Towards User Empowerment: Bridging the Gap in Health Misinformation Protection on Social Networks

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Health misinformation in social networks requires immediate attention due to its severe consequences, as exemplified by the COVID-19 pandemic response on social media. However, the existing solutions designed to combat misinformation generally overlook the unique characteristics of health misinformation domain. Through a review of relevant literature and a critical analysis of current anti-misinformation solutions, we have identified significant user-side issues that undermine the effectiveness of existing approaches in addressing health misinformation. To tackle these issues, we put forth several strategies to empower users in combating health misinformation. Our research contributes to understanding the challenges associated with health misinformation correction on social networks.

Additional Key Words and Phrases: Misinformation, Health; Credibility Indicators, Design Frictions

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1 INTRODUCTION

In recent years, there has been a growing trend of people using social media to address their well-being and health concerns [36]. While social media health groups can provide broader community support to its users[47], they can also become breeding grounds for misinformation. The COVID-19 pandemic is a notable example of this phenomenon, with numerous Facebook groups and Twitter threads promoting extreme views and misinformation about the virus and its countermeasures. Studies have shown a significant impact of vaccine deniers and conspiracy Facebook groups on spreading misinformation about vaccines and hygiene practices among the general population [5, 20]. Several scholars have referred to the COVID-19 pandemic as an "infodemic" [31, 34], characterized by the rapid spread of information, including a substantial amount of false and misleading content. Social media platforms play a significant role in propagating such misinformation, leading people to act against public health policies and scientific guidance, ultimately causing harm to its users. Academics, government officials, industry stakeholders, and social media platform owners have suggested various ways of addressing the challenges posed by this infodemic [23, 28, 39]. Within the field of Human-Computer Interaction, current approaches to combat misinformation include design friction methods that aim to delay users from immediately sharing information, giving them time to evaluate the news before sharing [8, 19, 30]. Another line of research focuses on developing credibility indicators that signify potential credibility problems with content [13, 26, 44]. However, these solutions have shown limited effectiveness in combating misinformation [14, 42]. Furthermore, most current solutions do not consider health misinformation's specific characteristics, including the content's nature and users' motivations for sharing it. In this paper, we discuss how the characteristics of health misinformation limit the efficiency of existing anti-misinformation

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solutions and how we can address these limitations to enhance the efficiency of credibility-building and misinformation prevention. Our proposals aim to make fact-checking and misinformation prevention elements in social network interfaces user-friendly, respectful of users' choices and preferences, and personalized to their needs. The future solutions aim to address users' doubts about the credibility of information sources, enable them to customize the information provided by different sources, and provide a tool for quick fact-checking before sharing information. To illustrate our ideas, we present a mock-up interface embedded in a fictional mobile Facebook plugin incorporating interactive features for fact-checking and misinformation prevention. We discuss the mock-ups and provide directions for future development and evaluation.

2 RELATED WORK

2.1 Characteristics of Health Misinformation in Social Networks

Health misinformation refers to health-related claims of fact that are currently considered to be false due to a lack of scientific evidence or contradicting the consensus of the scientific/expert community regarding a given topic [11, 37]. While most studies agree that health misinformation creates great risks to society [15, 17, 25], a limited number of studies discuss the specific characteristics of this type of misinformation in comparison with the characteristics of other types of misinformation (political or marketing) in relation to the interventions that can be applied to protect users from this specific kind of threat [42]. Recent studies indicate that when it comes to sharing information on social networks, the motivation behind sharing political misinformation is often driven by partisanship or enjoyment [27, 38]. However, for health-related topics, including both accurate information and misinformation, altruistic motivation emerges as one of the primary factors influencing sharing behavior [4, 46]. In relation to this, sharing health-related information in social networks often takes the form of personal stories, motivated by the search for people with shared experiences and seeking social support [35, 40] or, to some extent, for self-presentation purposes [29]. That means, in many cases, health-related information in social networks incorporates opinion-based features and personal experiences, which makes it difficult to be marked as "true" or "false," even if the mentioned treatments contradict expert consensus. If the system marks such content as false, it can be perceived as a personal attack by the individuals sharing their experiences. Another issue is that misleading health information sometimes includes genuine medical terms and concepts, which require professional expertise to fully understand and make appropriate content suggestions. [9]. In this context, the knowledge gap stops users from understanding the false claims within the text. Alternatively, even genuine medical information, when presented via social networks to non-professionals, can generate misinformation claims as non-professional users cannot fully understand the concepts and relations behind the information [24, 48].

