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# Health information-seeking internet behaviours among pregnant women: a narrative literature review

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## ABSTRACT

**Background:** Pregnant women often turn to the internet as a primary source of pregnancy-related information. However, there is great concern about the accuracy of health-related information on the internet, making research on women's internet behaviours and decision-making critically important. Previous research has been conducted within a number of distinct but related fields, yet existing review papers have often failed to connect across the various disciplines.

**Objective:** This review aims to synthesise the large and cross-disciplinary body of literature on women's health information-seeking internet behaviour regarding pregnancy and childbirth.

**Methods:** A narrative literature review, which includes research from both health and social sciences, was conducted.

**Results:** Findings address the 'who, where, what, why, and how' of information-seeking behaviour on the internet, with suggestions for future research in each area further discussed.

**Conclusions:** Additional research which addresses the remaining gaps in the literature can help providers be more aware of their patients' informational needs. Providers can be an important source of information, while also helping guide their patients on how to evaluate information. Enhanced patient portals and communication platforms can help to provide more timely and reliable information. Providing their patients with guides can be important for fostering enhanced health literacy.

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## KEYWORDS

Pregnancy; internet usage; health; interdisciplinary; information-seeking

## Introduction

Pregnant women often turn to the internet as a primary source of pregnancy-related information (e.g. Bjelke et al., 2016; Huberty et al., 2013; Osma et al., 2016; Sayakhot & Carolan-Olah, 2016). One large-scale study found that the majority of first-time mothers reported pregnancy-relevant websites and smartphone-based applications ('apps') as 'very valuable' sources of information (E.R. Declercq et al., 2013). An interview-based study of a small number of pregnant women in England found that most women felt their online information-searching behaviours had greatly increased since they became pregnant (Prescott & Mackie, 2017). Another study found that almost a quarter of women surveyed reported more than 100 internet searches for pregnancy or childbirth

information during the course of their pregnancy (E. R. Declercq et al., 2006), suggesting that the internet is both a frequently used and a highly valued resource for a majority of pregnant women.

However, the accuracy of health-related information on the internet is a concern. One study analysed the top websites returned in pregnant women's common internet searches and found many of the websites to be poor quality; only 14 of the 126 websites analysed (11%) had high information reliability (Artieta-Pinedo et al., 2018). Some popular sources of pregnancy information, like community groups and blogs, are highly likely to contain inaccurate information (Lobo et al., 2020). Women frequently recognise that they have been to a website that contained wrong or misleading information about pregnancy (Huberty et al., 2013). Despite this recognition, data suggests that women still hold confidence in the quality of pregnancy related information on the internet. In one study, while 69% of women stated that they had visited a website with wrong or misleading information, 83% still considered the quality of online information generally to be 'good' or 'excellent' (B Lagan et al., 2010).

The disconnect between the actual and perceived accuracy of sources, and frequent reliance on the internet as a source of pregnancy-related information, makes research on women's internet behaviours and decision-making critically important. Studies that aim to understand more about motivations for searching for information, strategies for searching, and information evaluation processes, for instance, can be beneficial for health care providers to better understand how to support their patients in accessing high-quality, scientifically accurate information that fits both practical and informational needs. Previous research has been conducted across a number of distinct but related fields, including psychology, sociology and anthropology, communications, nursing, and women's health, yet existing review papers have often failed to connect across the various disciplines.

Thus, the current review paper takes a comprehensive look at information-seeking behaviour on the internet during pregnancy, including interdisciplinary research addressing the following broad questions:

- 1) **Who:** what are the characteristics (demographic, situational, psychological, etc.) of women who seek information online?
- 2) **Where:** what types of sources or platforms do women frequently use for information?
- 3) **What:** what kind of information are women most commonly seeking?
- 4) **Why:** what motivational factors are related to information-seeking online?
- 5) **How:** how do women evaluate the trustworthiness or reliability of sources?

