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Khamis, Sahar; Agboada, Delight Jessica

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Article

## Maternal Health Information Disparities Amid Covid-19: Comparing Urban and Rural Expectant Mothers in Ghana

Sahar Khamis \* and Delight Jessica Agboada

Department of Communication, University of Maryland, College Park, USA

\* Corresponding author (Skhamis@umd.edu)

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### Abstract

The Covid-19 pandemic disrupted mothers' access to credible and reliable health information from their healthcare providers. However, the impact of the pandemic on maternal health information access among rural and urban mothers has not been studied, especially in the Global South. Guided by the channel complementarity theory, we examined the sources of maternal health information rural and urban Ghanaian mothers used during the pandemic. Specifically, we analyzed the role access to technology plays in determining the quantity and quality of maternal health information expectant mothers had during the pandemic. Through purposive and snowball sampling techniques, we recruited and conducted in-depth interviews with 15 mothers, eight from rural communities and seven from urban communities in Ghana. We thematically analyzed the data and found that rural and urban mothers used medical and non-medical sources to obtain maternal health information. While medical sources remained the most credible information source even amid the pandemic, the mothers equally appreciated the immense benefits of other sources, particularly the internet. Our findings also suggest that the motivations for using maternal health information sources complementarily were not limited to the mothers' functional needs, level of interest, and source characteristics but also covered the mothers' location, resources, and health information literacy levels.

### Keywords

Covid-19; Ghana; maternal health information; rural mothers; urban mothers

### Issue

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### 1. Introduction

The Covid-19 pandemic posed serious economic, social, environmental, and health challenges to humanity. Dubbed a "once-in-a-century global health crisis" (Horton, 2020), it significantly burdened marginalized individuals in underdeveloped areas of the world, magnifying longstanding inequities across gender, race, and class (Fisher & Ryan, 2021; Obinna, 2021; Parry & Gordon, 2021).

On March 12, 2020, a day after the World Health Organization declared Covid-19 a pandemic, Ghana recorded its first two cases. Several measures, includ-

ing a lockdown, the mandatory wearing of masks, a ban on social gatherings, and social distancing were implemented by the government and health institutions to curtail the spread of the virus (Kenu et al., 2020). One of the areas that were significantly impacted by these restrictions was maternal health services, which are essential to women during pregnancy, delivery, and postpartum. The pandemic posed unique challenges to pregnant women in most parts of the world as access to their providers became limited and irregular (Chasson et al., 2021; Pant et al., 2020; Temesgen et al., 2021). Some of these challenges include (a) psychological stress on mothers, (b) reduced facility-based births, (c) increased

mortality, and (d) reduced antenatal care (ANC) attendance (Asuming et al., 2022; Senkyire et al., 2023). ANC is a public health service that aims to prevent health risks through the early detection of abnormalities, the institution of corrective measures, and the spread of health education to ensure a good start to life for each newborn child (Manyeh et al., 2020). Considering these benefits, ANC visits are crucial, especially for women in low- and middle-income countries, who constitute almost 99% of maternal deaths worldwide (Adu et al., 2018; Boah et al., 2018).

The regularity of ANC check-ins with practitioners was disrupted due to virus transmission fears and the imposition of measures to reduce the spread (Green et al., 2020). However, in most developed countries, practitioners adjusted ANC protocols by switching to telehealth (Tolu et al., 2021). Thus, even though face-to-face healthcare was impacted, expectant mothers who were pregnant during the pandemic in developed nations still had access to their practitioners via internet-based applications. This significant switch typified the relevance of technology and telemedicine to maternal health. Unfortunately, this switch to telehealth was not available to many women in the rest of the world as there is increasing evidence of a widening digital divide between countries in the Global South and the Global North (Ogunsola & Okusaga, 2006). Moreover, the pandemic has widened the digital gap between the technological haves and have-nots globally (Khamis & Campbell, 2020). Sadly, with the absence of telehealth in most areas of the Global South, most expectant mothers experienced a lack of relevant maternal health information (MHI) from their providers and thus resorted to seeking MHI from other sources.

