman who doesn't know anything. If you're starting from zero, you don't even know what to look for."* (P1)

Technology level challenges are specific to digital tools and platforms, encompassing limitations in AI systems, pregnancy apps, and online search interfaces.

4.2.8 Digital platforms give pregnant people unreliable information, and many people do not know how to use such platforms properly. Digital platforms such as pregnancy apps, search engines, and Large Language Models (LLMs) often present barriers due to their design limitations and people's insufficient familiarity with the platforms. Participants described pregnancy apps as difficult to navigate, too general, or filled with articles that rarely addressed specific questions. Searches for particular pregnancy symptoms sometimes produced exaggerated or conflicting results, and LLMs provided responses that were inconsistent, difficult to interpret or broad. Online forums were seen as echo chambers, leaving participants uncertain about the reliability of the shared advice.

Pregnancy applications. Pregnant people found pregnancy apps too general and not useful. An application provided by hospitals and healthcare providers was considered difficult to navigate.

> *"The apps that are out there it's like a bunch of just textbook stuff that's been crammed into an app. so it's so general, and it's so well-known already that you don't even need to download the app."* (P4)

> *"I feel like it's (app) just a collection of articles, and so then you have to be lucky if an article happens to answer the question that you're looking for...and maybe I just don't know how to use it...I think it's just not that easy to use."* (P9)

> *"It (app) was kind of hard to navigate. They had different sections about various topics. They had a breastfeeding section, they had some sort of section about prenatal care. Within those sections, it was pretty hard to navigate between the articles. I would read some of them, and then I'd go back, and I couldn't find where I had stopped reading."* (P13)

Search engines. Pregnant people found search results often provided irrelevant or alarmist information.

> *"I was doing a lot of walking, and I felt my upper thigh was going numb...I was traveling at the time, so I didn't have access to my doctors as readily, so I googled the symptoms...The first thing that came up was if you feel numbness in your upper thigh, you need to get to an emergency room right away...The thing about computers is that they do exactly what you tell them to, so I modified my search parameters to be upper thigh numbness while pregnant, and then the next results told me this is totally normal for pregnant women. You get completely different results depending on whether or not you're pregnant." (P5)*

> *"if I search up a very specific symptom that I'm having, I'll get an answer that I know clearly doesn't apply to me. Especially with some type of pain symptoms? usually, the answers you'll get from most sources are if it's really bad pain, it's concerning and could be a problem. But usually in my head, I know this isn't concerning, I was just curious if it was a common symptom...It exaggerates and kind of jumps to the worst conclusion."* (P6)

Large Language Models (LLMs). Participants expressed concerns about LLMs, specifically conversational AI tools such as ChatGPT and Google Gemini. The concerns centered on the AI tools providing contradictory responses and information of questionable accuracy. Additionally, some participants had limited familiarity with the technology.

> *"I kind of find myself being a little bit more critical if I Google and this time there's AI. So when I say can pregnant women eat some kind of cheese. Sometimes a Gemini answer will be yes, it is generally safe for this, but then when I keep reading, the answer kind of turns to no, it's not safe."* (P9)

> *"It could be my misinterpretation of what AI is. But I feel like they gather information from across the web, and it might not be 100% accurate, or maybe not 100% backed by science or whatever, so it might just be telling me something that's really popular right now, because it's being talked about a lot on the internet. Sometimes I have a hard trust with AI when it comes to my pregnancy, just because it does feel so serious. I'd rather have a person be giving me my information."* (P2)

> *"I think there's some sources that are very broad, and they don't really give you enough insight into what you're going through. Sometimes AI can be that way, I've noticed, or it tells you to check a lot of different sources. Usually when I'm trying to look something up, foods for example, foods to help alleviate sickness. I'd just like them to go more detailed into actual foods instead of maybe food groups, or things with high carbohydrates because that can be a lot of different foods, but it doesn't really specify the exact ones that could help you the most at that time."* (P12)

> *"...hallucinations (on AI tools) are too common, and it seems like I end up spending the time then checking in information that I get and I could have just spent that in the first place, looking at something on ACOG and following their links."* (P14)

> *"I think it's just I don't know how to use them (AI tools) a ton."* (P11)

Online communities. Pregnant people viewed online pregnancy communities as biased echo chambers.