2.2 Design Interventions and Solutions for Informed Decision-Making and Misinformation Reduction in Social Media Platforms

Previous research in the HCI domain has introduced various interventions to assist users in making informed decisions about the media they consume. These interventions enhance user awareness and credibility assessment through credibility rating scales, provenance indicators, warnings, and credibility labels. For instance, Enrico et al. incorporated a credibility rating scale and displayed the source of credibility in the user interface [7]. Amin et al. proposed a similar intervention using labels indicating credible fact-checking sources and pop-up warning notifications to capture users' attention [2]. Several works have proposed using provenance warnings to alert users when the source of information is unverified [12, 33]. Binary credibility labels, such as "thumbs up/down" icons, have also been utilized to indicate the integrity of news articles [6].

In addition to efforts focused on assessing information credibility, researchers have explored design interventions to raise awareness and promote critical news consumption behavior, aiming to reduce the spread of misinformation on social media [32]. These interventions can take the form of nudges and frictions. Nudges are designed to guide individuals in a specific direction without restricting their freedom of choice [16]. For example, Jahanbakhsh et al. developed behavioral nudges that provide users with accurate assessments and explanations regarding the accuracy of news stories, thereby reducing the dissemination of false content [19]. Similarly, Andi and Akesson investigated using "social norm-based nudges" to encourage individuals to share more responsibly. These nudges remind users that false news is prevalent online and that responsible individuals think twice before sharing information with friends and followers [3]. Chen et al. focused on nudging and boosting users to resist misinformation by exposing them to the presence of filter bubbles and presenting news beyond those bubbles [10]. Capraro and Celadin examined three types of nudges in the Facebook format and discovered that endorsing accuracy reduced the sharing of misinformation while increasing the sharing of genuine news [8].

An emerging group of solutions encourages users to engage with the content actively, offering them accessible tools to verify the authenticity of the information's source. The approach involves providing users with web browser extensions that offer quick access to information and context about specific publishers or content, enabling users to verify the credibility of information [1, 45] or providing clues about information credibility and offering an instrument to mark questionable content [21]. Interactive AI-based solutions have emerged as potential tools for combating misinformation, also offering users a more tangible way to interact with information. The approach was employed by Jahanbakhsh et al., who used a human-in-the-loop to present AI suggestions regarding possible misinformation in tweets and receive human feedback on the proposals. The system also allowed users to request explanations from the AI system regarding its decisions [18].

3 REFINING MISINFORMATION CORRECTION SOLUTIONS FOR HEALTH INFORMATION IN SOCIAL NETWORKS

While studies indicate that correcting misinformation in the health domain tends to be more successful than in the political sphere [43] and no significant evidence suggests that attempts correct health-related misinformation inadvertently increase people's acceptance of the falsehood [42], the overall impact of correction efforts remains in the weak-to-moderate range [42], which calls for a discussion on the potential limitations of current correction measures and the identification of additional factors that can enhance intervention effectiveness.

One criticism of current solutions is their **oversimplified approach to assessing message credibility**. The categorization of news as either "true" or "false" overlooks the intricate nuances and uncertainties. For instance, health-related information shared on social networks often takes the form of personal storytelling. Treating the entire narrative as "non-credible information" can be judgmental and impolite. The design community should explore better alternatives for addressing opinionated claims, such as developing tools to highlight specific pieces of information containing false claims while keeping the rest of the message intact. This approach would allow for a more nuanced understanding of the content.

The second critical limitation of current approaches to identifying non-factual content on social media, particularly in the context of health-related information, is the **lack of transparency**. In the health domain, users are likely to accept misinformation corrections when provided by credible organizations such as international health agencies[41]; studies show the high trust in medical scientists as a source of credible information [37]. Unlike political topics where source bias is more commonly perceived, users in health-related discussions are generally more open to reconsidering

their beliefs. Providing transparent access to external sources, especially trusted health sites, can enhance users' reliance on credibility indicators.