Furthermore, the impact of socio-economic discrepancies on information access, even within the same country, is significant. While individuals in urban areas enjoy higher socio-economic status and considerably easier and faster access to rich and credible health information, many of those in rural areas are technological have-nots or digital illiterates with limited health information options (Abekah-Nkrumah & Abor, 2016; Chen et al., 2019). Earlier studies have confirmed that access to health information can influence health behavior, healthcare access, health outcomes, and overall quality of life (Kelley et al., 2016). Specifically, mothers' access to the right sources of MHI positively impacts mothers' health behaviors during and after pregnancy (Galle et al., 2021). Thus, in places with unequal access to healthcare, alternative information sources are necessary to fill the knowledge gap caused by the lack of face-to-face healthcare and telehealth. However, literature comparing health information access between rural and urban mothers remains scant.

Therefore, this study investigates how expectant mothers from two areas in Ghana, namely more affluent urban areas and underserved rural communities, access MHI while equally navigating access to the health ser-

vices and resources needed to ensure a safe pregnancy and delivery during the pandemic.

## 2. Literature Review

Research has established that MHI is essential for women's health during pregnancy, childbirth, and postpartum (Mulauzi & Daka, 2018). Keeping mothers informed about their pregnancy effectively prepares them for prenatal care, reducing pregnancy's adverse outcomes (Kamali et al., 2018; Sokey & Adisah-Atta, 2017). Existing literature reveals that mothers source MHI from varied sources, including healthcare providers, interpersonal networks, the internet, mass media, and books (Criss et al., 2015; Zhu et al., 2019).

Loudon et al. (2016) found that first-time mothers' (FTMs) information needs included sleep, nutrition, healthcare, family welfare, mother-infant groups/activities, and baby products and recommendations for getting these products. The authors found that the participants highly valued face-to-face communication with other mothers, followed by family and websites. They also found that the mothers' challenges include "lack of time and opportunity; conflicting information from different sources; requiring information about potentially contentious or sensitive topics; and lack of engagement with peers" (Loudon et al., 2016, p. 36). Greyson (2017) studied the health information practices of young parents in Canada. The study revealed that most participants were sophisticated information seekers with good access to information and highly networked through mobile technologies. However, participants faced challenges assessing the large quantity of information they retrieved. All these studies were conducted in urban areas.

Kassim (2020) and Das and Sarkar (2014) studied the MHI-seeking behavior of rural women in rural Tanzania and India, respectively. They found that rural mothers' information needs include the detection of pregnancy, pregnancy and delivery complications, use of traditional medicines during pregnancy, immunization and prevention of communicable diseases, and nutrition and exercise during pregnancy (Das & Sarkar, 2014; Kassim, 2020). Furthermore, they found that mothers had to overcome unique challenges to satisfy these information needs. These challenges include traveling long distances to health facilities, inadequate time spent with skilled professionals, lack of privacy, poor maternal health services, low level of education among pregnant women, and familial pressure in terms of chores and childcare (Das & Sarkar, 2014; Kassim, 2020). Kassim (2020) concludes that satisfying these information needs is crucial for rural women to make prompt and informed decisions about their maternal health.

From this review, a notable difference emerges between the information needs of women who live in economically advantaged areas and those in resource-impo-

as they have mainly focused on the MHI needs of mothers and the challenges or barriers to accessing MHI. This recurring pattern in the literature calls for investigating varied dimensions of MHI-seeking, such as complementary source use and its impact on the quality and quantity of MHI. Another gap in the existing literature pertains to the studied population. Most studies have focused on mothers from either urban or rural areas. To add to the current studies, we compare mothers from rural and urban areas since social inequalities inform mothers' access to and use of MHI (Sokey & Adisah-Atta, 2017; Ukonu & Ajaebili, 2021; Yakong et al., 2010). Finally, studies that apply communication theories to mothers' health information-seeking are limited. Therefore, using the channel complementarity theory, this study fills these gaps by investigating how rural and urban mothers' access to varied sources of MHI impacted the quality and quantity of MHI they received during the pandemic.

### 3. Theoretical Framework: Channel Complementarity Theory

Channel complementarity theory explains the use of multiple sources to seek information (Dutta-Bergman, 2004a). Dutta-Bergman (2004a, p. 44) asserts that when "motivated by an underlying interest in a certain subject or issue, the users of one medium in the domain of a specific content perhaps also use other media in the same content domain to gather information." Essentially, an individual's functional needs and the level of interest to satisfy those needs determine media usage (Dutta-Bergman, 2004b; Tian & Robinson, 2008), and newer media channels complement, rather than replace, older channels and face-to-face communication (Ruppel & Burke, 2015).

