

Review

Factors Affecting the Formation of False Health Information and the Role of Social Media Literacy in Reducing Its Effects [†]

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Abstract: The COVID-19 pandemic heightened concerns about health and safety, leading people to seek information to protect themselves from infection. Even before the pandemic, false health information was spreading on social media. We conducted a review of recent literature in health and social sciences and proposed a theoretical model to understand the factors influencing the spread of false health information. Our focus was on how false health information circulated before and during the pandemic, impacting people's perceptions of believing information on social media. We identified four possible strategies to counteract the negative effects of false health information: prebunking, refuting, legislation, and media literacy. We argue that improving people's social media literacy skills is among the most effective ways to address this issue. Our findings provide a basis for future research and the development of policies to minimize the impact of false health information on society.

Keywords: false health information; health fake news; health misinformation; health disinformation; social media literacy; COVID-19



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1. Introduction

The COVID-19 pandemic was severe, comparable to the Spanish flu from a century ago, affecting both physical and mental health [1]. Researchers have extensively studied its impact on society, revealing psychological issues and challenges, such as psychological disorders, anxiety, etc. [2]. Worldwide measures like lockdowns, travel restrictions, vaccination mandates, and the use of contact tracing apps were implemented to curb the virus [3–5]. Some resisted these measures, viewing them as conspiracies [6]. Even those who believed in vaccinations became confused, turning to false health information on social media. This skepticism made it harder for health authorities to control the virus, worsening its impact. Our research delves into the creation and spread of false health information on social media before and during the pandemic, aiming to understand the influencing factors, and proposing ways to mitigate its impact in the future. In particular, we focus on three research questions (RQs):

RQ1: What are the factors that make people believe false health information?

RQ2: What are the factors that make people generate false health information?

RQ3: What methods can reduce the impact of false health information?

Prior research has discussed various instances of incorrect health information spreading in the media. Usually, three terms are used to discuss such incorrect information, i.e., health fake news, health misinformation, and health disinformation. According to prior literature, fake news is “(online) news articles that are intentionally and verifiably false and misleading” and misinformation is “incorrect information circulating on the Internet

or social media” [7], whereas disinformation “includes all forms of false, inaccurate, or misleading information designed, presented and promoted to intentionally cause public harm or for profit” [8]. However, recipients of such incorrect information, if they choose to believe it, are not able to distinguish whether the incorrect information is generated intentionally or unintentionally. Therefore, it is indifferent to them whether such incorrect information is misinformation (unintentional) or disinformation (intentional). Therefore, we propose to use the term “false information” in our work and define false health misinformation as a combination of online health news articles that are intentionally and verifiably false and misleading (i.e., fake health news), incorrect health information circulating on the Internet or social media (i.e., health misinformation), and all forms of false, inaccurate, or misleading health information designed, presented, and promoted to intentionally cause public harm or for profit (health disinformation).

This paper presents a review that concentrates on social media-related research, as social media has been identified as the most influential medium for disseminating false health information in contemporary society [9]. We anticipate that this approach will furnish a crucial understanding of the prevailing situation and develop a model to summarize our findings. As a review article, we aim to present a summary of the existing literature related to false health information research and identify the research gaps in this area. Through synthesizing the information collected in our review and our earlier findings [10], this paper is positioned to present an organized summary of the latest information in this field, help other researchers conduct their research, and guide them in conducting future research in this area by providing a clear future research direction.

2. Literature Review

2.1. Research on False Health Information on Social Media before COVID-19

Since the advent of Web 2.0, individuals have gained the ability to easily generate and share user-created content. This has led to the establishment of interactive platforms, facilitating medical practitioners’ knowledge sharing and staying abreast of the latest medical science developments [11]. Additionally, it has provided a space for patients and their loved ones to exchange health information and offer social support [12]. However, social media has become a conduit for the creation and dissemination of false health information. The ease with which alternative opinions and wrong information can be generated and propagated on the Web poses a challenge from a public health standpoint.

Indeed, we witness that social media significantly spreads false health information. Waszak, Kasprzycka-Waszak, and Kubanek’s analysis of social media data from Poland between 2012 and 2017 indicated that approximately 40% of health-related information circulated on these platforms was false, particularly pertaining to alternative medicine, disease denial (e.g., AIDS), and anti-vaccination sentiments [13]. Another study conducted in the United States in 2013 by Oliver and Wood [14] found that around half of the participants believed in at least one medical conspiracy theory circulating on the Internet. Furthermore, Wang et al. [15] conducted a systematic literature review on false health information research related to social media, covering papers from major academic databases between January 2012 and November 2018, revealing that out of 57 analyzed papers, 30 were linked to misinformation about communicable diseases (e.g., HPV, MMR, flu, Zika virus) and vaccinations. Other topics included misinformation about chronic non-communicable diseases (e.g., cancer, cardiovascular disease) and various health-related rumors. The data also highlighted that social media platforms like Facebook, Twitter, and YouTube served as channels for the dissemination of such false health information.

Some people who initially do not believe in anti-vaccination conspiracy theories may be influenced by such information when seeking health information online to decide whether to be vaccinated and subsequently decide for themselves and their families not to take vaccines [16]. This situation leads to outbreaks of infectious diseases that have been under control for years and are problematic, such as measles [17].

Those who believe in these opposite or even conspiracy views often reinforce their beliefs by consuming information from like-minded individuals, dismissing facts presented by those who hold opposing views [18]. This phenomenon results in the echo chamber effect and hostile media effect [4]. Individuals initially skeptical of anti-vaccination campaigns may become influenced when seeking health information online. This influence can lead them to make decisions against vaccination for themselves and their families, contributing to outbreaks of infectious diseases that were previously under control, such as measles, creating a significant public health challenge [16,17].