## Method

A narrative literature review was conducted to search for peer-reviewed published empirical papers that investigated one or more of the aspects of information seeking behaviour on the internet during pregnancy as described above. PsycINFO and Google Scholar were used as primary databases for the search. Keywords of 'information-seeking', 'internet', and 'pregnancy' were used to identify papers, and abstracts were scanned for relevance. Citation searching was also used, identifying relevant citations in the papers found through database searching. Searching was concluded when topic information saturation appeared to be reached, and no additional new information was being revealed. Table 1 contains summary information for all of the included papers, including

**Table 1.** Summary information for papers included in the narrative literature review.

REFERENCE	FIELD	DESIGN	SAMPLE SIZE	SETTING
Arcia et al., 2019	Health Sciences	Focus Groups	16	USA
Bernhardt & Felter, 2004	Social Sciences	Focus Groups	20	USA
Bert et al., 2013	Health Sciences	Questionnaire	1347	Italy
Bjelke et al., 2016	Health Sciences	Questionnaire	193	Sweden
Coglianese et al., 2020	Health Sciences	Questionnaire	105	Italy
Fleming et al., 2014	Health Sciences	Interview	7	USA
Fredriksen et al., 2016	Health Sciences	Interview	11	Norway
Gao et al., 2013	Health Sciences	Questionnaire	335	China
Grimes et al., 2014	Health Sciences	Questionnaire	350	Australia
Guillory et al., 2014	Social Sciences	Experiment	1329	USA
Hämeen-Anttila et al., 2013	Health Sciences	Questionnaire	7029	Multinational
Harrison et al., 2021	Social Sciences	Questionnaire	205	UK
Huberty et al., 2013	Health Sciences	Questionnaire	293	USA
Kavlak et al., 2012	Health Sciences	Questionnaire	185	Turkey
Kraschnewski et al., 2014	Health Sciences	Focus Groups	17	USA
B Lagan et al., 2010	Health Sciences	Questionnaire	613	Multinational
B. M. Lagan et al., 2011	Health Sciences	Focus Groups	92	Multinational
Larsson, 2009	Health Sciences	Questionnaire	182	Sweden
Lee & Moon, 2016	Health Sciences	Questionnaire	193	South Korea
Lev, 2013	Social Sciences	Interview	50	Israel
Link et al., 2016	Social Sciences	Content Analysis (Internet Posts)	1032 posts from 620 members	Germany
Lobo et al., 2020	Health Sciences	Questionnaire	68	Australia
Lupton, 2016	Social Sciences	Focus Groups	36	Australia
Lupton & Pedersen, 2016	Social Sciences	Questionnaire	410	Australia
Mankuta et al., 2007	Health Sciences	Content Analysis (Internet Posts)	2000 posts	Israel
Mansour & Francke, 2017	Social Sciences	Interview	19	Sweden
Narasimhulu et al., 2016	Health Sciences	Questionnaire	503	USA
Özkan Şat & Yaman Sözbir, 2018	Health Sciences	Questionnaire	230	Turkey
Özkan Şat & Yaman Sözbir, 2021	Health Sciences	Questionnaire	376	Turkey
Prescott & Mackie, 2017	Social Sciences	Interview	16	England

*(Continued)*

**Table 1.** (Continued).

REFERENCE	FIELD	DESIGN	SAMPLE SIZE	SETTING
Rodger et al., 2013	Social Sciences	Interview	35	Australia
Smith et al., 2020	Social Sciences	Questionnaire	48	Australia
F. W. Song et al., 2012	Social Sciences	Interview	32	USA
H. Song et al., 2013	Social Sciences	Questionnaire	63	USA
Wallwiener et al., 2016	Health Sciences	Questionnaire	220	Germany
Wexler et al., 2020	Social Sciences	Content Analysis (Internet Posts)	262,238 posts	Multinational
Willcox et al., 2015	Health Sciences	Questionnaire	368	Australia
Zhu et al., 2019	Social Sciences	Interview	20	China

the field (health or social sciences), research design, sample size, and setting. The current paper contains a summary and synthesis of these articles, as well as suggestions for future research.