While the theory provides a general explanation for why information seekers use multiple sources to seek information, Ruppel and Rains (2012) extended the theory by (a) situating it in health communication literature and (b) arguing that source characteristics determine how users use different channels complementarily. Defining source characteristics as the relatively enduring structural or technical features of a source, the authors propose four source complementarity characteristics peculiar to seeking health information. First, *access to medical expertise* includes the degree to which a source makes it possible to gain access to medical practitioners. Second, *tailorability* refers to the degree to which users can acquire idiosyncratic information. Third, *anonymity* covers the degree to which the source conceals a user's identity. Finally, *convenience* entails the ease of access and use of a source.

Similarly, Lin and Dutta (2017) used this theory to understand the health information-seeking patterns of internet users in India, extending its use beyond the Western context. The authors observed that internet users use complementary channels to source health

information. Moreover, they detected a complementary relationship between internet use and interpersonal sources. Finally, they found that age impacted how users utilize the media complementarily, as younger information seekers were more likely to use multiple sources complementarily. Lin and Dutta's (2017) study is one of the few studies that highlight how individual characteristics impact source choice. Thus, we argue that rural and urban mothers' use of multiple sources complementarily is informed by their information needs, resources, geographical location, health information literacy skills, and source characteristics. This article contributes to the literature on health information seeking as it provides relevant insights into factors that inform complementary source use by information seekers from different economic, cultural, and social environments.

As such, we explore the following research questions:

RQ1: What MHI sources are available to rural and urban Ghanaian expectant mothers during Covid-19?

RQ2: How does access to technology, or lack thereof, impact the quantity and quality of MHI available to rural and urban Ghanaian expectant mothers during Covid-19?

### 4. Methodology

This qualitative research study adopted a phenomenological lens (Spencer et al., 2014) to unpack the complexities and nuances of the participants' lived realities, everyday experiences, behaviors, and practices as pregnant women navigating many hurdles, including limited access to MHI amid a deadly pandemic.

We purposively recruited participants using fliers that were shared on the social media pages (WhatsApp and Instagram) of the second author (Delight Jessica Agboada), who handled data collection. Mothers interested in the study then contacted the second author, who screened them according to the study's eligibility criteria. The criteria include the mothers being (a) Ghanaian, (b) at least 18 years of age, (c) pregnant during Covid-19, (d) having at least basic English proficiency, and finally, (e) living within an urban or rural area in Ghana (participants self-reported during the screening process and the interviewer, the second author, confirmed using the definition of rural and urban areas provided by Ghana Statistical Service, 2014).

Purposive sampling enabled us to select the best and most information-rich data available to gain an in-depth understanding of the phenomenon (Staller, 2021). However, this initial search did not yield many mothers expressing interest in the study. Therefore, we used snowball sampling to increase the number of participants by asking the participants to refer others who might equally be qualified for the study. We used the same screening method for those participants recruited through snowball sampling. When our advertisements

yielded no more participants, we recruited a key informant through the researchers' contacts to recruit more participants. The key informant used our fliers to recruit more participants. The informant then connected the mothers who expressed interest in participating in the study with the second author via phone. The second author scheduled interviews with this set of mothers. Those who were not interested in participating after learning about the study dropped out without any penalty.

In total, we recruited 15 Ghanaian mothers from different towns and cities in the Volta, Central, Greater Accra, and Oti regions of Ghana. Overall, we had seven urban and eight rural mothers. Table 1 summarizes the research participants' demographics, including their status as first-time mothers (FTMs) or multiparous mothers (MPMs).

We conducted in-depth interviews with 14 mothers via phone calls and one via text messages. In-depth interviews allowed us to concentrate on MHI and ultimately co-create meaning with the participants by acknowledging their unique and important knowledge of the phenomenon (Hesse-Biber, 2017). The semi-structured interview questions covered a range of topics, including mothers' pregnancy-related health needs, how those needs are satisfied, and the impact of Covid-19 on MHI, among others. The interviews were conducted for four months, from April through July 2022. Most of the mothers had given birth at the time of the interview, while some were still pregnant. We capped the sample size at 15 when data from new participants added little value to the emergent analysis (Tracy, 2013). We reached saturation at 14 interviews but conducted one more interview to confirm saturation.

Each phone interview was audio recorded with the participants' verbal consent and lasted between 40 and

60 minutes. We retained the text of the text message interview as data with the consent of that participant. All interviews were conducted in English. The study was approved by the Institutional Review Board of the University of Maryland (1856806–1). Additionally, the regulations for international research under UNESCO, which has Ghana as a member country, are consistent with the provisions of the University of Maryland Institutional Review Board, which protect the identity and privacy of the participants and minimize the risks the study might pose to them.