Many cases of false health information are rooted in conspiracy theories, attributing hidden motives to public authorities and governments. One notable example is the debunked claim that the MMR vaccine causes autism, which was persistently circulated within the anti-vaccination community as an illustrative “conspiracy.” This misinformation even impacted a court decision in the Court of Rimini, Italy, in 2012, which initially ruled in favor of a link between childhood vaccination and autism [19]. Although later overturned by the Appeal Court in Bologna in 2015 [20], the initial ruling led to a decline in Italy’s vaccination rate during those years, demonstrating the lasting impact of conspiracy theories, especially when they seem to have “supporting evidence” [19].

Similarly, before the COVID-19 pandemic, Zika conspiracy theories gained attention, with 20% of Americans believing in at least one of them, showing a correlation with their level of conspiracy thinking [21]. Another example is the skepticism surrounding COVID-19 contact tracing apps mandated by many countries, with conspiracy theorists claiming these apps were tools for government surveillance [5]. Individuals with elevated levels of conspiracy thinking are more susceptible to accepting such theories, emphasizing the need for targeted campaigns to correct their misconceptions [21]. This underscores the enduring influence of conspiracy theories, even when proven false.

In summary, false health information, often propelled by conspiracy theories, was circulating on social media even before the COVID-19 pandemic. These theories assert that authorities conceal the actual risks of vaccinations and propose other conspiracies, suggesting that governments fabricate diseases as a pretext for imposing greater control on society. Those subscribing to such theories are adept at distorting research findings to align with their beliefs and persuade others to adopt them. These actions can lead to significant negative consequences, including a decline in vaccination rates and the resurgence of diseases that were previously under control for an extended period.

2.2. Research on False Health Information on Social Media during COVID-19

Recent research highlights a concerning trend in the dissemination of false health information, exacerbated by a global erosion of trust in governments. This skepticism toward public authorities, particularly evident in the reluctance to adhere to COVID-19 mandates [5], was intensified by the pandemic, as noted by Pertwee, Simas, and Larson [22]. They argued that the public’s trust in health authorities had further declined, contributing to vaccine hesitancy.

Pummerer et al. [23] found that those embracing COVID-19 conspiracy theories exhibited reduced institutional trust, were less supportive of government regulations, less likely to practice social distancing, and showed diminished social engagement. The implication was that combating the pandemic was hindered when false health information was disseminated in the media. However, Walter et al.’s meta-analysis [24] suggested that corrective interventions can mitigate the impact of misinformation.

This issue is not exclusive to the pandemic. Romer and Jamieson [6] demonstrated that conspiracy theories and vaccination misinformation influenced decision-making during the early stages of the COVID-19 crisis, hindering the adoption of preventive measures and vaccination.

Exploring the impact of social media on the spread of false COVID-19 health information, Chipidza et al. [25] analyzed data from Twitter and Reddit collected between 4 March and 12 March 2020—early in the pandemic. Using Latent Dirichlet Allocation (LDA), they

examined COVID-19-related topics in social media news coverage. Their findings revealed a broader range of topics compared to traditional media like newspapers and cable TV. Social media discussions included misinformation on preventive measures and alleged cures for COVID-19.

Similarly, Bin Naeem, Bhatti, and Khan [26] conducted a content analysis of 1225 fake news pieces published from January to April 2020. Their study identified three primary types of false health information related to COVID-19: (i) false claims, (ii) conspiracy theories, and (iii) pseudoscientific health therapies. This underscored the diverse nature of misinformation circulating on social media platforms during the early stages of the pandemic.

Moreover, Melki et al. [27] conducted telephone interviews with Lebanese individuals at the onset of the pandemic, spanning from 27 March to 23 April 2020. Their findings revealed that those more inclined to believe false health information about COVID-19 were individuals who placed their trust in social media news, interpersonal communication, and clerics. Additionally, researchers observed a notable interest among individuals in viewing YouTube videos that propagated misinformation, as opposed to videos presenting accurate information from public health authorities [28].

Similarly, Quinn, Fazel, and Peters [29] employed content analysis on 300 Instagram posts collected over ten days in April 2020. Their analysis highlighted a pervasive mistrust of authorities, with individuals believing that the “truth” about COVID-19 was being concealed. Moreover, a significant number of Instagram posts were found to be associated with the dissemination of conspiracy theories during this period.

Given the pre-existing low level of trust in governments, the extended duration of the COVID-19 pandemic exacerbated this skepticism, leading individuals to be more susceptible to false claims, conspiracy theories, and pseudoscientific arguments. Social media, as the predominant means of connection and information dissemination during the pandemic, served as an efficient channel for both accurate and inaccurate health information, especially for those in locked-down or quarantined areas.

The alarming trend emerges as people exhibit a greater interest in misinformation. This underscores the urgent need for public health authorities to devise strategies to counteract this phenomenon, aiming to rebuild trust, effectively disseminate accurate information, and address the proliferation of false health narratives on social media. Reversing this situation is crucial for fostering a more informed and resilient public during these challenging times.

3. Model Development

In this study, we develop a theoretical model for understanding the factors making people, in particular young people, as they are the major social media users nowadays, believe and generate false health information and find methods for reducing the impacts of false health information in our society. We used the three research questions mentioned above to guide our model development and make relevant propositions.

3.1. RQ1: What Are the Factors Making People Believe False Health Information?

As noted, social media serves as the primary platform for disseminating both accurate and misleading health information. Le et al. [12] identified five significant types of health information sought online by individuals, encompassing the sharing of personal health information, sharing health-related knowledge, general health messages, outcomes of health-related information sharing, and findings from exploratory health research. Despite the ready availability of such information, the challenge lies in the public’s ability to comprehend it, given their limited understanding of medical sciences and statistics. This knowledge gap can lead to misconceptions and misinterpretations of valid information.