## Results

### Who

A number of previous research studies have looked at the characteristics of pregnant women who choose to utilise internet-based sources for health-related information about their pregnancy and childbirth. Women who are pregnant with their first child are more likely to use both the internet (Arcia et al., 2019; Bernhardt & Felter, 2004; Kavlak et al., 2012; Lobo et al., 2020; Mankuta et al., 2007; Narasimhulu et al., 2016) and smartphone apps (Lee & Moon, 2016; Wallwiener et al., 2016) to gather pregnancy-related information than women who have previously given birth. Only a few studies found equally high internet usage rates among primiparous and multiparous women (Bert et al., 2013; Bjelke et al., 2016), and in both of these studies usage rates were 95% or higher for both groups.

Age also often appears as a relevant characteristic, with younger women more frequently using the internet and smartphone apps for pregnancy information than older women (Bernhardt & Felter, 2004; Lee & Moon, 2016; Narasimhulu et al., 2016; Smith et al., 2020; Wallwiener et al., 2016). There is also some data to suggest that younger women find internet-based information more helpful. In an international study of 613 women from 24 different countries, younger women (17–25 years old) were more likely to feel that the use of the internet for information aided their doctor's appointments than older women (B Lagan et al., 2010). One study that looked at internet use across a period of 10 years (2008–2018) found increasing trends in relying on the internet for pregnancy-relevant health information (Lobo et al., 2020).

Another relevant characteristic is educational attainment. Women who have achieved at least a college degree are more likely to use the internet to obtain pregnancy-related information (Grimes et al., 2014; Guillory et al., 2014; Kavlak et al., 2012; Narasimhulu et al., 2016; Willcox et al., 2015) and, according to one study, are

more likely to feel that this information influenced how they thought their pregnancy should be managed (B Lagan et al., 2010). However, a newer study focusing specifically on smartphone apps found no difference in usage based on education levels (Lee & Moon, 2016), suggesting that this format may be more accessible to women regardless of literacy or educational constraints.

Additionally, there may be overlapping effects of age, education, and income; one study of 63 young and low-income pregnant women in the US (mean age of 21 years old, 58% in their teens) found that the internet was their least-used source for pregnancy-related health information (H. Song et al., 2013). Only 54% of these women reported having internet access and only 78% had access to a cell phone. However, today in the US, 96% of people ages 18–29 and 95% of people ages 30–49 report owning a smartphone (Pew Research Center, 2021), so newer research which includes multiple demographic samples may be helpful to clarify.

Health and pregnancy status also plays a role in informational needs. One study of pregnant women in Sweden found that more than half of the women (54%) reported searching for information more often in the beginning of their pregnancy than in the later stages (Larsson, 2009). Additionally, women with greater health needs during pregnancy may be more inclined to seek information on the internet. A cohort study of 105 women in Italy who were hospitalised for a pregnancy complication found that nearly all (90.5%) of those women had used the internet to search for information specific to their obstetric condition (Coglianese et al., 2020). A study of middle-class women in the US found that those who experienced pregnancy-related health complications (e.g. infertility, pre-eclampsia, miscarriage, foetal complications) were more likely to describe themselves as 'high intensity' internet users (i.e. actively participating in online message boards, self-reported 'obsessive' searching) than those who did not experience health complications. This applies to newer technologies as well; a study of 220 pregnant women in Germany found that those who rated themselves as less healthy were more likely to use pregnancy-related smartphone apps (Wallwiener et al., 2016).

One area that is particularly understudied is the role that psychological states or traits (e.g. depression, anxiety, personality traits, etc.) may play in predicting internet information-seeking, and conversely how these states may be impacted by internet information-seeking behaviours. One survey of 48 pregnant women, mostly from Australia, found that women who more frequently used digital media for pregnancy-related information also tended to show higher self-criticism, higher negative affect and lower social quality of life (Smith et al., 2020). A number of studies also found that women reported feeling anxious after reading about negative information or worst-case scenarios (Bjelke et al., 2016; B. M. Lagan et al., 2011; Prescott & Mackie, 2017; F. W. Song et al., 2012), suggesting that the internet may negatively impact mental health during pregnancy.