We manually analyzed the data using Braun and Clarke's (2006) six-phase approach to thematic analysis. First, we familiarized ourselves with the data by listening repeatedly. We then agreed upon the salient parts of the audio recording and transcribed only those essential parts, as these parts contained the data we needed for this study. We then anonymized the data using pseudonyms for each participant in the transcripts. The second author generated the initial codes. We then met over two meetings and jointly searched for the themes that captured the key ideas and reviewed, defined, and named the themes. Finally, we produced the report using thick and rich descriptions (Creswell & Báez, 2021).

## 5. Findings

### 5.1. Impact of Covid-19 on Mothers' Maternal Health Information Access

Undoubtedly, Covid-19 presented a plethora of challenges to mothers. However, the most significant impact of the pandemic on expectant mothers was psychological stress. Most of the mothers reported experiencing

**Table 1.** Research sample demographics.

| No. | Name     | Age | FTM or MPM | Occupation                     | Level of education           | Area  |
|-----|----------|-----|------------|--------------------------------|------------------------------|-------|
| 1   | Denise   | 29  | FTM        | Teacher                        | Bachelor's degree            | Rural |
| 2   | Joyce    | 30  | FTM        | Sanitation and hygiene officer | Master's degree              | Urban |
| 3   | Daniella | 33  | FTM        | Social worker                  | Master's degree              | Urban |
| 4   | Adjoa    | 37  | MPM        | Electrician                    | Technical certificate        | Rural |
| 5   | Gifty    | 31  | FTM        | Learning coordinator           | Master's degree              | Urban |
| 6   | Angela   | 32  | FTM        | Stay-at-home mother            | Master's degree              | Urban |
| 7   | Steph    | 32  | FTM        | Social worker                  | Bachelor's degree            | Urban |
| 8   | Rahinatu | 24  | FTM        | Businesswoman                  | High school diploma          | Urban |
| 9   | Emma     | 28  | FTM        | Businesswoman                  | Bachelor's degree            | Rural |
| 10  | Afua     | 23  | MPM        | Student                        | Bachelor's degree            | Rural |
| 11  | Naa      | 28  | FTM        | Teacher                        | Bachelor's degree            | Rural |
| 12  | Esther   | 22  | FTM        | Unemployed                     | High school diploma          | Rural |
| 13  | Vida     | 29  | FTM        | Teacher                        | College of education diploma | Rural |
| 14  | Seyram   | 33  | MPM        | Teacher                        | Bachelor's degree            | Rural |
| 15  | Cecy     | 40  | MPM        | Lecturer                       | Master's degree              | Urban |

increased fear and anxiety during their pregnancies amid the pandemic. A notable trigger of this psychological stress was the fear of contagion. Most of them acknowledged how this fear led them to either delay ANC initiation, choose facilities with fewer patients or strictly adhere to the uncomfortable Covid-19 protocols. For example, Gifty, a 31-year-old learning coordinator with a master's degree who is an FTM and lives alone in an urban area, shared that "I did not attend ANC during the first trimester because I felt it wasn't completely safe because I was vulnerable. So, I consulted with a hospital online instead." This finding corresponds to the results of other studies that there was a reduction in ANC attendance (Senkyire et al., 2023; Tadesse, 2020).

Other mothers intimated their difficulty in keeping up with the Covid-19 safety measures. For example, Naa, a 28-year-old teacher with a college degree who is an FTM living with her nuclear family in a rural area, noted that "it was stressful wearing a nose mask all the time because I frequently experienced shortness of breath. The safety protocols then were burdensome for me." Finally, we found that Covid-19 redefined all the mothers' MHI needs. Essentially, the pandemic added many information needs for the mothers to satisfy. This meant that the mothers increasingly sought more information on topics unrelated to the traditional MHI needs established in extant literature. Some of the areas of concern for the mothers were mother-to-child transmission, Covid-19 risks and safety measures, and Covid-19 vaccine issues. In the next section, we discuss the various sources of MHI available to mothers amid the pandemic.

## 5.2. Research Question 1

The findings indicate that the mothers relied on various sources of MHI to better understand the changes pregnancy presented to them and generally manage motherhood amid the pandemic. These sources are in two broad categories: medical and non-medical sources of MHI. For medical sources of information, most mothers relied on their healthcare providers. For non-medical sources of information, most mothers sourced information from their interpersonal networks of family and friends, as well as new and mainstream media. These sources of information are presented below, focusing on the similarities and differences between rural and urban mothers.