> *"When it comes to peer-community boards and stuff, say, a Facebook group, those tend to be kind of echo chambers of things sometimes, where I just don't know how I personally feel about being a part of it...Trying to be unbiased in those situations is a little hard. There tends to be a big opinion one way or the other when you get into those peer-created groups."* (P2)

> *"I didn't dive deep into all the things it (the app) provided. I think it was very heavy on providing the community aspect...I was sick of the community everywhere! And I'm like, where is this community? Do we need more of that online thing? I think the most important thing for a woman during that time is physical closeness."* (P4)

4.3 Mental models shaped by perceived risks affect information-seeking

Our participants revealed multi-layered information-seeking strategies to navigate pregnancy-related health questions, characterized by two key patterns:

4.3.1 People choose different information sources for different topics. Participants engaged in contextual risk assessment, tailoring their choice of information sources to the assumed urgency and safety of each question rather than relying on a single source. For example, P4 distinguished between everyday questions, urgent emergencies, and medically complex issues. Similarly, P1 chose the sources based on the severity of her questions.

> *"It highly depends on the question. If the food is safe to eat, that's like a Google AI. But if I fell and there's a risk of placenta being detached from your uterus, that's another type of question. When it comes to finding information regarding I have a headache. Is Tylenol okay? I'm also taking this other medication. That is definitely a healthcare provider. If you fall and have those questions, I think that's an emergency room thing."* (P4)

> *"It depends on the kind of question. If it was more like a personal question, I would either go to Google or Reddit. Look it up, and then immediately find the exact scenario that I'm asking about, the exact situation."* (P6)

> *"Kind of depends on the question that I have, if it's something minor that I know is not urgent, and they're not life and death kind of question, just Google stuff, with the filter of evidence-based birth, or ACOG...and maybe in my next appointment, if I still have that issue and it has not been alleviated, I would also ask my doctor."* (P1)

> *"When I first got pregnant I used that (social media) a lot. Because I was so excited, and it was a new experience, and I wanted to know, emotionally how that would be, so I would watch YouTube videos of women's pregnancy experience and reading through posts of what people have gone through. But as I've progressed through the pregnancy, I'm used to it, the excitement's worn off a little bit, and now it's just more medical questions and is my baby progressing correctly? So I rely on it less now."* (P6)

> *"If it's a question that has more significant consequences, then I want to be able to talk with my physician and get their input, ideally it would be send a MyChart message...less severe or less consequential things, there'd be some sort of Fairly well-sourced app that I could ask the question, and I mean it would be a chatbot that would give good answers back, and that would provide you kind of the references or resources that they're drawing that from."* (P13)

4.3.2 People developed ordered pathways for information-seeking across topics. Participants described following ordered pathways when seeking information. Most participants moved from digital resources to seeking social validation to consulting professionals. For example, P1 outlined a process that started with general searches, moved through layers of cross-referencing, and ultimately reached professional consultation.

> *"If it's something minor...just Google stuff, with the filter of evidence-based birth, or ACOG. It would give me some answers. With sources, I would click on the sources, like ACOG or NIH, or CDC, if it gives me so that I receive medically appropriate information. I would also go on Reddit, mostly for symptoms that are just uncomfortable and see how many people have had similar symptoms...if they don't, then I would also sometimes ask my friends, just message them on WhatsApp or ask my mom...after all of those filters, hopefully I have reassured myself that this is something normal...and maybe in my next appointment, if I still have that issue and it has not been alleviated, I would also ask my doctor...I try to steer my sources to something that I will believe in."* (P1)