### **Where**

Women have a number of internet-based sources they can go to for pregnancy-related information, including search engines, commercial websites, medical websites, web forums, social media platforms, and smartphone apps. Many studies found that women reported search engines as their most frequently used source to locate informational websites and answer general questions about pregnancy and childbirth

(Arcia et al., 2019; Bernhardt & Felter, 2004; Bert et al., 2013; Bjelke et al., 2016; Huberty et al., 2013; Kraschnewski et al., 2014; B Lagan et al., 2010; Lev, 2013; Narasimhulu et al., 2016; Rodger et al., 2013; F. W. Song et al., 2012). One study of 132 women in Australia asked respondents to list the websites they used most often for pregnancy-related information. Only five of 47 unique websites reported were non-commercial and not-for-profit sites (i.e. '.gov' or '.org' websites). The remainder were search engines (e.g. [www.google.com](http://www.google.com)) or commercial sites (e.g. [www.babycenter.com](http://www.babycenter.com) [www.huggies.com](http://www.huggies.com); Grimes et al., 2014). There is some evidence that these individual preferences remain consistent throughout their pregnancy; one study of 50 pregnant women in Israel found that most women (88%) were 'loyal' to one or two websites that they use for pregnancy-related information (Lev, 2013).

Despite providing the most accurate information, academic or government websites are less commonly used as a source of pregnancy information than commercial information websites (Huberty et al., 2013; Wallwiener et al., 2016). An interview study with 35 pregnant women in Australia found that while 51% used Baby Center (<http://www.babycenter.com.au>) only 28% had used a Government website for pregnancy-related information (Rodger et al., 2013). Similarly, a large study of 613 women from 24 countries found that while nearly all (97.4%) had used commercial websites, only 62% had used health professional sites and even fewer had used links to medical journals (50.1%), local health service sites (47.3%), or government sites (45.5%; B Lagan et al., 2010).

Newer studies have found that web forums and social media are also common sources for pregnancy related-information, however these numbers vary widely across studies. For instance, a study of pregnant women in Australia found that 26% reported using discussion forum websites (Lupton & Pedersen, 2016) compared to 17.5% in a study of women in Germany (Wallwiener et al., 2016) and 71.6% in a study of women in Sweden (Bjelke et al., 2016). Facebook and other social media websites are also often cited as popular sources of information (Bjelke et al., 2016; Lupton, 2016; Lupton & Pedersen, 2016; Mansour & Francke, 2017). Women who do use social media often use it as a source of daily information; a small focus group of women in the US found that 82% use online social networking at least once a day (Kraschnewski et al., 2014). One recent study of 20 pregnant women in China who reported using social media for pregnancy-related information at least once in the past month found that almost all of them (85%) reported utilising social media every day (Zhu et al., 2019). Smartphone apps are also increasingly popular as a source of information, but again the rates vary widely across studies. A large study of 410 women in Australia found that 73% said that they had used a pregnancy-specific app (Lupton & Pedersen, 2016) compared to 22.4% in a study of women from Germany (Wallwiener et al., 2016). Other mentioned sources for pregnancy-related information included video clips such as YouTube (Arcia et al., 2019; Kraschnewski et al., 2014; Lupton & Pedersen, 2016; Rodger et al., 2013), blogs (Bert et al., 2013; Bjelke et al., 2016; Lee & Moon, 2016), or even general sites like Pinterest, Etsy or Instagram (Lupton, 2016).