### 5.2.1. Medical Sources of Information: Healthcare Providers

Visiting healthcare providers is a channel patients use for reliable health information (Tian & Robinson, 2008). The findings of this study reveal that the most relevant source of MHI available to the participants is their healthcare providers. All the mothers indicated using ANC services during different stages of their pregnancies and received MHI during these visits. Primarily, mothers receive MHI at health facilities in two ways. First, general

MHI is delivered by healthcare providers to the mothers during their ANC classes. This is an excellent example of what Greyson (2017) describes as *encountering information*, which involves a time when mothers were not actively seeking information but received it by simply being at the healthcare facility. Second, the mothers actively seek MHI during individual consultations with their healthcare providers by asking specific questions concerning their pregnancies and Covid-19. Often, these questions cover (a) changes the pregnancy had introduced to their bodies and (b) safe pregnancy practices, especially amid the pandemic.

Joyce, a 30-year-old sanitation and hygiene officer with a master's degree who is an FTM and lives alone in an urban area, mentioned, "I ask some questions—what to do, what not to do and the medications to take, the scans to do, when to do them, why am I prone to this or that?"

Seyram, a 33-year-old teacher with a bachelor's degree who is an MPM and lives with her nuclear family in a rural area with two children, mentioned that she asks questions concerning:

The care for myself and my unborn child because I have been observing people going through a lot from conception to delivery, so I was thinking that the only way to avoid that is to have more education so that in case I was going through those same things, I will know how to handle the situation.

We also found that mothers generally preferred their healthcare providers as their primary source of MHI because they found their information credible. This aligns with the finding of Criss et al. (2015) that mothers find their healthcare provider to be a trusted source of information. However, there were mixed reactions when asked to assess their satisfaction with the MHI received from their healthcare providers during their ANC visits amid the pandemic. All the rural mothers were quick to express their satisfaction with the information they received from their healthcare providers. However, only a few urban mothers expressed similar satisfaction.

Notably, the urban mothers who expressed satisfaction were mothers who used private facilities. For example, Gifty revealed that she was not so pleased with the depth of information she received from the public facilities. Hence, she used the private facility when she wanted detailed information about her health and her baby's wellbeing. This is confirmed in an earlier study (Abekah-Nkrumah & Abor, 2016), which indicated that dissatisfaction with some public facilities forces users to turn to private facilities.

Most of the rural mothers who expressed satisfaction with the information received from their healthcare providers attributed their satisfaction to their healthcare providers' friendly and approachable attitude. This made it easy for them to freely interact with their providers, enabling them to ask all their questions and receive credible information.



The urban mothers who were unsatisfied with the information they received indicated they were disappointed because of a few factors. First, some mentioned that they felt disrespected by their midwives, which resulted in them being hesitant to seek MHI. However, they had no option but to keep attending ANC until they gave birth. This is consistent with the findings of Yakong et al. (2010), who found that participants believed that they had no option but to accept disrespect from the nurses and thus kept to themselves to avoid conflict with nurses. Second, some participants were unhappy with the medical system in general, as the high patient-provider ratio reduces the time providers spend on one-on-one consultations, which inadvertently hampers the quantity and quality of the information received. This high patient-provider ratio is further complicated by Covid-19, making it very stressful for mothers to have their information needs met during their visits to their healthcare providers.

Adjoa, a 37-year-old electrician who is an MPM and lives in a rural area, narrated that her dissatisfaction with the public facility during her first pregnancy before Covid-19 forced her to seek the services of a midwife. She indicated her satisfaction with the midwife's services because of the depth of their one-on-one interaction during ANC. She stated that "she [the midwife] never gets annoyed or shouts at you under any condition," alluding to her prior experience with midwives at public facilities.

Aside from face-to-face information seeking, the findings also indicate that some rural and urban mothers had access to their providers outside regular ANC hours via phone and text. For example, Steph, a 32-year-old social worker living in an urban area, said, "the midwife gave me her personal number to call her anytime I had questions." The participants who had access to their providers outside ANC hours were either given personal phone numbers by their healthcare providers or had access to the general call number of their providers. In such cases, the mothers mainly reached their providers if they had urgent health matters that required immediate information from a credible medical source.