> *"My ideal situation would be...My question is where's the cutoff for my baby should've turned head down by now? I pull out my phone, I Google it and the first thing that comes up is a page on ACOG. And it says the summary line is your obstetrician will expect that baby is head down by 34 weeks. I've answered my question."* (P14)

> *"(TikTok) For me, it's a place where I go and it's the beginning of, okay, I have this question, let me see what's the overall consensus around this question, and then through there I find other resources, other questions that help me narrow down what I'm looking for...And then I'm like let me see what's the overall (consensus). Now, let me go to PubMed and see if there's any actual research and evidence...In terms of medical information, the articles that were published, I like to do a little research on the article itself, meaning who funded it, what are the biases that could exist."* (P4)

> *"The first default search answer that I get on Google Search is Gemini AI...I usually do read its summary, and it does have sources to everything it's saying. So I do click on the sources, and I read through the source. If it's coming through a place that I believe in like, if it's citing ACOG, I know that that is correct, then I would usually click on that."* (P1)

> *" I tend to follow up with the information she (healthcare provider) tells me from any pamphlets I'm given from her or the website of their medical institution tends to have information, as well as the World Health Organization and the National Institute of Health...If I learn something new from Instagram or TikTok or friends, then I'll kind of implement the rest, and look up those with my doctor or different websites, but if I had a question today, I would wait to just talk to my doctor. And if I didn't have a doctor's appointment very soon, I would probably start with Google, and then go that route."* (P12)

> *"I would type it into Google and then read the first handful of results. And then maybe the couple sites that come up under that. And then, if I don't feel like that gives me a good answer, then I would probably hop onto YouTube. Type it into YouTube and just see what pops up as the first few options...Again, assuming I wasn't going in for an appointment or something where I could also just ask the provider."* (P10)

Interpersonal networks (family and friends) played an important role in the information-seeking process. P2 described layering different sources, Google, news outlets, books, while cross-referencing interpretations with family members.

> *"I probably Google it, and then I would look through and see if there's any reputable news sources I'd probably send it over to my sister, ask her what her thoughts about it are. I talk to my husband a lot and if I still don't feel satisfied at that point, I'll probably start reading into my books and seeing if I can find even more information about it."* (P2)

Finally, P9 demonstrated how information consistency across institutional sources could satisfy information needs, while contradictions triggered escalation to professional consultation.

> *"I would probably first ask Google and then If there were concerns that were brought up like how it might affect the baby, I might save it and not act on it, and just save it until I can talk it through with my midwife. But if there's 10 different links, and many from institutions or governmental agencies, or the APA I use a lot too, for the baby-related questions. But I think if there's bunch of information on the internet and it's all doesn't contradict and it's a cohesive answer. Then that's probably the end of my search. If there's contradictory information online, I might talk to friends about it in the meantime, and then I'll probably just talk to my midwife about it when I see her."* (P9)

Such adaptive, context-sensitive approaches demonstrate that participants have developed personalized frameworks for navigating uncertainty while prioritizing safety through institutional credibility (ACOG, CDC, NIH), social validation (Reddit communities, peer experiences), and professional guidance as the ultimate authority.

5 Discussion

Our research reveals that people engage in extensive cross-referencing across multiple sources, even when they trust certain sources. Current technology tools like apps, search engines, and AI reproduce rather than solve information-seeking challenges. Pregnant people strategically avoid certain topics due to emotional concerns, while many pregnant people also face unique circumstances for which relevant information simply does not exist. We suggest that pregnancy information systems should shift from "all-in-one" designs to specialized tools tailored to distinct needs.