Lack of user agency can also be considered an important limitation in health-related domains. Most existing solutions in social networks passively provide users with final judgments about the integrity of information. However, research has shown that user agency is essential in combating online misinformation [22]. Previous studies have indicated a strong motivation for research and knowledge-seeking regarding sharing and seeking health-related information online [40]. To address this, we propose an interactive approach that actively engages users in asking questions about different aspects of health-related information. This approach can enhance their critical thinking and decision-making by empowering users to form their own opinions about the truthfulness of the information.

Finally, **health(mis)information often involves complex medical domain knowledge, making it challenging for users to comprehend**. To alleviate this issue, we suggest implementing a tool that can automatically summarize and simplify text while highlighting key concepts and explaining the main message using non-specialized language. This tool would not require specific medical knowledge, enabling users to understand the information better and make informed decisions about sharing it.

Based on the highlighted challenges and potential solutions, we have developed a series of mock-ups to illustrate these ideas. We aim to utilize these mock-ups in forthcoming discussions with users to explore the suitability, efficiency, and ethical considerations of current and future solutions. The mock-ups, along with their descriptions, are presented in the Appendix.

4 CONCLUSIONS

The prevalence of health misinformation in social networks requires immediate attention. Practitioners must recognize and comprehend the unique characteristics of this type of misinformation to develop specialized solutions. This paper serves as an initial step in bridging the gap between the problem of health misinformation and the broader field of misinformation-combating solutions, which are currently used in social networks. We hope that our work catalyzes future research endeavors that focus on designing more effective interventions in the health-related misinformation domain.

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A APPENDIX: MOCK-UPS OF PROPOSED SOLUTIONS

An app presented on Figure 1 aims to resolve the issues linked to oversimplified news credibility and the absence of transparency in generating credibility indicators. The goal is to provide users with clear information about the source of opinions regarding the reliability of news articles. Frame 1 shows the initial news feed. The second frame explains our approach to viewing information as a mixture of facts that require verification rather than simply true or false. We also emphasize that it is the user's responsibility to assess the credibility of the information. In Frames 4 and 5,

we highlight questionable information and include links to credible sources that can verify the information.

Figure 2 presents a way to empower users by giving them agency and providing a toolbox of solutions to actively transform information, making it easier to access and evaluate. The first frame represents the initial text, which can be challenging to understand and verify. To interact with the text, we allow users to select a specific part of the text and ask the system a question related to that particular section (Frame 2). Another option is to utilize a module that simplifies the text (Frames 3-4), offering a quick overview of the information by summarizing it (Frames 5-6).