### 5.2.2. Non-Medical Sources of Information: Interpersonal Networks and Mainstream Media

When the mothers are not seeking or receiving MHI during their regular ANC, they use other sources of information to help them optimize their maternal health during their pregnancy. These include online sources, interpersonal sources, and mainstream media. We will discuss the interpersonal sources and mainstream media in detail below and elaborate on the use of online sources when discussing the findings of the second research question.

As for interpersonal networks, the findings of this study reveal that some mothers from both groups occasionally sought MHI from friends and families. In most instances, the mothers who sought information from

their families and friends specifically chose people with prior experience with childbirth or professional expertise in maternal health. Therefore, these mothers found value in the experiential nature of the information they receive from other mothers (Gagné et al., 2016; Loudon et al., 2016). When asked if she sourced information from others, Naa mentioned:

Yes, I was an ulcer [stomach] patient before pregnancy, which affected me badly, but I had one experienced mother [a friend] who always helped me cope with this condition. For example, she advised me on what kinds of fruits and foods I should avoid eating and how I should make sure to eat on time.

While those mothers who sought information from healthcare workers within their networks were able to affirm the credibility of the information they received, others questioned the credibility of information received from their lay family and friends. For instance, Afua, a 23-year-old college student who is an MPM living with her extended family in a rural area, observed:

We all know times are changing, and our health systems are changing compared to our mothers' times when they used herbal medicines for their healthcare. But now, all the chemicals they use on our crops affect herbs as well, so I would rather seek healthcare from a health facility rather than take the herbs my mother recommends.

Thus, she preferred seeking MHI from a trusted professional instead of relying on traditional knowledge.

Regarding mainstream media, contrary to what has been established in previous studies on rural Ghanaian women's use of mainstream media, such as radio sets, to seek health information (Sokey & Adisah-Atta, 2017), our findings reveal that most participants from both groups did not actively seek MHI through mainstream media. For example, Steph explained she does not use mainstream media to seek MHI because "it is difficult getting this type of information [MHI] through such media. They are not specific. There are no specific programs."

Whereas mothers in an earlier study purposely gleaned pregnancy and/or child health information through television (Criss et al., 2015), the mothers in our study who mentioned receiving MHI through television mainly did so through unintentional, passive encountering (Greyson, 2017). For example, Seyram recounted her experience with mainstream media:

I listen to some of this information occasionally on the radio, but as for TV, maybe only if I'm watching a film, for example, and for a brief moment, they advertise a program that is related to maternal healthcare. However, I never planned this in advance or did it on purpose.

Overall, our findings indicate that mainstream media do not satisfy the mothers' maternal information needs and are not considered primary or purposeful sources for obtaining reliable and credible MHI during the pandemic.

### 5.3. Research Question 2

#### 5.3.1. Online Sources and Access to Maternal Health Information

All the mothers who live in urban areas have mobile devices with a strong and stable internet connection enabling them to access MHI via the internet, primarily using the search engine Google and other sites such as YouTube and pregnancy apps, including Baby Center and Pregnancy Calculator. Cecy, a 40-year-old lecturer with a master's degree who is an MPM living with her nuclear family in an urban area, confirmed that she uses websites and other pregnancy apps to access MHI.

However, Rahinatu, a 24-year-old businesswoman with a high school diploma who is an FTM living with her nuclear family in an urban area, was the only urban mother who did not use the internet to source MHI. She explained that she did not use the internet to source health information because she was denied access to a phone during her pregnancy because of family issues. She mentioned, "I did not use Google because I didn't have a phone to communicate or research anything."

Although earlier studies (e.g., Sokey et al., 2018) found substantial evidence that supports the implications of the urban-rural divide on rural women's MHI access, our findings are mixed. First, the rural participants are split into two categories—users and nonusers. The nonusers mainly attributed their nonuse to infrastructural barriers, such as the lack of stable internet connection. Thus, despite the desire some had to source MHI through the internet, they could not rely on the internet as the main MHI source.

On the other hand, the rural mothers who used the internet to access MHI expressed the importance of the internet in their search for and access to MHI. They mentioned that the internet helps them to (a) expand their knowledge base on maternal health during pregnancy, (b) understand the implications of Covid-19 on them, (c) get the needed MHI in the absence of their providers, and (d) be better prepared for ANC. For instance, Emma, a 28-year-old businesswoman from a rural area, explained: "I use Google whenever the midwives do not answer my calls." Thus, the internet helps her access MHI when she cannot communicate with her midwives.