An illustrative case on Facebook, reported by Ho, Chan, and Chiu [4], exemplifies this issue. People misinterpreted the CDC’s report on COVID-19 vaccination, arguing that receiving vaccines would increase susceptibility to infection and death from the virus. The misinterpretation stemmed from a failure to consider age groups when calculating infection and casualty rates. Vaccination rates varied between younger and older individuals, with

different casualty rates (lower for young people). Unfortunately, such misinterpretations can inadvertently lend support to conspiracy theories that falsely claim harm from COVID-19 vaccines, using distorted “evidence” derived from reinterpreting government reports. Addressing these misinterpretations becomes crucial in fostering accurate understanding and countering the spread of misinformation.

Believing false health information often stems from adherence to conspiracy theories in which individuals think that governments are concealing information or pursuing hidden agendas [18]. This reflects a broader trend of diminished trust in authorities [5]. Political affiliations also play a role, as evidenced by the connection between COVID-19 vaccination rates and political ideology in the U.S., with Republican-led states exhibiting lower vaccination rates than Democrat-led states [4]. Empirical evidence supporting the link between false health information and politics was presented by Romer and Jamieson [6]. Political ideologies also significantly influence health-related issues, such as women’s abortion rights in the United States [30].

In essence, an individual’s political background can impact their susceptibility to believing false health information. This dynamic not only contributes to the circulation of misinformation on social media but also further erodes trust in authorities. For a summary of our initial findings related to RQ1, please refer to Table 1.

Table 1. Factors making people believe false health information.

Factors	Details	References
Lack of scientific and statistical background	People who do not have sufficient knowledge to understand health information and misunderstand health information available on social media.	[4]
Believe in conspiracy theories and lack of trust in authorities	Some people believe in conspiracy theories and think governments and authorities hide the truth. This is also related to a low level of trust in authorities internationally.	[5,18]
Follow their political party line	Political party supporters believe (false) health information agreed upon by their political party line.	[4,6,30]

Based on the findings related to our RQ1, we developed the following three propositions:

Proposition 1. *Social media users who do not have the scientific and statistical background to understand health information. They will misunderstand health information available on social media and cannot distinguish between health information and false health information. As a result, people who do not have sufficient scientific and statistical background are more likely to believe false health information.*

Proposition 2. *Social media users believe in conspiracy theories and think governments and authorities hide the truth. Particularly, people with a low level of trust in authorities are more likely to believe in conspiracy theories. As a result, social media users who believe in conspiracy theories are more likely to believe false health information.*

Proposition 3. *Political parties may agree and support false health information due to political reasons. Their endorsement of false health information will influence their supporters. As a result, their supporters, who are social media users, are more likely to believe false health information agreed upon by their political party line.*

3.2. RQ2: What Are the Factors That Make People Generate False Health Information?

Social media content being user-generated creates a scenario in which individuals with good intentions may unknowingly propagate false health information, driven by the echo chamber effect and hostile media effect [31,32]. The echo chamber effect involves

the circulation of misinformation among like-minded individuals, reinforcing their shared beliefs as truth. Meanwhile, the hostile media effect manifests when individuals perceive opposing views in the media as being biased against them.

Several reasons contribute to the generation of false health information. Some individuals, acting in good faith, may genuinely believe their misconceptions represent accurate health information [4]. Conspiracy theory believers generate and disseminate misinformation to promote their ideas and influence others. Loyal supporters may generate false health information aligning with their party's stance. Additionally, reports suggest that some countries leverage health misinformation to interfere in other countries' politics, aiming to erode citizens' trust and influence election results [17].

Moreover, opportunistic individuals exploit public health concerns, such as during the COVID-19 pandemic, for financial gains. They generate fake news, promote medical products or services as solutions, and capitalize on people's health-related anxieties. Others may create controversial content on platforms like YouTube to attract viewers and drive online traffic, ultimately generating advertising revenue [33,34]. For a summary of our findings related to RQ2, please refer to Table 2.

Table 2. Factors making people generate false health information.

Factors	Details	References
Act in good faith	Some people generate false health information, intentionally and unintentionally, as they believe such alternative or incorrect views are correct. These people may misunderstand the correct information and misrepresent it. They can also be conspiracy theory believers or people supporting a political party that supports false health information, and they want to generate "evidence" to support the false information and conspiracy theories in which they believe.	[31,32]
Financial gain	Some people generate false health information to obtain financial gain, such as suggesting people purchase their medical products or services or driving online traffic to their sites to earn advertising revenue.	[33,34]
Foreign country influence	A prior study showed that some countries tried to use bots or Internet water armies to influence another country's political environment, such as helping a political party that was more friendly to them to gain political advantage or more influence in the international arena.	[17]

Based on the findings related to our RQ2, we developed the following five propositions:

Proposition 4. *Some social media users generate false health information in good faith as they misunderstand the health information they found and present their incorrect information on social media to others as false health information.*

Proposition 5. *Some social media users generate false health information in good faith as they are believers in conspiracy theories. They intentionally or unintentionally generate false health information grounded on the conspiracy theories in which they believe and circulate on social media, which becomes false health information.*

Proposition 6. *Some social media users generate false health information in good faith as they are supporters of political parties. They intentionally or unintentionally generate false health information to support the stance of the political parties and present that information on social media, which becomes false health information.*

Proposition 7. *Some social media users intentionally generate false health information for their financial gain. They use the false health information they generate to suggest people purchase their medical products or services or drive traffic to their social media sites to gain viewership, which can earn more advertising revenue.*

Proposition 8. *Some countries may intentionally use false health information to influence another country's political environment, and they hope to gain political advantage over another country or gain advantage in the international arena through such actions.*

3.3. RQ3: What Methods Can Reduce the Impact of False Health Information?

Addressing the impact of false health information in society is a challenging task, particularly when misinformation is supported by perceived “evidence.” The example involving the Court of Rimini illustrates how a court decision can be influenced by a retracted paper, further serving as “evidence” for conspiracy theory believers [16]. Even if the court ruling is overturned, conspiracy theory believers may continue to reference and distort it to justify their claims of “authority intervention.”

