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Factors Influencing the Formation of False Health Information

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ABSTRACT

The COVID-19 pandemic created uncertainty about our health and lives, and people were scared and looking for information to make themselves less likely to get infected. Yet, much information spread on the Internet may not be true. Before the pandemic, fake news, misinformation, and disinformation about public health (i.e., false health information) were found spreading on social media. Due to the citizens' lack of trust in their governments in many countries, people were more likely to believe in such false health information. This research proposed a conceptual model for understanding factors influencing false health information formation by reviewing recent literature on spreading fake news and misinformation about health information from health science and social science disciplines. We focused on understanding how it spread during and after the COVID-19 pandemic and how it affected people's perceptions of believing and not believing the information disseminated on social media by different stakeholders (i.e., government departments, public health authorities, etc.). Our findings provided a clear understanding of potential factors influencing the spreading of false health information and helped researchers and stakeholders understand how false health information spreads. It set the foundations for future research on this research area, including but not limited to studying factors making people believe in false information, factors making people alert to false information, and factors that strengthen or weaken those effects, and developing policy recommendations for how we can minimize the impact of false health information on our society and others.

Keywords: False health information, health fake news, health misinformation, privacy, and COVID-19.

INTRODUCTION

We are walking through the COVID-19 pandemic together. It is probably one of the most severe pandemics since the notorious Spanish flu happened about 100 years ago. The COVID-19 pandemic not only created a public health crisis that affected not only our physical health but also our mental health (Ye & Ho, 2023; Ye *et al.*, 2023). Much effort has been put into researching the impact of COVID-19 on various issues in our society (Huang *et al.*, 2021, 2022, 2023). Rocha *et al.* (2023) also reported that the COVID-19 pandemic caused people to have psychological disorders, anxiety, etc. Most countries worldwide, if not all, had to take tight measures to avoid the spread of the COVID-19 virus, which included massive lockdowns, quarantines, travel restrictions, social distancing, and mandates of wearing masks, having vaccinations, and using contact tracing apps (Ho, Chan & Chiu, 2022; Ho, Chiu & Sayama, 2023). People who did not believe in vaccinations and various government health policies before the COVID-19 pandemic would not follow these government mandates and suggested that it was a conspiracy (Romer & Jamieson, 2020). Some people who used to believe in vaccinations and public health policy requirements also felt puzzled about why the COVID-19 virus could not be controlled and turned to believe in false health information spread on social media. As some people did not believe in the public health policy requirements, it made it more difficult for the public health authorities to contain the virus and slow its transmission, resulting in a more severe impact on our society. In this research, we reviewed papers on how false health information was formed and spread on social media before and during the COVID-19 Pandemic to understand factors affecting its creation and spreading and find ways to reduce its impact on our society in the future. Particularly, we would like to focus on the following three research questions (RQs):

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

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

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

We focus our review on research related to social media because it has been known to be the most influential media in spreading false health information in the model society (Bode & Vraga, 2017), and we hope this approach will provide us with an essential understanding of the situation.

LITERATURE REVIEW

Research on False Health Information on Social Media Before COVID-19

Starting from Web 2.0, people can easily create and share user-generated information. Web 2.0 provides opportunities for developing interactive platforms for medical practitioners to share their knowledge and keep up to date with the latest medical science developments (Bougioukas *et al.*, 2020) and for patients and members of the public to share health information and provide social support to each other (Le, Hoang & Pham, 2023). However, it also provides a platform for people to generate and

spread false health information. From public health perspectives, alternative opinions and even wrong information can now be easily created and spread on the Web and attract people's eyeballs. Nowadays, the extent of false health information shared on social media is quite severe. For example, based on social media data collected from Poland between 2012 and 2017, Waszak, Kasprzycka-Waszak, and Kubanek (2018) suggested that about 40% of health information shared on social media was fake, relating to alternative medicine, disease denial (such as AIDS), and anti-vaccination. In addition, a study conducted in 2013 with participants from the United States by Oliver and Wood (2014) showed that about half of the participants believed in at least one of the medical conspiracy theories circulating on the Internet. This shows that false health information can be disseminated on social media, and many believe in it. In addition, Wang *et al.* (2019) conducted a systematic literature review on false health information research related to social media, with papers retrieved from major academic databases between January 2012 to November 2018. Of the 57 papers analyzed, 30 were related to misinformation about communicable diseases (such as HPV, MMR, flu, Zika virus, etc.) and vaccination. Others were related to misinformation about chronic non-communicable diseases (such as cancer, cardiovascular disease, etc.) and other topics, such as smoking, rumors on health issues, etc. They also reported that other scholars were investigating social media like Facebook, Twitter, and YouTube as the channels for spreading such false health information.