Despite claiming satisfaction with the ANC services she received, Naa said: "Most times I don't get everything I need from the healthcare practitioners, so I go online to find out more information in addition." These findings are consistent with an earlier study which found that mothers sourced information online to meet unmet offline information needs and seek broader experiences

or opinions (Loudon et al., 2016). Interestingly, there was no apparent difference between rural and urban women while discussing the uses of the internet in sourcing MHI. The urban women also intimated using the internet for the same purposes as the ones enumerated above.

Even though the internet is vital in sourcing MHI, accessing information online does not come without challenges. We found that more rural mothers experienced challenges while seeking MHI through the internet than urban mothers. For example, some rural mothers indicated that, despite their desire to know more by resorting to the internet, they experienced difficulty getting a stable and strong internet connection. Other participants mentioned that it was difficult to determine the most credible information from the pool of information the internet provides. This finding is confirmed by existing literature that rural women experience more difficulties while seeking health information (Sokey & Adisah-Atta, 2017).

#### 5.3.2. Impact of Access to Technology on the Quantity and Quality of Maternal Health Information

The findings indicate that the mothers' access to technology, mostly via a smartphone connection to the internet, impacted the depth and breadth of information they received from all the other sources. Most of the mothers valued the internet because it provided access to more information, which enabled them to fully understand the changes in their bodies and adjust accordingly. For instance, Denise, a 29-year-old teacher and FTM with a college degree living alone in a rural area who received care in an urban area, stated:

Sometimes I get more information from YouTube than I get from the hospital. We are many, so they [midwives] will just rush through the information without enough details at the hospital. So, YouTube helps me a lot in terms of filling some of these knowledge gaps.

Most of the participants shared Denise's experience. Thus, the internet becomes a secondary source of MHI when their primary source, healthcare providers, does not meet their expectations. This finding shows that although healthcare providers are considered a credible source of MHI, the limited time spent with them sometimes hampers the depth of information received.

Participants' thoughts were divided on the quality of information retrieved through the internet. While some believed the internet provides detailed and trustworthy information, others were not convinced. Additionally, the mothers' view of the quality of information on the internet determines how they use it. For instance, if a mother deems the internet a source of accurate, credible, and detailed information, she uses it to augment the MHI she acquires during ANC and, ultimately, source information through that resource more often.



However, when the credibility of the information is questioned, some mothers go through a fact-checking and validation process through their healthcare providers (Criss et al., 2015) during ANC, or they call/text them to validate the information before acting upon it. Therefore, the assessment of credibility is a factor that drives mothers' complementary use of MHI sources. The quote below illustrates how a mother used two different sources complementarily. Emma notes:

Towards the latter part [of the pregnancy], I was really having this thigh pain, and then I Googled, and I wasn't really sure of what to think because it gave me a lot of reasons. So I had to call the midwives. They gave me clear answers, and I was like: "Wow!" I really believed them, and they told me what to do and what not to do, and it worked.

Thus, the ability of the midwives to provide tailored information—information unique to one's circumstances—encouraged Emma to use midwives as a source of MHI in addition to the internet (Rains & Ruppel, 2016).

Interestingly, all the above information sources are similar to those health information seekers used in studies conducted before Covid-19 (e.g., Loudon et al., 2016; Rains & Ruppel, 2016). This finding indicates that MHI sources remained the same even amid the pandemic. The significant change, however, is the motivation behind using a source and its frequency. For most mothers, disruptions in ANC access and the psychological stress experienced while seeking ANC informed their frequent use of the internet in seeking MHI during the pandemic.

## 6. Discussion

Our findings indicate that rural and urban expectant mothers used complementary sources to seek MHI during the pandemic. We found various factors that informed complementary source choice and use among the mothers. The findings reveal substantial evidence supporting the theory's assumption that individuals' functional needs and level of interest determine source use (Dutta-Bergman, 2004b; Tian & Robinson, 2008). In our study, the mothers' need for MHI during their pregnancies and the desire for a positive pregnancy experience and safe delivery informed their choice of information sources. Similar to the findings of Kamali et al. (2018), we found that healthcare providers and the internet were significant information sources for rural and urban mothers during the pandemic. This finding highlights both the continued importance of interpersonal, face-to-face communication with healthcare providers and the significance of access to technology amid the pandemic. Thus, newer media complement rather than replace face-to-face communication (Ruppel & Burke, 2015).