In light of these challenges, Cichocka [35] proposed a proactive approach to handling health misinformation. Instead of solely relying on refutation after misinformation has spread, she suggested implementing “prebunking.” This involves anticipating false health information that authorities expect to be disseminated and warning the public in advance. This proactive strategy could be achieved through education initiatives focused on information literacy and analytical skills.

Additionally, Vraga and Bode [36] proposed leveraging expert sources to counter false health information on social media. In an online experiment focusing on misinformation related to the Zika virus outbreak, they demonstrated that corrective responses from public health authorities, such as the CDC, were effective in refuting health misinformation.

Chipidza et al. [25] recommended involving communication specialists from public health authorities in the early stages of a pandemic. This strategic use of experts can contribute to controlling and preventing the spread of false health information.

To combat misinformation, social media platforms are adopting practical measures. They are encouraging their operators to actively participate in the removal of false health information from their platforms [17,37]. These collaborative efforts between health authorities, communication specialists, and social media platforms aim to mitigate the impact of false health information on society.

While some countries have implemented legal punishments for those spreading false health information, Au, Ho, and Chiu [7] found that the imposition of legal consequences had a mixed impact. Respondents were deterred from sharing health news that they believed to be accurate but were paradoxically encouraged to share news they perceived as fake. The researchers suggested that individuals might still share false health information online, even in the face of potential punishment. This could be driven by a desire to display rebellion against anti-false information legislation or a perception that the false health information was “too fake” to be taken seriously.

In this context, individuals may view sharing such information as akin to sharing a joke rather than disseminating false health information, potentially leading them to believe they would not be punished. Despite these challenges, there are still avenues to prevent the spread of false health information. The effectiveness of legal measures may be enhanced when complemented with proactive strategies, such as education on information literacy, analytical skills, and collaborative efforts involving public health authorities and communication specialists.

In conclusion, some scholars have recommended a fundamental step to address the spread of false health information: enhancing public education. This involves improving an individual's skills in identifying and recognizing misinformation while discouraging the tolerance of pseudoscientific health practices by emphasizing the associated risks [26].

Additionally, there is a call for elevating people's level of media literacy [27]. This comprehensive approach, focused on education and awareness, is seen as a crucial initial step that governments can promptly undertake to mitigate the impact of false health information in society. For a summary of these recommendations, please refer to Table 3.

Table 3. Possible methods to reduce the impact of false health information on society.

Methods	Details	References
Prebunking	As it is more difficult to refute a conspiracy theory after it spreads, authorities should warn people about false health information they anticipate before it starts to spread.	[35]
Refuting by authorities	It is possible that corrective responses provided by authorities, with the help of communication specialists, could help to refute false health information.	[17,25,36,37]
Legislation against the spreading of false health information	While some countries plan to implement legislation to deter people from spreading false information, its effect is questionable.	[7,38]
Education on media literacy	It is essential to provide more education on media literacy and identifying false information in society to help citizens identify false health information and avoid spreading it.	[26,27]

Based on the findings related to our RQ3, we developed the following four propositions.

Proposition 9. *Authorities should consider using prebunking to mitigate the impacts of false health information, as it is more difficult to refute a conspiracy theory after it spreads. Therefore, authorities should warn social media users about false health information they anticipate before it starts to spread to reduce the impact of false health information on society.*

Proposition 10. *Authorities should refute false health information to reduce its impact on society. They may need to work hand-in-hand with communication specialists and social media platforms when false health information starts to circulate on social media.*

Proposition 11. *Authorities may implement legislation to deter people from spreading false (health) information. This may help reduce the impact of false health information on society.*

Proposition 12. *Providing media literacy education to social media users would improve their ability to identify false health information. This may help to reduce the impact of false health information on society.*

3.4. Proposed Theoretical Model

Our findings provide us with the foundations for conducting further research on why people believe and generate false health information and finding possible ways to reduce the impact of false health information on society. Based on our findings, we developed a theoretical model, as presented in Figure 1. Table 4 summarizes the findings of prior research and how they are related to our propositions.

Concerning our model, we first identified the characteristics of people believing false information, i.e., (i) lack of scientific and statistical background to understand health information, (ii) belief in conspiracy theories, and (iii) following their political party line. People may generate false health information in good faith due to their lack of understanding of science and statistics, believing in conspiracy theories, loyalty to their political parties, or treating it as an opportunity to obtain financial gain. Also, foreign countries may want to gain political influence over the country concerned and generate false health information to influence the view of their citizens toward their own country or take it as an opportunity to gain more international influence.

At the same time, we discovered methods that may help to reduce the spread of fake news, including: (i) prebunking, (ii) refuting by authorities with the help of communication

specialists and social media platforms, (iii) legislation against the spreading of false health information, and (iv) education on media literacy. If we can use these methods correctly, we may have a chance to reduce the impact of false health information on society. Among the four methods of reducing the impact of false health information, media literacy is the one that is not a direct action by authorities. We will further discuss this option in the Discussion section.