One of the predominant false health information on the Internet and social media is fueled by the anti-vaccination movement. Anti-vaccination activists use social media to engage with potential readers and spread their beliefs actively using tactics such as skewing the science or even presenting pseudoscience by arguing scientifically proven findings as incorrect and supporting non-proven anti-vaccine findings, continuously providing "new" theories and hypotheses to suggest that vaccines are useless and harmful, censoring information and arguments presented by others in their websites social media who were not supporting to their anti-vaccination arguments, and attacking people and organizations supporting vaccination (Kata, 2012). Believers in these extreme theories may usually reinforce their beliefs by reading the information presented by people alike and disbelieving in facts presented by others who do not believe in their ideas, becoming victims of the echo chamber effect and the hostile media effect (Ho, Chan & Chiu, 2022). Furthermore, some people who initially do not believe in anti-vaccination campaigns may be influenced by such information when seeking health information online to decide whether to be vaccinated and decide for themselves and their families not to take vaccines (Carrieri, Madio & Principe, 2019). This situation is problematic as it can lead to outbreaks of infectious diseases, such as measles, that have been under control for years (McKee & Middleton, 2019).

Indeed, many pieces of false health information are grounded in conspiracy theories. These include framing public authorities for covering the adverse effects of vaccines and pushing through governments' secret agendas. One typical example is the accusation that the MMR vaccine would cause autism, which has already been proved wrong but still circulated in the anti-vaccination community as an "example" of conspiracy (Destefano, 2007). Yet, this misinformation influenced the court decision in Italy, in which the Court of Rimini ruled in favor of a link between childhood vaccination and autism in 2012, and in 2015, the ruling was overturned by the Appeal Court in Bologna (Rizzi *et al.*, 2021). However, the ruling from the Court of Rimini had already caused the decline of Italy's vaccination rate in those years. This finding suggested that conspiracy theories, particularly those that once had "supporting evidence", would have a long-term effect on society even if they would have been proved wrong later. A more recent example before the COVID-19 pandemic is the Zika conspiracy theories, of which 20% of Americans believed in at least one of them, and is related to their conspiracy thinking level. Another example is the COVID-19 contact tracing apps mandate imposed by many countries, which conspiracy theory believers insisted is the tool governments wanted to use to surveil their citizens (Ho, Chiu & Sayama, 2023). Indeed, people with high levels of conspiracy thinking are more likely to accept such theories, and tailored publicity campaigns may be needed to target this group of people to rectify their misunderstanding (Klostad *et al.*, 2019).

In brief, even before the COVID-19 Pandemic, false health information has already been spreading on social media. It is fueled by conspiracy theories, particularly those proposing authorities cover the "true" facts of the "harm" of vaccination and other conspiracies for governments spreading "fake" diseases and using them as an excuse to impose more controls on society. Believers in such conspiracy theories and related campaigns are ready to twist the research findings to support their ideas and convince people to believe them. These actions can cause severe adverse effects, such as reducing vaccination rates and causing outbreaks of diseases that have been under control for a long time.

Research on False Health Information on Social Media During COVID-19

Recent research findings of false health information show a more alarming situation. First, from a global perspective, people now have a low level of trust in their governments. Many people did not believe in various public health mandates for reducing the spread of the COVID-19 virus and would not like to follow them (Ho, Chiu & Sayama, 2023). Pertwee, Simas, and Larson (2022) argued that the COVID-19 pandemic further weakened people's trust in the public health authorities and fueled vaccine hesitancy. In addition, Pummerer *et al.* (2022) reported that people who believed in or were confronted with the COVID-19 conspiracy theory would have lower institutional trust, less support of government regulations related to COVID-19, less likely to adopt social distancing, and somehow reduced social engagement. Therefore, they even suggested that reporting false health information related to COVID-19 in the media (i.e., by telling people that it is false) would already reduce our efforts to fight the pandemic. Yet, a meta-analysis result reported by Walter *et al.* (2021) suggested that the corrective interventions would reduce the effect of false health information on people. Also, similar to the pre-pandemic situation, Romer and Jamieson (2020) also showed that conspiracy theories and vaccination misinformation influenced people's decisions to take preventive measures to protect themselves and be vaccinated during the beginning of the COVID-19 pandemic.