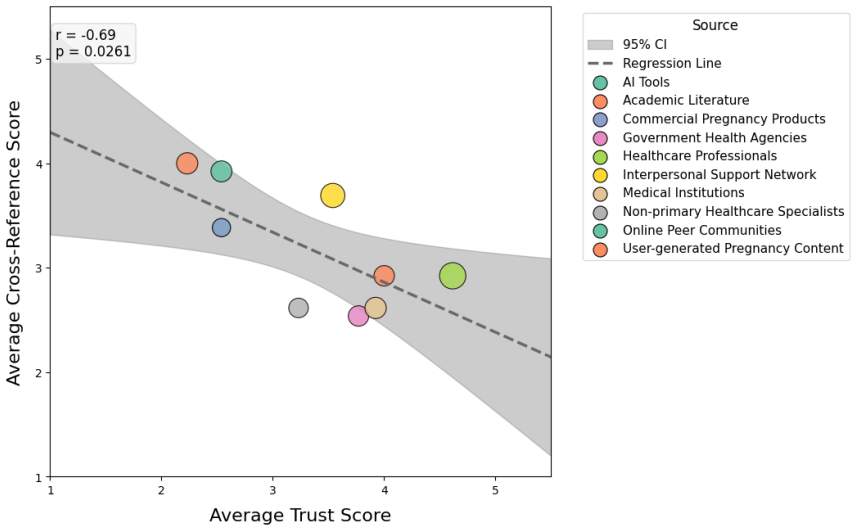

Fig. 2. Sources with lower trust scores have higher cross-referencing scores.

5.1 Cross-referencing information behavior reveals unmet needs

Cross-referencing emerged as a common behavior across all participants, regardless of their trust levels in different information sources. Participants engaged in more extensive cross-referencing for low-trust sources. However, they consistently verified information even from highly trusted sources such as healthcare professionals, government agencies, and medical institutions (Figure 2). Several factors motivated participants to cross-reference sources. Participants observed medical advice evolving over time. One participant described how treatment recommendations for clogged milk ducts changed dramatically from putting heat on it to putting ice on it. This experience fostered what participants described as *"healthy skepticism"* towards official sources. Participants also felt healthcare providers sometimes dismissed their embodied knowledge. When patients felt their healthcare providers lacked adequate knowledge about their condition or failed to validate their concerns, they sought other sources of information to fill knowledge gaps [25].

People also cross-reference for multiple purposes beyond fact-checking. For example, people cross-reference to seek reassurance about symptoms or best practices [49]. Some people attempted to validate their personal beliefs, with one participant sharing, *"I try to steer my sources to something that I will believe in."* Some people used cross-referencing to assess bias and evaluate the credibility of sources. One participant described their process, saying they researched the background of the information source, *"meaning who funded it, what are the biases that could exist."* Despite the prevalence and importance of cross-referencing, participants faced significant challenges including sources that lacked proper citations, overwhelming amounts of contradictory information that required continued research until sources *"didn't contradict,"* conflicting advice, and complications from commercial content mixed with health information.

Information-seeking and cross-referencing address slightly different needs: with cross-referencing, people attempt to validate information already received from a source. Cross-referencing is a multifaceted process that goes beyond simple fact-checking to encompass validation, contextualization, and synthesis across multiple sources. Such trends show up more broadly in healthcare: people with cardiovascular disorders sought four distinct types of validation: technical accuracy through metrics, institutional credibility via FDA approvals, professional endorsement from clinicians, and peer validation through sample sizes [53]. Our findings similarly show that people cross-reference to meet multiple needs, including confirming accuracy, detecting biases, reassurance, and validating decisions. Unlike general information-seeking, which begins with a question, cross-referencing starts with both a question and a provisional answer in need of verification.

Designing cross-referencing systems might benefit from a deeper understanding of this complexity and potentially support multiple validation needs. Moreover, such a system could allow people to emphasize what matters most to them, authoritative citations, or different perspectives from people. Additionally, systems can personalize information delivery, since some people want extensive details while others prefer concise inputs [8, 27]. When looking for health information, people may look for information to confirm their prior beliefs [52]. A cross-referencing system could help reduce confirmation bias by presenting counter-evidence. When someone searches for potentially misleading information, the system could provide counter-evidence using sources the person considers more trustworthy. Such cross-referencing systems could enhance critical decision-making, particularly during complex and emotionally charged life transitions like pregnancy.