## What

Both qualitative and quantitative research studies have explored the kinds of informational needs that women are turning to the internet to fulfill. Foetal development was generally the most commonly searched topic across research studies (Bernhardt &

Felter, 2004; Bert et al., 2013; Bjelke et al., 2016; Gao et al., 2013; Larsson, 2009; Lupton & Pedersen, 2016; Özkan Şat & Yaman Sözbir, 2018; Smith et al., 2020; Zhu et al., 2019). Other common topics included pregnancy ailments and complications (Bjelke et al., 2016; Gao et al., 2013; Kavlak et al., 2012; B Lagan et al., 2010; Larsson, 2009; Mankuta et al., 2007; Narasimhulu et al., 2016), childbirth information and preparation (Bjelke et al., 2016; Gao et al., 2013; Kavlak et al., 2012; B Lagan et al., 2010; Larsson, 2009; Mankuta et al., 2007; Narasimhulu et al., 2016; Zhu et al., 2019), and health and nutrition during pregnancy (Bjelke et al., 2016; Gao et al., 2013; Kavlak et al., 2012; B Lagan et al., 2010; Larsson, 2009; Özkan Şat & Yaman Sözbir, 2018; Zhu et al., 2019). Studies analysing pregnant women's posts on pregnancy forums found that maternal physical health (e.g. physical symptoms, health problems, body changes, and complications) were the most commonly asked about topics (Link et al., (2016); Wexler et al., 2020). Information-seeking was also dependent on pregnancy stage; threads started in the first trimester of pregnancy were most often about miscarriage, morning sickness, bleeding, while threads started in the third trimester were most often about labour signs, labour induction, and pain (Wexler et al., 2020).

While some popular topics are consistent across cultures, others reflect regionally-specific differences. For instance, comprehensive prenatal testing (e.g. screenings for Tay-Sachs, amniocentesis testing) is more common in Israel than other countries. As a result, one interview study of 50 women in Israel found that the most commonly reported need for information-seeking on the internet was in regards to prenatal testing, including testing timing and interpreting test results (Lev, 2013). Another study surveyed 7,092 women from across Europe, Australia, and the Americas about whether they used the internet as an information source about medications during pregnancy. Response rates varied widely by country, from a low of 44% (Canada) to a high of 90% (Russia), with an overall average across participants of 60% (Hämeen-Anttila et al., 2013).

There are also differences observed in how specific platforms may fulfill distinct informational needs. A focus group study of women in the US found that while women often used search engines to fulfill simple searches about pregnancy-related symptoms (e.g. abdominal pain, constipation, fatigue, heartburn), they were more likely to use smartphone apps (e.g. BabyCenter) for information about foetal and child development, and to use social media (e.g. Facebook) to learn about the experiences of others (Kraschnewski et al., 2014) or request emotional support (Link et al., (2016)). One study of Turkish women found that women seeking information via pregnancy-apps were more likely to look for information on foetal development and due dates, while women seeking information via pregnancy blogs were more likely to look for information on nutrition and health (Özkan Şat & Yaman Sözbir, 2018). The privacy aspect of some social media channels (e.g. closed Facebook groups) may lead women to use them to seek more sensitive information that they wouldn't feel comfortable asking about in a more public forum (Arcia et al., 2019; Mansour & Francke, 2017). For instance, one interview-based study of 20 women in China found that sharing private or personal information on public forums was rare, but in private channels, they frequently reported requesting and sharing information about their husbands (50%), pregnancy announcements (45%), or their preparations for delivery (40%; Zhu et al., 2019).