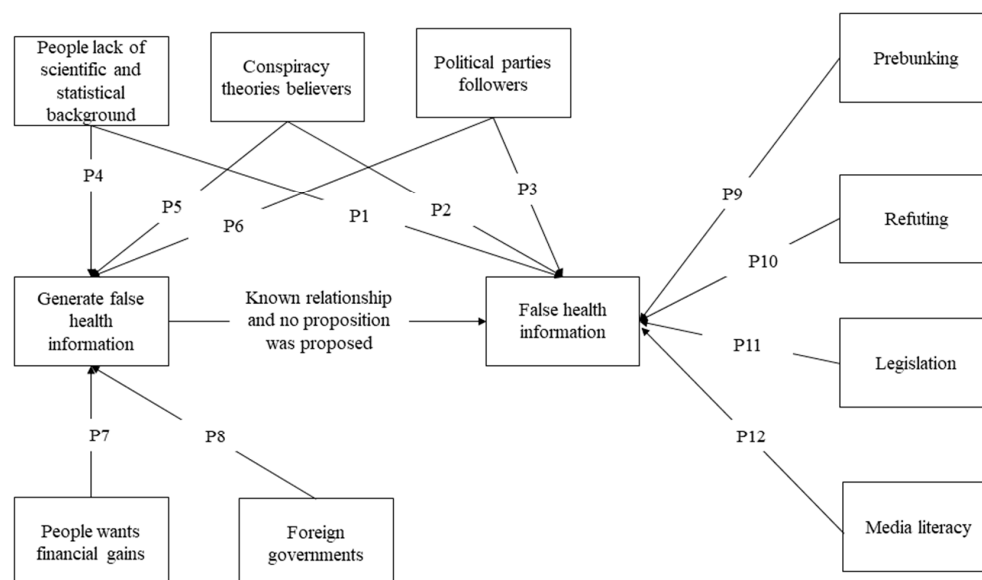


Figure 1. Theoretical Model.

Table 4. Key findings from the literature supporting the propositions.

Proposition	Representative Citations
People believe false health information (P1 to P3):	
• Lack of scientific and statistical background (P1)	[4]
• Believing in conspiracy theories (P2)	[5,18]
• Following political party line (P3)	[4,6,30]
People generate false health information in good faith (P4 to P6):	
• Misunderstand the information (P4)	[4,31,32]
• Believing in conspiracy theories (P5)	[5,16,31,32]
• Believing and supporting their political parties (P6)	[4,6,30–32]
People generate false health information to obtain financial gain (P7)	[33,34]
Foreign governments generate false health information to obtain political influence over other countries (P8)	[17]
Possible methods for reducing the impacts of false health information (P9 to P12):	
• Prebunking (P9)	[35]
• Refuting (P10)	[17,25,36,37]
• Legislation (P11)	[7,38]
• Media literacy (P12)	[26,27]

4. Discussion

4.1. General Discussion

We conducted a review of the literature related to false health information before and during the COVID-19 pandemic. We used the literature findings to address the three research questions proposed, which covered factors that make people believe false health information (i.e., RQ1), factors that make people generate false health information (i.e., RQ2), and methods to reduce the impact of false health information (i.e., RQ3). Based on the literature reviewed, we proposed twelve propositions addressing these RQs (see Table 4), and we further incorporated these propositions into our theoretical model in Figure 1.

People may believe false health information due to one or a combination of the three possible reasons we presented in Propositions 1 to 3. They may believe in conspiracy theories (P2) or the political party to which they belong and mindlessly follow the party line (P3), or not have the necessary education background in science and statistics (P1) to understand the reports. Based on their beliefs, these people may generate false health information and share it on social media (see the respective P4 to P6). Apart from that, people may also see generating false health information as an opportunity to obtain financial benefits (P7), and foreign governments may also see spreading false health information as a method of gaining political advantage in a host country (P8).

Obviously, the easiest way to stop the influence of false health information from spreading is to stop the generation of such information. Therefore, we should focus on finding methods to deter the actors of false health information generation, i.e., people may act in good faith (P4 to P6), people may act for financial gain (P7), or foreign governments may act for (international) political gain (P8).

We also found four possible methods to reduce the impact of false health information on society. Prebunking (P9) is useful as a defensive measure, as it provides information to the public ahead of the spread of false health information. In addition, it can be included as part of media literacy (P12) [34]. Refuting (P10) is another useful defensive measure that neutralizes the impact of false health information after it has spread.

Proactively, we should find methods to deter different actors from spreading false health information. Legislation punishing people (P11) who spread false health information may be useful to deter people who look for financial opportunities to spread false health information, as they are purposely spreading such false information. It may also be helpful to deter foreign actors in host countries from generating false health information to a certain extent.

However, such legislation may not be able to stop people who spread false health information in good faith (i.e., those we considered in P4 to P6). Indeed, these people generate and spread false health information because they perceive that such information is accurate. Therefore, the best way to resolve this issue (and this is likely the most common case for generating and spreading false health information) is to improve people's media literacy (P12) and equip them with the skills to identify false health information. Nowadays, as most false health information is spread through social media, we focus on our further discussion on how to use social media literacy to reduce the impact of false health information.

4.2. Using Social Media Literacy to Reduce the Impact of False Health Information on Society

According to Polanco-Levicán and Salvo-Garrido [39], the evolving concept of social media literacy is a product of the integration of the media literacy concept with the characteristics and implications of social media platforms, involving concepts related to critical thinking, social-emotional competence, and technical competence. When applying social media literacy as a tool for fighting against false health information, we first need to look into how we apply media and information literacy in fighting false health information.

As a foundation, we understand from prior research that young people like to use social media as their health information source [40]. This is important because it means that

social media literacy may be more effective in helping young people as an age group. This also suggests that alternative approach(es) may be needed in helping other age groups.

Much false health information was spread on social media before [13] and during [41] the COVID-19 pandemic. For example, COVID-19 vaccination hesitancy was fueled by false health information [42,43]. Indeed, false information spreads faster than accurate news through the Internet and social media [44], and we anticipate that false health information would also have the same behavior and spread faster through the Internet and social media.

Prior research also suggests that improving information literacy for young people would be helpful in reducing the impact of false health information. In particular, Cheng and Nishikawa [45] used data collected from Japan to show that health literacy could reduce people's beliefs about false health information related to COVID-19 and vaccination but would not have any effect on changing people's beliefs about COVID-19 conspiracy theories. In addition, they reported that people who relied on social media to obtain COVID-19 news were more likely to have a higher level of believing false health information. In addition, Inoue et al. [40] also reported that health literacy could improve people's responses to COVID-19 knowledge, and people using face-to-face communication and digital media (i.e., information obtained from Websites, Web searches, and News apps) as information sources had higher health literacy. Yet, they reported that young people liked to use social media as their information source, but it was not a good source for health information as their findings showed that there was no correlation between using social media as an information source and health literacy scores.