Healthcare providers are a significant information source for mothers because they provide tailored and credible MHI; thus, both rural and urban mothers use this as their primary source of MHI. This finding is consistent with Ruppel and Rains' (2012) assertion that health information seekers consider their healthcare provider an authoritative and reliable source of health information because of their extensive training. In addition, this is supported by earlier conclusions by Tian and Robinson (2008) that complementarity extends beyond media usage to interpersonal contact with healthcare providers.

The findings support conclusions in extant literature that the internet has become an indispensable tool for sourcing health information (Zhu et al., 2019). In this study, the mothers used the internet as a source of MHI because it afforded anonymity and convenience during the pandemic (Kamali et al., 2018; Ruppel & Rains, 2012). In most instances, these characteristics were lacking in the other sources the mothers used. In addition, most mothers found it difficult to seek information on some personal issues because ANC consultations did not provide them with the needed privacy. Thus, the internet filled that gap and enabled the mothers to access MHI anonymously. Finally, the internet provided convenience as it helped the mothers access MHI instantaneously from the safety of their homes without risking being exposed to the virus. Therefore, the internet pairs well with the other information sources as it has characteristics that the other sources lack.

Although channel complementarity theory postulates that newer media do not replace older media, we discovered that a channel's ability to satisfy a need primarily informs its use with other channels (Dutta-Bergman, 2004b). Thus, participants' limited reliance on mainstream media, for example, is associated with the lack of maternal health content. This is substantiated by Tian and Robinson (2008, p. 186), who observe that "media channels that are unlikely to include relevant health information are unlikely to be attended to at the same level as media channels that do include relevant health information." Therefore, although some participants expressed interest in receiving MHI through mainstream media, the lack of relevant content discouraged them.

In addition to the mothers' functional needs, levels of interests, and source characteristics (Dutta-Bergman, 2004b; Ruppel & Rains, 2012), we found the mothers' health information literacy skills and access to resources to be significant in complementary source use. In essence, for mothers to use multiple sources complementarily, they must have the requisite skills and resources. This study revealed that the mothers needed to possess health information literacy skills and the necessary resources to combine multiple sources in seeking MHI. These information literacy skills include the mothers' abilities to source, evaluate, and use MHI. The resources include mothers' access to smartphones,

the internet, mobile data, and friends and family who have experienced pregnancy. Thus, the mothers who did not use multiple sources complementarily, especially those from rural areas, either lacked the literacy skills or access to the resources that would enable them to use various sources in seeking information.

## 7. Limitations

While this study provides evidence of MHI sources used by both rural and urban expectant Ghanaian mothers during the pandemic, it has some limitations. First, we interviewed only mothers with basic English proficiency. This recruitment criterion precluded low-educated mothers' perspectives. Therefore, future studies should recruit women with low literacy for more nuanced perspectives. Second, we interviewed when the impact of Covid-19 had declined in Ghana, and most of the participants had given birth. Therefore, the interview timeframe made some interviews ex post facto. Future studies should consider data collection during the peak of a pandemic to limit the impact of recall bias on the data. Finally, while this study provides substantial evidence of the sources of MHI for Ghanaian expectant mothers during the pandemic, it did not explore how access to MHI informs maternal health behaviors. Thus, future research should investigate how expectant mothers' access to MHI impacts their maternal health behaviors.

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## Conflict of Interests

The authors declare no conflict of interests.

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## About the Authors



**Sahar Khamis** is an associate professor in the Department of Communication at the University of Maryland, College Park. She is an expert on Arab and Muslim media and the former head of the Mass Communication Department at Qatar University. She is the co-author of the books *Islam Dot Com: Contemporary Islamic Discourses in Cyberspace* (Palgrave Macmillan, 2009) and *Egyptian Revolution 2.0: Political Blogging, Civic Engagement and Citizen Journalism* (Palgrave Macmillan, 2013), and the co-editor of the book *Arab Women's Activism and Socio-Political Transformation: Unfinished Gendered Revolutions* (Palgrave Macmillan, 2018).



**Delight Jessica Agboada** is a PhD candidate in the Department of Communication at the University of Maryland, College Park, where she specializes in public relations and strategic communication. She conducts research on health information and misinformation among mothering publics, maternal health access among underserved populations, and corporate social responsibility communication. Delight obtained her master's degrees at Ohio University, USA (Communication and Development Studies) and the University of Education, Winneba, Ghana (Communication and Media Studies).