## Why

Across studies, women endorsed the internet as a preferred source of information due to its ease of use; internet searches are quick, accessible, and convenient (Bert et al., 2013; Fleming et al., 2014; Lee & Moon, 2016; Lev, 2013; Lupton, 2016; Narasimhulu et al., 2016; Prescott & Mackie, 2017; Rodger et al., 2013). Women have fewer prenatal care appointments early in pregnancy, which is when they often have the most questions (Kraschnewski et al., 2014; B. M. Lagan et al., 2011). Even when they do have appointments, women often expressed a need for more information to follow up on or clarify things mentioned by their healthcare provider (Bernhardt & Felter, 2004; Huberty et al., 2013; Kavlak et al., 2012; B Lagan et al., 2010; Rodger et al., 2013). Women often said that they didn't want to 'burden' their healthcare provider by 'bothering' them with simple questions (B. M. Lagan et al., 2011), so instead they turn to the internet. Women also use the internet as a source of information *before* prenatal appointments. Many women reported a desire to gain knowledge and/or confidence before speaking to their healthcare provider (Huberty et al., 2013; B Lagan et al., 2010; Lev, 2013; Prescott & Mackie, 2017; Smith et al., 2020). However, providers rarely directly provide online resources to their patients (Arcia et al., 2019), so they are searching on their own. Additionally, many women do not review the information they found online with their healthcare provider (Fleming et al., 2014; Gao et al., 2013; Kavlak et al., 2012; Larsson, 2009), which means providers are missing an important opportunity to (1) provide scientifically accurate internet resources and (2) contradict incorrect information that may have come up their patients' internet searches. However, one study that included a larger percentage of women under the care of midwives found much lower levels of internet searching than observed in other studies (Grimes et al., 2014), which may reflect differences in support provided by different kinds of providers.

In addition to information, forums and social media can fulfill needs for social and emotional support (Arcia et al., 2019; Bjelke et al., 2016; Fredriksen et al., 2016; B. M. Lagan et al., 2011; Smith et al., 2020). First-time moms, in particular, may be looking for social connection (Fleming et al., 2014). Social media platforms enable timely support from other women, reducing feelings of anxiety and loneliness during pregnancy (Zhu et al., 2019). This may be particularly relevant to the ongoing COVID-19 pandemic, where we may see increased needs for both information and social affiliation. High levels of psychological distress, such as anxiety (e.g. Conrad, 2021), have been observed in pregnant women during the pandemic, and both social isolation and social support have been found to be associated with these mental health problems (Khoury et al., 2021). Limited research on changes in pregnancy-related internet searching behaviours during the current pandemic has been conducted so far, but one study of Turkish women found that 30% of women who reported using pregnancy-related apps said that they were looking for information specific to COVID-19 (Özkan Şat & Yaman Sözbir, 2021). Another study conducted during the early stages of the pandemic (May-June 2020) found that increased internet and app usage related to pregnancy information was correlated with higher anxiety, but posting in forums was negatively correlated with anxiety (Harrison et al., 2021), suggesting that social connection on the internet may be beneficial for the mental health of pregnant women.

Social media may also fulfill specific emotional needs through validation of the 'normality' of specific pregnancy experiences (B. M. Lagan et al., 2011; F. W. Song et al., 2012). In an interview based study, reassurance and validation were commonly

expressed themes; women described the information on the internet not as a replacement for information from their health care provider, but as beneficial for gaining a sense that other women also share their feelings or experiences (Prescott & Mackie, 2017). The ability to read about and gain experience-based information from women in the same situation as them was often noted, especially for women facing health or pregnancy complications (Bjelke et al., 2016; Fredriksen et al., 2016; F. W. Song et al., 2012).

### How

Many women across studies acknowledged the presence of inaccurate information on the internet and the need to evaluate the quality of information (Kraschnewski et al., 2014; Lee & Moon, 2016; Prescott & Mackie, 2017; Rodger et al., 2013). Women often reported relying on the source of the information, such as the company or organisation, as a way of deciding what information to trust (Bernhardt & Felter, 2004; B Lagan et al., 2010). In one study, most women (76%) said that they checked to see who was providing the information (Huberty et al., 2013). Women also often reported looking at the education or expertise level of the author of the information (Bernhardt & Felter, 2004; Fredriksen et al., 2016; Kavlak et al., 2012) or for the provision of references (Gao et al., 2013; Larsson, 2009). Women often expressed scepticism in accepting information from commercial sources, recognising their motivation to sell products (Bernhardt & Felter, 2004).