To look into the role of social media on false COVID-19 health information, Chipidza *et al.* (2022) used data collected from Twitter and Reddit between March 4 and 12, 2020, i.e., the beginning of the pandemic, as sources to conduct Latent Dirichlet Allocation (LDA) analysis on COVID-19-related social media news coverage topics. They showed that the topics found in these two social media included more topics than traditional media, such as newspapers and cable TV. Topics like misinformation on preventive measures and cures for COVID-19 could be found on such social media. Bin Naeem, Bhatti, and Khan (2020) also conducted a content analysis using a dataset of 1,225 fake news pieces published between January and April 2020. They showed that the three major types of COVID-19-related false health information published were (i) false claims, (ii) conspiracy theories, and (iii) pseudoscientific health therapies.

Furthermore, Melki *et al.* (2021) also used telephone interviews to collect responses from Lebanese at the beginning of the pandemic (between March 27 and April 23, 2020). They showed that people more likely to believe in false health information about COVID-19 were those who trusted social media news, interpersonal communication, and clerics. In addition, researchers also noted that people were more interested in viewing YouTube videos showing misinformation than videos with correct information presented by the public health authorities (Yeung *et al.*, 2022). Another research by Quinn, Fazel, and Peters (2021) used content analysis on 300 Instagram posts collected for ten days in April 2020. They noted that there was a general mistrust of authorities as people believed that they were covering up the “truth” of COVID-19, and there were a lot of posts related to conspiracy theories spreading on Instagram.

To sum up, with people having a low level of trust in their governments, the prolonged COVID-19 Pandemic further weakens their ties. It makes people more readily accept those false claims, conspiracy theories, and pseudoscientific arguments. As the most convenient tool for connecting people and receiving information during the pandemic (particularly for those with their towns locked down or under quarantine), social media has become the most efficient channel to spread both true and false health information. Yet, it is alarming that people would receive more interest in misinformation than true information. Therefore, public health authorities should find ways to reverse this situation.

FINDINGS AND DISCUSSION

RQ1: What are the Factors Making People Believe in False Health Information?

As mentioned, social media is the primary channel for circulating true and false health information online. Le *et al.* (2023) reported that people search for five significant types of health information online, including (i) sharing of personal health information, (ii) sharing health-related knowledge, (iii) general health messages, (iv) outcomes of health-related information sharing, and (v) findings of exploratory research in health. Yet, while such information is readily available, it is difficult for members of the public to understand it, as they do not have sufficient knowledge of medical sciences and statistics to understand the findings, and they may misunderstand the valid information and misinterpret the findings. Ho, Chan, and Chiu (2022) reported a case on Facebook showing that people misinterpreted the CDC’s report on the COVID-19 vaccination report and argued that taking vaccines would make people more easily infected by the COVID-19 virus. Indeed, the misinterpretation is caused by not taking the age group into calculating the infection rate. However, such misinterpretation would provide “evidence obtained from (re)interpreting from government reports” for supporting conspiracy theories.

Some people believe in false health information due to their beliefs in conspiracy theories, which they believe that governments are hiding information or having secret agendas (Destefano, 2007). This situation can reflect that trust in authority nowadays is low (Ho, Chiu & Sayama, 2023). Also, some false health information cases are related to politics. For example, it has been known that, in the U.S., the COVID-19 vaccination rate at the state level is related to political ideology, i.e., Republican States usually have a lower vaccination rate than Democrat States (Ho, Chan & Chiu, 2022), and further empirical findings to support the relationship between false health information and politics have also been reported by Romer and Jamieson (2020). Other health-related issues, such as women’s abortion rights, are also significantly influenced by political ideology (such as in the United States) (Chang *et al.*, 2023). Therefore, a person’s political background would be influential on whether a person would believe in false health information. This situation would increase false health information circulated in social media and further lower the trust in the authorities. Table 1 summarizes our initial findings related to RQ1.

Table 1: Factors making people believe in false health information.

| Factors | Details | References |
|---|---|---|
| Lack of scientific and statistical background | Most people do not have sufficient knowledge to understand health information and will misunderstand the health information available on social media. | Ho, Chan, and Chiu (2022) |
| 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. | Destefano (2007); Ho, Chiu, and Sayama (2023) |
| Follow their political party line | Political party supporters believe in (false) health information agreed by their political party line. | Chang <i>et al.</i> (2023); Ho, Chan, and Chiu (2022); Romer and Jamieson (2020). |

Source: This study.

RQ2: What are the Factors That Make People Generate False Health Information?