5.2 Role of technology in pregnancy information seeking

When seeking information during pregnancy, people turn to both general-purpose tools (*e.g.*, Google and AI models) and pregnancy-specific resources (*e.g.*, apps and forums). These sources deliver knowledge in different ways, but both

have limitations. Search engines, for instance, do not generate knowledge themselves, and large language models (LLMs) synthesize information partly based on how prompts are framed. In contrast, forums allow people to share their experience and feelings with others dealing with similar conditions. Prior research has documented how people turn to forums for support and to learn from others' experiences or receive reassurance [4, 5, 22, 40].

Participants were aware of the limitations of such platforms, and tried to worked around the limitations. Participants reported using Google and AI tools interchangeably, often employing "end-user programming" strategies to refine results. For example, appending keywords such as "ACOG" to search queries to receive institutional resources or framing their prompts about specific aspects of pregnancy. For forums, the differences between trust scores (mean = 2.5, median = 3) and cross-reference scores (mean = 3.9, median = 4.0) suggests participants treat peer content less as actionable advice and more as a source to compare different people's inputs.

Technological information sources rarely provided perfect responses. Instead, participants used them as a starting point to locate and evaluate the information they cared about most. The shortcomings were consistent across platforms: apps often offered superficial or redundant information; AI tools offered overly broad responses that required extensive follow-up verification, provided contradictory information within the same response, or generated inaccurate content; Google searches returned misleading information that exaggerated risks or severity; and forums acted as echo chambers where users reinforced each other's biased perspectives rather than providing balanced information. Pregnancy apps in particular drew criticism: many overemphasized community features that participants found irrelevant (*"I was sick of the community everywhere! Do we need more of that online thing? I think the most important thing for a woman during that time is physical closeness."*), while offering shallow, generalized content that was insufficient for people's specific concerns. Apps risked becoming the digital equivalent of a bad Swiss knife: broad but ineffective at addressing any single need well.

Participants' reflections suggest that their needs are not met by "all-in-one" designs and instead require tailoring to distinct specific needs. Such specialized focus has been effective in how patients communicate with their health-care providers, and in reducing their anxiety [26]. There can be multiple ways to design digital systems that are more *biased* toward knowledge needs or emotional needs. For example, a *knowledge-biased* system might prioritize evidence-based information retrieval and asses the risks associated with people's questions. A *reassurance-biased* system might facilitate peer connections and provide emotional support, and complement it with relevant knowledge. Such specialized approaches acknowledge that there is multiplicity in both information sources and individual needs.

5.3 Role of personal context in information-seeking

As Maia Jacobs et al. discuss in their paper "Care Frictions," the ideal patient behavior—characterized by comprehensive information-seeking, open communication with healthcare providers, and adherence to clinical best practices—is not the case in real-world healthcare experiences. Patients' actual behaviors are often different from medical ideals due to complex social, emotional, and contextual factors [8]. People often avoid seeking health information when it provokes strong emotions, exposes them to misinformation, or threatens their ability to regulate those emotions [2, 41]. One study suggests that avoidance patterns in pregnancy are shaped by social stigma and judgment fears. Participants avoided seeking information about topics they felt ashamed of (like food safety anxieties, mental health medication, or substance use) because they feared being perceived as paranoid, vain, or irresponsible. Anonymity enables people to disclose sensitive experiences, and seek support without fear of stigma [3, 29]. People's self-censorship pushes them toward anonymous information-seeking when they might need trusted guidance.