Fig. 1

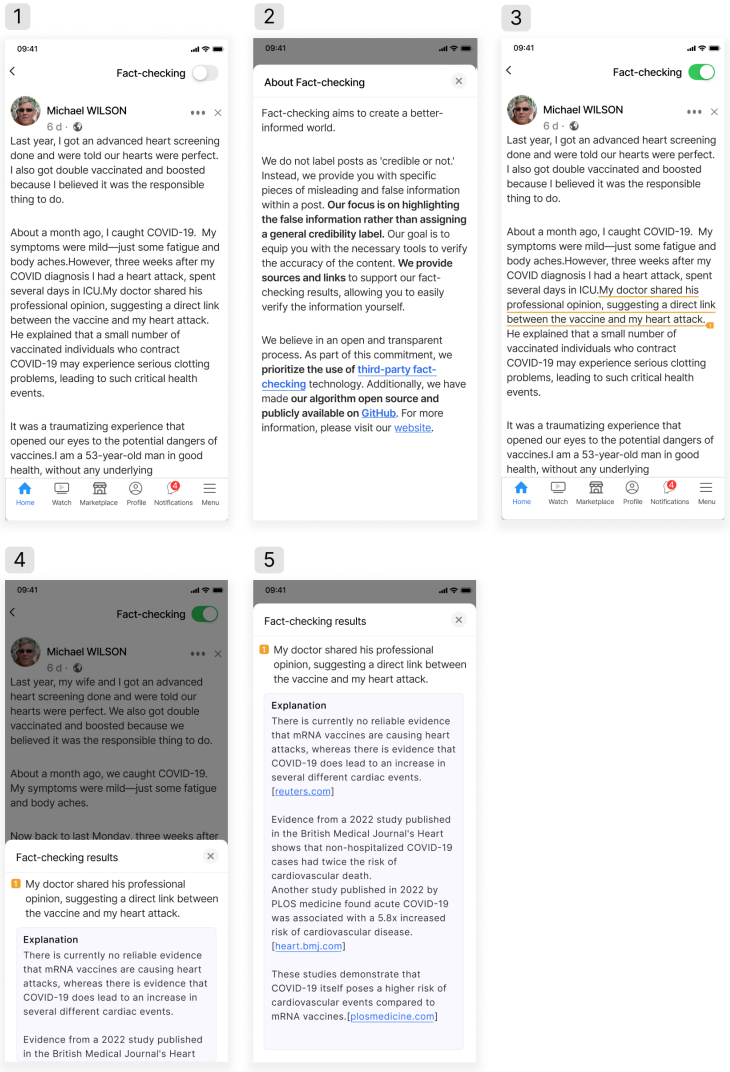
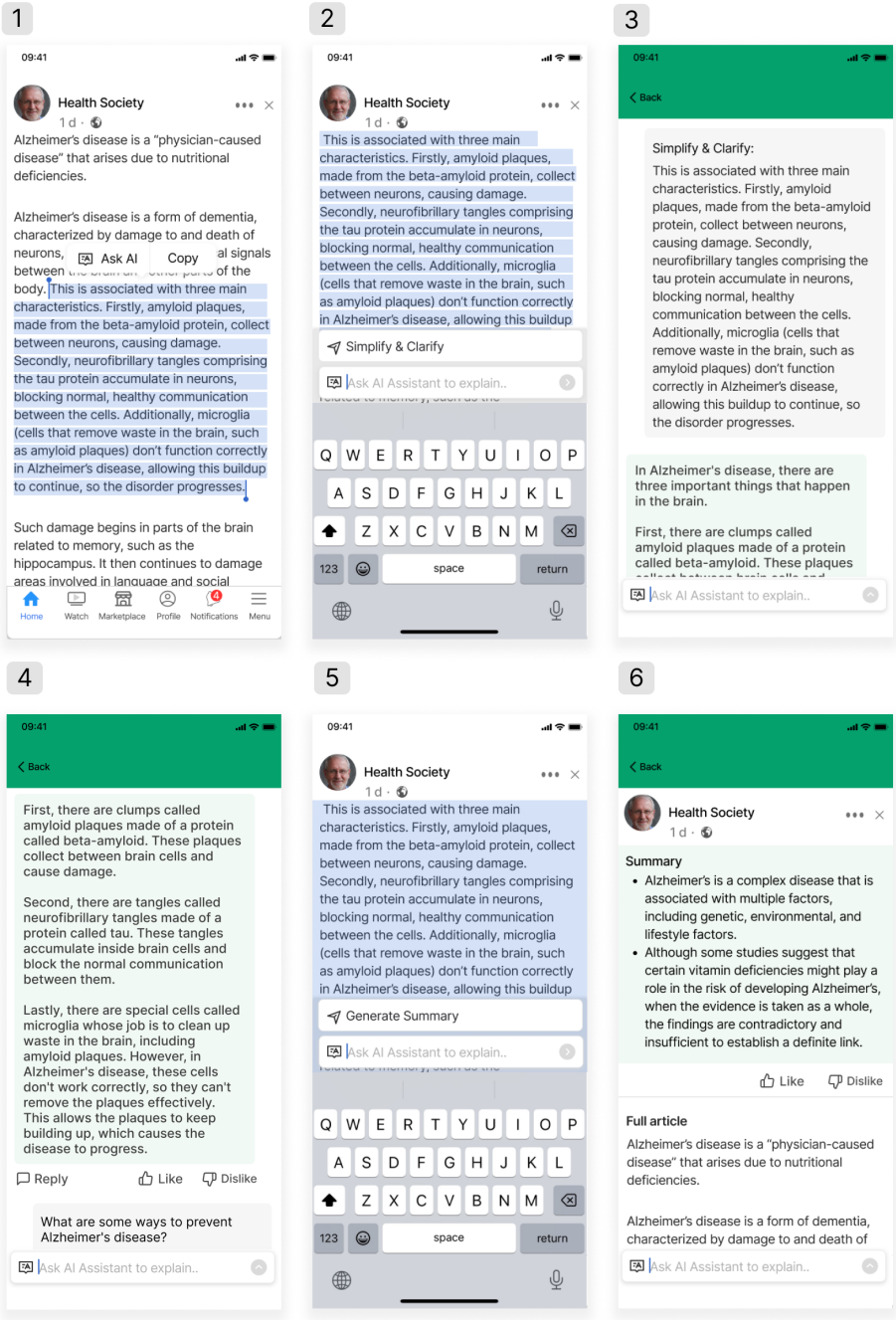