The above findings are not surprising as there is a large amount of false health information available on social media [13], and we conjecture that young people who mainly use social media to collect health information would have a higher chance of receiving false health information. Therefore, this result shows the importance of enhancing people's information and social media literacy skills.

The literature also discusses how to develop information literacy skills. Jones-Jang, Mortensen, and Liu [46] reported the importance of information literacy based on empirical data collected from the U.S. They showed that among media literacy, information literacy, news literacy, and digital literacy, information literacy was the only one that helped people to identify fake news. On the other hand, Montesi [47] emphasized the importance of using civic values to combat such false information. In addition, Molina et al. [33] suggested four operational indicators, i.e., message and linguistic, sources and intentions, structural, and network, to analyze information circulated on the Internet to help identify fake news. Indeed, their proposed indicators could also be used to screen health information available on social media as quick tools for identifying the authenticity of such information.

With the above background, we suggest that we should equip society with social media literacy programs to improve young people's literacy in handling the information available on social media. While prior research, such as that summarized by Polanco-Levicán and Salvo-Garrido [42], defined social media literacy based on the concept of media literacy, we propose to develop social media literacy as a more holistic concept in blending information and media literacy concepts and applying it in a social media context. Indeed, members of the public need to equip themselves with a higher literacy level in applying critical thinking and information literacy skills, for example, the four operational indicators mentioned by Molina et al. [33], in their daily usage of social media. This would help society to be more aware of false information and hopefully would help to reduce its severe impact. In addition, Ye, Toshimori, and Horita [48] used a panel survey and developed cross-lagged effect models to study the relationships between information literacy, social media use, and social skills. Using cross-lagged effect models, they found that relationships between information literacy, social media use, and social skills were influenced by gender and the type of social media used. As young people in Japan use different social media for connecting with different groups of people (for example, they use Twitter and Facebook to connect with new acquaintances and strangers and LINE to connect with close friends), and males and females have different behaviors in using social

media, we suggest that social media literacy programs to be developed should be tailored in terms of: (i) age, (ii) gender, and (iii) type of social media use. In addition, we should also address the possible negative impact of protection behaviors related to the implementation of social media literacy on subjective wellbeing [49]. In the long run, we need to consider these factors, and it should be a possible future research direction.

5. Conclusions

The call to collectively address the spread of false health information underscores the importance of recent research focused on understanding its detrimental impact on society, eroding trust in public health suggestions and policies. The theoretical model presented in this study aims to provide insight for research and public health administrators, serving as a foundation for further exploration and solutions to the false health information problem.

While this research contributes valuable insight, it acknowledges certain limitations. While it proposes a theoretical model, the model itself might still oversimplify the complex interplay of factors that contribute to the issue, as real-world scenarios are often more nuanced, with intertwined political, psychological, and social elements. Therefore, when applying this model to developing further empirical research, researchers should consider this issue. As a theoretical study, it proposes a model that outlines how different actors believe and create false health information and suggests ways to mitigate its effects. There is a recognition that additional constructs, such as personality factors, may interact with those in the model. However, the study contends that the included constructs are the most critical based on a comprehensive literature review. Another point to note is that the proposed strategies for reducing the impacts of false health information, when applied, should also take into account cultural, educational, and psychological adjustments needed for different populations and contexts.

The next phase involves developing a qualitative study based on the preliminary model. Before commencing the qualitative study, the researchers plan to further strengthen the model through an additional literature review. This review will explore the impact of information sources, levels of trust and distrust, and their co-creation in the social media environment concerning the formation, spread, and prevention of false health information.

The qualitative study will aim to identify relevant constructs influencing the generation of false health information, including trust and distrust in public health authorities, scientific and statistical knowledge, political loyalty, and belief in conspiracy theories. It will also examine factors strengthening an individual's beliefs, such as online information collecting behavior and the influence of the echo chamber and hostile media effects. Additionally, the study will explore methods to reduce the impact of false health information. In particular, due to the complexities of individual and cultural differences affecting the perception and spread of false health information, the qualitative study to be developed should be designed to probe the psychological and social dynamics at play, as well as incorporate data collected from different cultural and demographic backgrounds. In addition, care will be taken in designing the study with a more balanced and detailed investigation of political influence to avoid potential biases.

The qualitative study's results will lay the groundwork for the final stage of the research: developing a quantitative study to validate the theoretical model. Through this iterative process, the research aims to contribute to the ongoing efforts to understand and combat the detrimental effects of false health information on society.