As social media content is user-generated, people may generate false health information in good faith as they think their alternative or incorrect information is correct. Their beliefs in the false health information may be the result of the echo chamber effect, i.e., they circulate their false health information among people with similar beliefs and thus reinforce their beliefs are the truth (Cinelli *et al.*, 2021) and/or the hostile media effect, i.e., they believe that media presenting opposite views are biased against them (Vallone, Ross & Lepper, 1985). Such actions can be the result of the following reasons. First, some people may act in good faith and believe that their misunderstanding of the health information is the correct representation, and generate false health information. In addition, believers of conspiracy theories would also generate and spread false health information grounded on those conspiracy theories they believed in to promote their ideas to others and to “help” other people. Also, some loyal supporters may generate false health information to fill the need for supporting the party line. In addition, there are reports that some countries may want to interfere in another country’s politics (i.e., further reduce citizens’ trust in another country) by spreading health misinformation by engaging people in social media and using bots (McKee & Middleton, 2019). Table 2 summarizes our findings related to RQ2.

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 them. They can also be conspiracy theory believers or people supporting a political party that supports false health information, and they want to create “evidence” to support the false information and conspiracy theories they believe in. | Cinelli <i>et al.</i> (2021); Vallone, Ross, and Lepper (1985) |
| Foreign country influence | Prior studies show that some countries tried to use bots or Internet water armies to influence other countries’ political environments, such as helping a political party that is more friendly to them to gain political advantages. | McKee and Middleton (2019) |

Source: This study.

RQ3: What are the Methods to Reduce the Impact of False Health Information?

Some possible ways to reduce or even stop the impact of false health information in society are summarized in Table 3. First, we must acknowledge that removing false health misinformation is challenging, particularly those “supported” by “evidence”. An example of the claim of a causal relationship between childhood MMR vaccination and causing autism presented above shows that a court decision could be influenced by a retracted paper, which subsequently becomes further “evidence” to be claimed by conspiracy theory believers (Carrieri *et al.*, 2019). The more troublesome situation is even after the court ruling is overturned, conspiracy theory believers could still reuse it and twist the appeal ruling as another support for “authority intervention”. As a result, Cichocka (2020) suggested that we should be proactive in handling health misinformation as it would be more difficult to refute it and make people believe in the fact after it spreads. She suggested that “Prebunking” would be more helpful, i.e., to warn people about spreading false health information, probably through education on information literacy and analytical skills.

Furthermore, Vraga and Bode (2017) proposed using expert sources to correct false health information on social media through an online experiment on misinformation related to the Zika virus outbreak. They showed that corrective responses provided by public health authorities (in their case, CDC) would help to refute health misinformation. Also, Chipidza *et al.* (2022) suggested public health authorities use communication specialists to provide information in the early stage of the pandemic and use it to control/prevent the spread of false health information. Another practical approach currently adopted by social media is asking social media operators to take part in helping remove false health information from their platforms (McKee & Middleton, 2019; Mheidly & Fares, 2020).

While some countries now punishing people and companies for spreading false health information may help to deter people from spreading such information (Morgan 2018), Au *et al.* (2021) conducted a survey to check if people would be more eager to spread fake news if they got paid and reduce their intention to spread such news if there was legislation to punish them for spreading false health information. While they found that providing financial incentives would encourage people to spread the news online, no matter whether they believed the news was true or fake, they discovered that imposing legal punishment would deter people from sharing health news that they thought was true but encouraged them from sharing those they thought was fake. They argued that people might share false health information online, even when they would face punishment. It is because they wanted to show their rebellion or thought it was “too fake” and would be considered as sharing a joke with others and opined that they would not be punished (as they were spreading “jokes”, not “false information”). Yet, it is still possible to prevent the spreading of false health information.

Finally, some scholars suggested providing more education for people to improve their skills in identifying and recognizing false health information and stop tolerating pseudoscience health practices by highlighting the risks of believing in those practices (Bin Naeem, Bhatti & Khan, 2020) on top of improving people’s level of media literacy (Melki *et al.*, 2021). This is, of course, a possible first and essential step that various governments can take immediately.