Sources such as government run websites, local health sites (e.g. local hospital), or sites run by health professionals were often cited as the most trusted or reputable sources (Huberty et al., 2013; Larsson, 2009; Lupton, 2016; B. M. Lagan et al., 2011; Prescott & Mackie, 2017). However, women may have trouble knowing where to find this information; one study found that only 11% of women could identify their country's Child and Youth Health Website by name (Rodger et al., 2013). Source information may also be more difficult to ascertain with newer technology, such as apps. One study found that 74% of women who had used pregnancy apps had not checked the sources of the information found within them (Lupton & Pedersen, 2016).

Some studies explored the ways that women evaluate information provided by other women in forums or social media. One study found that women used indicators of education level (e.g. language use and writing style), life experience (e.g. older kids, multiple children), and similarities in background to themselves (e.g. lifestyles, parenting values, worldviews, socioeconomic, cultural) to assess other women's credibility (Mansour & Francke, 2017). There was also acknowledgement in some studies that while other moms may be a good source of information on practical parenting advice or context-specific scenarios, they were not a good source of medical or health advice (Bernhardt & Felter, 2004; Mansour & Francke, 2017).

Other studies highlighted that women may be using strategies that are not necessarily the most effective evaluation strategies. Women often expressed using a 'cross-checking' strategy, feeling that if information was repeated across multiple sources then it was more likely to be true (Arcia et al., 2019; Bernhardt & Felter, 2004; Gao et al., 2013; Larsson, 2009; B. M. Lagan et al., 2011; Zhu et al., 2019). Some women also indicated that popularity or web-traffic was an indication of reliability (Gao et al., 2013; Kavlak et al., 2012; Zhu et al.,

2019). Women also reported relying more on information that coincided or resonated with their own lived experiences (Fredriksen et al., 2016; Zhu et al., 2019), leading to potential confirmation biases.

## Conclusions and future directions

The current review of the literature summarised the motivational and situational factors behind seeking pregnancy-related information on the internet, including where pregnant women go for information, what they are looking for, and how they evaluate that information. This summary helped to illuminate gaps in the literature where additional research can help better understand internet information-seeking behaviours during pregnancy, which are discussed here. The knowledge gained from further research can help practitioners to better support their patients as they navigate online resources to access accurate, evidenced-based information to fulfill the specific information needs of pregnancy.

A number of characteristics emerged across research studies which may define who is more likely to use the internet as an informational resource, including being a first-time mother, being younger, and achieving higher educational levels. However, many of these studies focused on limited populations and older technology; additional research which focuses more on smartphone usage, including apps, and compares across income and education levels may be helpful. Other studies revealed potential roles of health literacy, pregnancy stages, and pregnancy-related health complications in predicting internet information-seeking behaviours. Additional characteristics, like psychological states and mental health, remain understudied. Longitudinal, quantitative research in this area could be particularly beneficial for clarifying the direction of the relationship between mental health and internet behaviours in pregnancy, with potential clinical implications for women suffering from pre- and post-partum anxiety.

The current review also suggests that women tend to rely on commercial websites, apps, and social media forums for information over more accurate sources like academic or government website (Huberty et al., 2013; B Lagan et al., 2010; Rodger et al., 2013; Wallwiener et al., 2016). However, women often had individual preferences regarding preferred information channels (Lev, 2013; Rodger et al., 2013) and differed as to whether they are 'heavy users' of such platforms (Kraschnewski et al., 2014; Zhu et al., 2019). Future research here may want to focus on understanding who, based on demographic, personal, and situational variables, is likely to refer to more commercial sources and is likely to be a 'heavy user', to make sure that informational needs are met with high-quality and factual information for all women.

A number of common topics emerged in women's information searches, including foetal development, pregnancy complications, childbirth information, and maternal health. However, differences in informational needs were observed to vary by region (Hämeen-Anttila et al., 2013; Lev, 2013), platform (Kraschnewski et al., 2014), and pregnancy stage (Wexler et al., 2020). Few studies include women from across different countries or regions, so this may be important to further explore via studies with expanded populations. Further exploration of the kinds of information-seeking women do in these private and closed channels may also be beneficial, especially in regards to medical or health advice (Bernhardt & Felter, 2004; Mansour & Francke, 2017).