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References

1. Ye, S.Y.; Ho, K.K.W.; Wakabayashi, K.; Kato, Y. Relationship between university students' emotional expression on tweets and subjective well-being: Considering the effects of their self-presentation and online communication skills. *BMC Public Health* **2023**, *23*, 594.
2. Rocha, Y.M.; de Moura, G.A.; Desidério, G.A.; de Oliveira, C.H.; Lourenço, F.D.; de Figueiredo Nicolete, L.D. The impact of fake news on social media and its influence on health during the COVID-19 pandemic: A systematic review. *J. Public Health* **2023**, *31*, 1007–1016. [\[CrossRef\]](#)
3. Ho, K.K.W.; Chiu, D.K.W.; Au, C.H.; Dalisay, F.; So, S.; Yamamoto, M. Fake News, misinformation and privacy: How the COVID-19 pandemic changes our society and how blockchain and distributed ledger technologies reduce their effects? *Distrib. Ledger Technol. Res. Pract.* **2023**, in press. [\[CrossRef\]](#)
4. Ho, K.K.W.; Chan, J.Y.; Chiu, D.K.W. Fake news and misinformation during the pandemic: What we know, and what we don't know. *IT Prof.* **2022**, *24*, 19–24. [\[CrossRef\]](#)
5. Ho, K.K.W.; Chiu, D.K.W.; Sayama, K.L.C. When privacy, distrust, and misinformation cause worry about using COVID-19 contact-tracing apps. *IEEE Internet Comput.* **2023**, *27*, 7–12. [\[CrossRef\]](#)
6. Romer, D.; Jamieson, K.H. Conspiracy theories as barriers to controlling the spread of COVID-19 in the U.S. *Soc. Sci. Med.* **2020**, *263*, 113356. [\[CrossRef\]](#) [\[PubMed\]](#)
7. Au, C.H.; Ho, K.K.W.; Chiu, D.K.W. Stopping healthcare misinformation: The effect of financial incentives and legislation. *Health Policy* **2021**, *125*, 627–633. [\[CrossRef\]](#) [\[PubMed\]](#)
8. Kapantai, E.; Christopoulou, A.; Berberidis, C.; Peristeras, V. A systematic literature review on disinformation: Toward a unified taxonomical framework. *New Media Soc.* **2021**, *23*, 1301–1326. [\[CrossRef\]](#)
9. Bode, L.; Vraga, E.K. See something, say something: Correction of global health misinformation on social media. *Health Commun.* **2017**, *33*, 1131–1140. [\[CrossRef\]](#) [\[PubMed\]](#)
10. Ho, K.K.W.; Ye, S.Y.; Factors influencing the formation of false health information. In ICEB 2023 Proceedings, Chiayi, Taiwan, Paper 77. Available online: <https://aisel.aisnet.org/iceb2023/77> (accessed on 25 January 2024).
11. Bougioukas, K.I.; Bouras, E.C.; Avgerinos, K.I.; Dardavessis, T.; Haidich, A.-B. How to keep up to date with medical information using web-based resources: A systematized review and narrative synthesis. *Health Inf. Libr. J.* **2020**, *37*, 254–292. [\[CrossRef\]](#) [\[PubMed\]](#)
12. Le, L.H.; Hoang, P.A.; Pham, H.C. Sharing health information across online platforms: A systematic review. *Health Commun.* **2023**, *38*, 1550–1562. [\[CrossRef\]](#) [\[PubMed\]](#)
13. Waszak, P.M.; Kasprzycka-Waszak, W.; Kubanek, A. The spread of medical fake news in social media—The pilot quantitative study. *Health Policy Technol.* **2018**, *7*, 115–118. [\[CrossRef\]](#)
14. Oliver, J.E.; Wood, T. Medical conspiracy theories and health behavior in the United States. *JAMA Intern. Med.* **2014**, *174*, 817–818. [\[CrossRef\]](#) [\[PubMed\]](#)
15. Wang, Y.; McKee, M.; Torbica, A.; Stuckler, D. Systematic literature review on the spread of health-related misinformation on social media. *Soc. Sci. Med.* **2019**, *240*, 112552. [\[CrossRef\]](#)
16. Carrieri, V.; Madio, L.; Principe, F. Vaccine hesitancy and (fake) news: Quasi-experimental evidence from Italy. *Health Econ. Lett.* **2019**, *28*, 1377–1382. [\[CrossRef\]](#)
17. McKee, M.; Middleton, J. Information wars: Tackling the threat from disinformation on vaccines. *BMJ* **2019**, *365*, 12144. [\[CrossRef\]](#)
18. Kata, A. Anti-vaccine activists, Web 2.0, and the postmodern paradigm—An overview of tactics and tropes used online by anti-vaccination movements. *Vaccine* **2012**, *30*, 3778–3789. [\[CrossRef\]](#)
19. DeStefano, F. Vaccines and autism: Evidence does not support a causal association. *Vaccines* **2007**, *82*, 756–759. [\[CrossRef\]](#)
20. Rizzi, M.; Attwell, K.; Casigliani, V.; Taylor, J.; Quattrone, F.; Lopalco, P. Legitimising a 'zombie idea': Childhood vaccines and autism—The complex tale of two judgments on vaccine injury in Italy. *Int. J. Law Context* **2021**, *17*, 548–568. [\[CrossRef\]](#)
21. Kloststad, C.A.; Uscinski, J.E.; Connolly, J.M.; West, J.P. What drives people to believe in Zika conspiracy theories? *Palgrave Commun.* **2019**, *5*, 36. [\[CrossRef\]](#)
22. Pertwee, D.; Simas, C.; Larso, H.J. An epidemic of uncertainty: Rumors, conspiracy theories and vaccine hesitancy. *Nat. Med.* **2022**, *28*, 456–459. [\[CrossRef\]](#)
23. Pummerer, L.; Böhm, R.; Lilleholt, L.; Winter, K.; Zettler, I.; Sassenberg, K. Conspiracy theories and their societal effects during the COVID-19 pandemic. *Soc. Psychol. Personal. Sci.* **2022**, *13*, 49–59. [\[CrossRef\]](#)
24. Walter, N.; Brooks, J.J.; Saucier, C.J.; Suresh, S. Evaluating the impact of attempts to correct health misinformation on social media: A meta-analysis. *Health Commun.* **2021**, *36*, 1776–1784. [\[CrossRef\]](#) [\[PubMed\]](#)