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

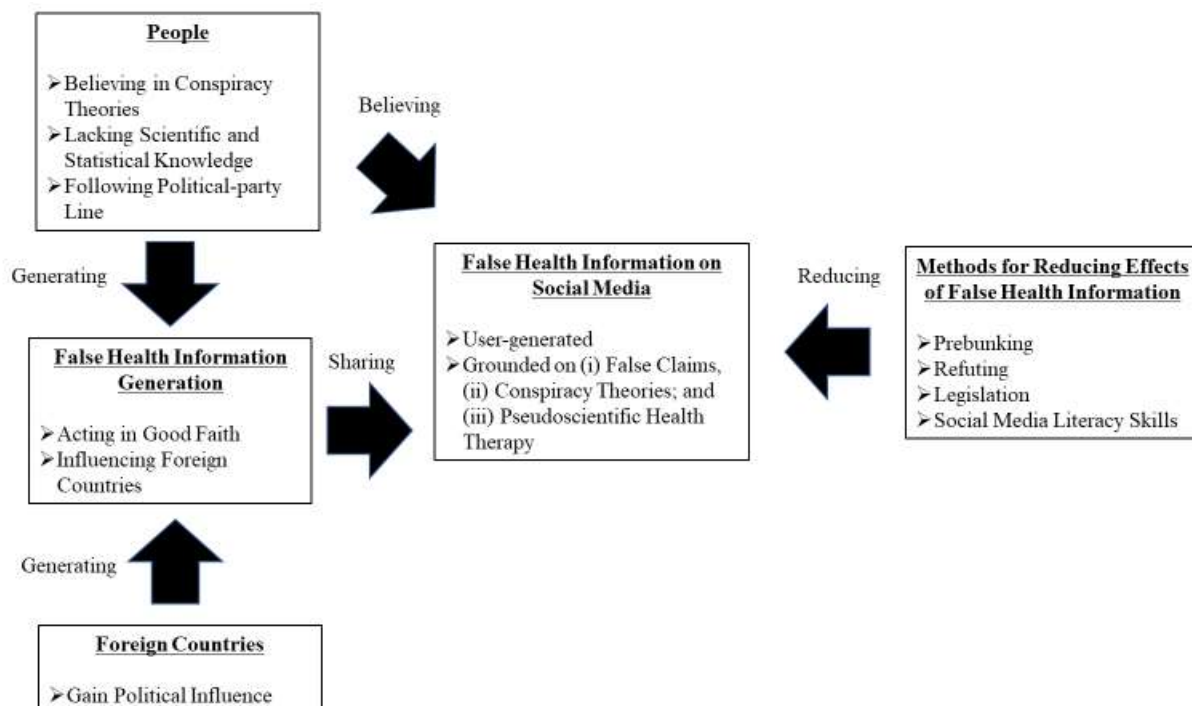
| Methods | Details | References |
|---|---|--|
| Prebunking | As it would be more difficult to refute a conspiracy theory after it spreads, authorities should warn people about spreading false health information before it starts to spread. | Cichocka (2020) |
| Refuting by authority | It is possible that corrective responses provided by authorities, with the help of communication specialists, could help to refute false health information. | Chipidza <i>et al.</i> (2022); McKee and Middleton (2019); Mheidly and Fares (2020); Vraga and Bode (2017) |
| 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. | Au <i>et al.</i> (2021); Morgan (2018) |
| Education on media literacy | It is essential to provide more media literacy and false information identifying education in society to help citizens identify false health information and avoid spreading it. | Bin Naeem, Bhatti, and Khan (2020); Melki <i>et al.</i> (2021) |

Source: This study.

Resultant Research Model

Our initial findings provide us with the foundations for conducting further research on why people believe in and generate false health information and finding possible ways to reduce the impact of false health information on society. Based on our initial findings, we developed a preliminary model as the foundation for further research, as presented in Figure 1. First, we identify the characteristics of people believing in 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 line. These people may generate false health information in good faith. Also, foreign countries may want to gain political influence on the country concerned and generate false health information to influence them.

At the same time, we discovered methods that may help to reduce the spread of fake news, including (i) prebunking, (ii) refuting by authority 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 chances to reduce the impact of false health information on our society.



Source: This study.

Figure 1: Research model.

The next step of this research is to develop a qualitative study based on this preliminary model. Before we start our qualitative study, we also plan to further strengthen the model by conducting a further literature review, including the effect of sources of information and the level of trust and distrust and how these factors co-create (See-To & Ho, 2014) the social media environment concerning the formation, spreading, and stopping of false health information. Our qualitative study will ascertain further relevant

constructs on influencing people in generating false health information (such as people's trust and distrust in public health authorities, people's level of scientific and statistical knowledge, people's loyalty to a political party, and their level of beliefs in conspiracy theory would influence their possibility to generate false information) and strengthening their beliefs (such as the online information collecting behavior and whether the echo chamber effect and hostile media effect influence them). We will also investigate more methods for reducing the effects of false health information. The result of our qualitative study set the foundations for the final stage of our study for developing a quantitative study to validate the final conceptual model.

CONCLUSION

We need all people to work together to reduce the spread of false health information in society. Indeed, many research studies in recent years have focused on studying how false information about health damages our society by making people disbelieve and distrust public health suggestions and policies. We hope this short review and the research model presented can provide insights into research and public health administrators for further developing new research to resolve the false health information problem for protecting our society.

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