It is clear that the internet is a preferred source for many women because it is quick, easy, accessible, and convenient. However, a concern that emerged was that many women are turning to the internet, rather than their healthcare provider, due to the nature and structure of prenatal healthcare (Kraschnewski et al., 2014; B. M. Lagan et al., 2011). One solution to these issues may be for providers to communicate directly with their patients over the internet, for instance, via smartphone apps or medical consultation forums (Mankuta et al., 2007). Healthcare providers may also want to ask their patients directly about their information-seeking strategies on the internet or provide additional online resources, in order to counter some of the mis-information they may find in their independent searches. There may also be differences here across different health care systems (i.e. doctors vs midwives; Grimes et al., 2014) that should be explored further.

Social media platforms, such as Facebook, were often perceived by women as serving their social and emotional support needs, especially first-time moms (Arcia et al., 2019; Bjelke et al., 2016; Fleming et al., 2014; Fredriksen et al., 2016; B. M. Lagan et al., 2011; Smith et al., 2020; F. W. Song et al., 2012; Zhu et al., 2019). Additional research, particularly longitudinal research, may be beneficial to see how social media affects women's anxiety, fear, sense of emotional connection, and loneliness over the course of pregnancy. Especially in light of the concerning rise in mental health distress among pregnant women during the ongoing pandemic (Conrad, 2021; Khoury et al., 2021), continued work on how the internet and smartphone apps may fulfill pregnant women's social support needs and whether usage could lead to improvements in mental health symptoms is crucially important.

While information seeking on the internet is easy and convenient, the information is not always reliable. Some of the strategies that women reported using to evaluate the accuracy of information may be effective, such as looking at the source of the information (Huberty et al., 2013), evaluating expertise of the author (Bernhardt & Felter, 2004; Fredriksen et al., 2016; Kavlak et al., 2012), or presence of references (Gao et al., 2013; Larsson, 2009). However, others appear to be less beneficial, such as using a website's popularity as an indicator of reliability (Arcia et al., 2019; Bernhardt & Felter, 2004; Gao et al., 2013; Kavlak et al., 2012; Larsson, 2009; B. M. Lagan et al., 2011; Zhu et al., 2019). Understanding evaluation strategies as well as general information-seeking is a part of health literacy more broadly, and it may be beneficial for healthcare providers to provide resources that can help their patients increase these skills. Another problem is that effective strategies, like source checking, is less likely when it comes to app use (Lupton & Pedersen, 2016). Providing patients with app suggestions, or even incorporating women-centred content into their own patient portal applications, may be a way to ensure that apps utilised by pregnant women are providing high-quality information.

## Limitations

The current paper served as a narrative literature review of the current state of research on health information-seeking internet behaviours during pregnancy from both health and social science sources. This paper identified recurring themes and findings, as well as shed light on future directions for further research. However, the search was not conducted in

a systematic manner, which may have introduced a degree of bias in regards to the literature that was included or excluded. Additional systematic reviews and meta-analyses may be helpful to validate these findings.

The current paper also focused on some of the major issues surrounding internet search strategies and evaluation, but did not include research on decision-making or behaviour change. Additional reviews that focus on the consequences of internet searching, for knowledge, emotions, and behaviour would be important.

Finally, the current review focuses only on pregnant women. Partners and fathers are also engaging in health information-seeking on the internet; one study of 92 Swedish fathers-to-be found that three-quarters sought pregnancy-related information on the Internet (Oscarsson et al., 2018). However, there is very limited research on how partners use the Internet to seek information, and how this impacts their own knowledge, emotions, and behaviour, and how much information they share with their pregnant partner.

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No potential conflict of interest was reported by the author(s).

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