25. Chipidza, W.; Akbaripourdibazar, E.; Gwanzura, T.; Gatto, N. Topic analysis of traditional and social media news coverage of the early COVID-19 pandemic and implications for public health communication. *Disaster Med. Public Health Prep.* **2022**, *16*, 1881–1888. [\[CrossRef\]](#) [\[PubMed\]](#)
26. Bin Naeem, S.; Bhatti, R.; Khan, A. An exploration of how fake news is taking over social media and putting public health at risk. *Health Inf. Libr. J.* **2021**, *38*, 143–149. [\[CrossRef\]](#) [\[PubMed\]](#)
27. Melki, J.; Tamim, H.; Hadid, D.; Makki, M.; El Amine, J.; Hitti, E. Mitigating infodemics: The relationship between news exposure and trust and belief in COVID-19 fake news and social media spreading. *PLoS ONE* **2021**, *16*, e0252830. [\[CrossRef\]](#) [\[PubMed\]](#)
28. Yeung, A.W.K.; Tosevska, A.; Klager, E.; Eibensteiner, F.; Tsagkaris, C.; Parvanov, E.D.; Nawaz, F.A.; Völkl-Kernstock, S.; Schaden, E.; Kletecka-Pulker, M.; et al. Medical and health-related misinformation on social media: Bibliometric study of the scientific literature. *J. Med. Internet Res.* **2022**, *24*, e28152. [\[CrossRef\]](#) [\[PubMed\]](#)
29. Quinn, E.K.; Fazel, S.S.; Peters, C.E. The Instagram infodemic: Conbranding on conspiracy theories, Coronavirus Disease 2019 and authority-questioning beliefs. *Cyberpsychol. Behav. Soc. Netw.* **2021**, *24*, 573–577. [\[CrossRef\]](#) [\[PubMed\]](#)
30. Chang, R.-C.; Rao, A.; Zhong, Q.; Wojcieszak, M.; Lerman, K. #RoeOverturned: Twitter dataset on the abortion rights controversy. *Proc. Int. AAAI Conf. Web Soc. Media* **2023**, *17*, 997–1005.
31. Cinelli, M.; De Francisci Morales, G.; Galeazzi, A.; Quattrociocchi, W.; Starnini, M. The echo chamber effect on social media. *Proc. Natl. Acad. Sci. USA* **2021**, *118*, e2023301118. [\[CrossRef\]](#)
32. Vallone, R.P.; Ross, L.; Lepper, M.R. The hostile media phenomenon: Biased perception and perceptions of media bias in coverage of the Beirut massacre. *J. Personal. Soc. Psychol.* **1985**, *49*, 577–585. [\[CrossRef\]](#) [\[PubMed\]](#)
33. Molina, M.D.; Sundar, S.S.; Le, T.; Lee, D. “Fake News” is not simply false information: A concept explication and taxonomy of online content. *Am. Behav. Sci.* **2021**, *65*, 180–212. [\[CrossRef\]](#)
34. Sharma, K.; Qian, F.; Jiang, H.; Ruchansky, N.; Zhang, M.; Liu, Y. Combating fake news: A survey on identification and mitigation techniques. *ACM Trans. Intell. Syst. Technol.* **2019**, *10*, 21. [\[CrossRef\]](#)
35. Cichocka, A. To counter conspiracy theories, boost well-being. *Nature* **2020**, *587*, 177. [\[CrossRef\]](#) [\[PubMed\]](#)
36. Vraga, E.K.; Bode, L. Using expert sources to correct health misinformation in social media. *Sci. Commun.* **2017**, *39*, 621–645. [\[CrossRef\]](#)
37. Mheidly, N.; Fares, J. Leveraging media and health communication strategies to overcome the COVID-19 infodemic. *J. Public Health Policy* **2020**, *41*, 410–420. [\[CrossRef\]](#)
38. Morgan, S. Fake news, disinformation, manipulation, and online tactics to undermine democracy. *J. Cyber Policy* **2018**, *3*, 39–43. [\[CrossRef\]](#)
39. Polanco-Levicán, K.; Salvo-Garrido, S. Understanding social media literacy: A systematic review of the concept and its competences. *Int. J. Environ. Res. Public Health* **2022**, *19*, 8807. [\[CrossRef\]](#)
40. Inoue, M.; Shimoura, K.; Nagai-Tanima, M.; Aoyama, T. The relationship between information sources, health literacy, and COVID-19 knowledge in the COVID-19 infodemic: Cross-sectional online study in Japan. *J. Med. Internet Res.* **2022**, *24*, 238332. [\[CrossRef\]](#) [\[PubMed\]](#)
41. Shimizu, K.; Shibuya, K.; Tokuda, Y. COVID-19 infodemic about nucleic acid amplification tests in Japan. *J. Gen. Fam. Med.* **2022**, *23*, 1–2. [\[CrossRef\]](#) [\[PubMed\]](#)
42. Yoda, T.; Suksatit, B.; Tokuda, M.; Katsuyama, H. The relationship between sources of COVID-19 vaccine information and willingness to be vaccinated: An Internet-based cross-sectional study in Japan. *Vaccines* **2022**, *10*, 1041. [\[CrossRef\]](#)
43. Yoshioka, T. COVID-19 vaccine hesitancy and media channel use in Japan: Could media campaigns be a possible solution? *Lancet Reg. Health—West Pac.* **2022**, *18*, 100357. [\[CrossRef\]](#) [\[PubMed\]](#)
44. Vosoughi, S.; Roy, D.; Aral, S. The spread of true and false news online. *Science* **2018**, *359*, 1146–1151. [\[CrossRef\]](#)
45. Cheng, J.W.; Nishikawa, M. Effects of health literacy in the fight against the COVID-19 infodemic: The case of Japan. *Health Commun.* **2022**, *37*, 1520–1533. [\[CrossRef\]](#)
46. Jones-Jang, S.M.; Mortensen, T.; Liu, J. Does media literacy help identification of fake news? Information literacy helps, but other literacies don’t. *Am. Behav. Sci.* **2021**, *65*, 371–388. [\[CrossRef\]](#)
47. Montesi, M. Understanding fake news during the Covid-19 health crisis from the perspective of information behaviour: The case of Spain. *J. Librariansh. Inf. Sci.* **2021**, *53*, 454–465. [\[CrossRef\]](#)
48. Ye, S.Y.; Toshimori, A.; Horita, T. Causal relationships between media/social media use and Internet literacy among college students: Addressing the effects of social skills and gender differences. *Educ. Technol. Res.* **2017**, *46*, 61–70.
49. Ye, S.Y.; Ho, K.K.W. Would you feel happier if you have more protection behaviour? A panel survey of university students in Japan. *Behav. Inf. Technol.* **2019**, *38*, 422–434. [\[CrossRef\]](#)

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