Information avoidance during pregnancy appears to be highly selective. People who avoided certain topics also conducted extensive research on other topics. Participant P4 deliberately avoided learning about birth procedures while simultaneously conducting detailed PubMed research on prenatal nutrition. Similarly, P3 avoided information about childbirth but thoroughly investigated how uterine fibroids might affect her pregnancy. These examples demonstrate that information avoidance operates as a strategic behavior rather than a general reluctance to engage with health information. People managing a health condition (*e.g.*, pregnancy) selectively research some aspects while avoiding others depending on how risky, stressful, or important they perceive each topic to be. Understanding the underlying reasons is important. For example, P3 avoided childbirth information because it induced anxiety for her. However, she extensively researched uterine fibroids despite finding this topic stressful, because her concern about miscarriage risk outweighed her discomfort with the information. This suggests people weigh the perceived necessity of information against their current emotional capabilities.

While some participants actively avoided certain topics, others faced the opposite challenge: they sought information but could not find anything relevant to their specific situation. Pregnant people are not a homogeneous group. Pregnancy experiences vary across individuals due to pre-existing conditions, professional circumstances, and personal health histories. In our study, participants dealt with Type 1 diabetes, depression requiring medication management, competitive athletics, and disabilities—each creating unique information needs that existing resources failed to address. Participants dealing with such unique personal experiences struggled to find relevant or applicable information for how to manage their circumstances during pregnancy. In such cases, patients may want to receive the treatments that work for others with similar conditions [18]. For example, participant dealing with diabetes had to find a subreddit of other birthing-parents who had the same condition, to learn more about the common lifestyle choices of other people during pregnancy.

Such challenges reflects a deeper complexity in the pregnancy information space: there might never be enough scientific answers to address all the questions people have for the multitude of contexts they experience over pregnancy. Similar to how no "ideal patient" exists, no "ideal information space" might exist either. This raises a critical challenge for human-computer interaction and health research: how can we design systems that help people make informed decisions in the face of limited knowledge? Approaches suggested before include providing learning material for people based on their specific context [43]. Our study suggests that there might be value in categorizing contexts in terms of possible risks. In lower-risk situations, where prior clinical evidence suggests minimal danger to health, people could be encouraged to engage in rigorous, clinician-assisted self-tracking to answer their questions rather than expending energy searching for personalized answers that might not exist [30]. In contrast, when existing scientific evidence points to significant potential harm, systems should explicitly caution people against making decisions on their own and direct them toward professional guidance.

5.4 Limitations

Our study limited participants to US residents, where pregnancy information can be shaped by distinct healthcare infrastructures, political climate, and health disparities [9, 10, 35]. Although we acknowledge the limitations in generalizing our findings to the global population, this criteria allows for focused insights on information-seeking behaviors within one broad geographical context.

Recruiting participants from pregnancy populations posed challenges. Pregnancy is already a high-risk and sensitive period, and many people choose not to participate in scientific studies during this time [37]. For our study, it was particularly difficult to find participants willing to commit to a one-hour interview, primarily due to time demands.

Recruitment was conducted through snowball sampling, referrals, and the NIH ResearchMatch program. Our sample consisted mostly of participants with higher levels of education. Our recruitment methods may have biased our pool toward individuals from higher socio-economic backgrounds, who are more likely to have access to such recruitment channels. We acknowledge that participants with different educational backgrounds might have brought forward different perspectives, which is an important topic for future studies.

6 Conclusion

This paper reveals that pregnancy information-seeking is characterized by cross-referencing across all sources regardless of trust levels; strategic information avoidance based on emotional capacity rather than general reluctance; and contextual source selection that matches information sources to perceived urgency and risk. Current technological information sources, from pregnancy apps to AI tools can reproduce information-seeking challenges, serving as inadequate starting points rather than comprehensive solutions. Moreover, "all-in-one" tools are less effective than the multi-source strategies participants naturally use. We argue for a shift from information delivery to cross-referencing support: systems that help validate across sources, recognize high-risk contexts for professional guidance, and recognize the adaptive strategies pregnant individuals employ to seek-information.

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