Fig. 2


1
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Health Society
1 d ·
Alzheimer's disease is a "physician-caused disease" that arises due to nutritional deficiencies.
Alzheimer's disease is a form of dementia, characterized by damage to and death of neurons,
Ask AI
Copy
al signals between
of the body. This is associated with three main characteristics. Firstly, amyloid plaques, made from the beta-amyloid protein, collect between neurons, causing damage. Secondly, neurofibrillary tangles comprising the tau protein accumulate in neurons, blocking normal, healthy communication between the cells. Additionally, microglia (cells that remove waste in the brain, such as amyloid plaques) don't function correctly in Alzheimer's disease, allowing this buildup to continue, so the disorder progresses.
Such damage begins in parts of the brain related to memory, such as the hippocampus. It then continues to damage areas involved in language and social
Home
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Notifications
Menu
2
09:41
Health Society
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This is associated with three main characteristics. Firstly, amyloid plaques, made from the beta-amyloid protein, collect between neurons, causing damage. Secondly, neurofibrillary tangles comprising the tau protein accumulate in neurons, blocking normal, healthy communication between the cells. Additionally, microglia (cells that remove waste in the brain, such as amyloid plaques) don't function correctly in Alzheimer's disease, allowing this buildup
Simplify & Clarify
Ask AI Assistant to explain..
3
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Simplify & Clarify:
This is associated with three main characteristics. Firstly, amyloid plaques, made from the beta-amyloid protein, collect between neurons, causing damage. Secondly, neurofibrillary tangles comprising the tau protein accumulate in neurons, blocking normal, healthy communication between the cells. Additionally, microglia (cells that remove waste in the brain, such as amyloid plaques) don't function correctly in Alzheimer's disease, allowing this buildup to continue, so the disorder progresses.
In Alzheimer's disease, there are three important things that happen in the brain.
First, there are clumps called amyloid plaques made of a protein called beta-amyloid. These plaques
Ask AI Assistant to explain..
4
09:41
Back
First, there are clumps called amyloid plaques made of a protein called beta-amyloid. These plaques collect between brain cells and cause damage.
Second, there are tangles called neurofibrillary tangles made of a protein called tau. These tangles accumulate inside brain cells and block the normal communication between them.
Lastly, there are special cells called microglia whose job is to clean up waste in the brain, including amyloid plaques. However, in Alzheimer's disease, these cells don't work correctly, so they can't remove the plaques effectively. This allows the plaques to keep building up, which causes the disease to progress.
Reply
Like
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What are some ways to prevent Alzheimer's disease?
Ask AI Assistant to explain..
5
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Health Society
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This is associated with three main characteristics. Firstly, amyloid plaques, made from the beta-amyloid protein, collect between neurons, causing damage. Secondly, neurofibrillary tangles comprising the tau protein accumulate in neurons, blocking normal, healthy communication between the cells. Additionally, microglia (cells that remove waste in the brain, such as amyloid plaques) don't function correctly in Alzheimer's disease, allowing this buildup
Generate Summary
Ask AI Assistant to explain..
6
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Back
Health Society
1 d ·
Summary
Alzheimer's is a complex disease that is associated with multiple factors, including genetic, environmental, and lifestyle factors.
Although some studies suggest that certain vitamin deficiencies might play a role in the risk of developing Alzheimer's, when the evidence is taken as a whole, the findings are contradictory and insufficient to establish a definite link.
Like
Dislike
Full article
Alzheimer's disease is a "physician-caused disease" that arises due to nutritional deficiencies.
Alzheimer's disease is a form of dementia, characterized by damage to and death of
Ask AI Assistant to explain..